

AIX Version 6.1



Installation and migration

AIX Version 6.1



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Note

Before using this information and the product it supports, read the information in “Notices” on page 375.

First Edition (November 2007)

This edition applies to AIX Version 6.1 and to all subsequent releases of this product until otherwise indicated in new editions.

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About this book

This book provides system administrators with complete information about how to perform such tasks as installing and maintaining the AIX operating system and optional software on standalone systems and on client systems from a resource server using the Network Install Management (NIM) interface. It also includes information on how to migrate a system, manage system backups, install AIX updates, use alternate disk installation, and troubleshoot problems with installation. This publication is available on the documentation CD or DVD that is shipped with the operating system.

Highlighting

The following highlighting conventions are used in this book:

Bold	Identifies commands, subroutines, keywords, files, structures, directories, and other items whose names are predefined by the system. Also identifies graphical objects such as buttons, labels, and icons that the user selects.
<i>Italics</i>	Identifies parameters whose actual names or values are to be supplied by the user.
Monospace	Identifies examples of specific data values, examples of text similar to what you might see displayed, examples of portions of program code similar to what you might write as a programmer, messages from the system, or information you should actually type.

Viewing readme files

The Base Operating System (BOS) includes a readme file that contains information not included in other documentation. Each software product may also have its own readme file with new information specific to that product. After you install BOS, view these files to learn important changes before using your system.

Use the following procedure to view the readme files for Base Operating System (BOS) software and optional software products:

1. Log in as root user if you have not already done so.
2. Enter the following command at the system prompt:

```
cd /usr/lpp
```

3. Type:

```
ls */*README*
```

The system lists readme files for each software product installed on your system.

4. To view a readme file for a specific software product, use the following command:

```
pg xxx/README
```

In this example, *xxx* is the directory name associated with a particular software product.

Press Enter when the copyright screen appears. Press the following keys or key combinations to scroll through the readme file:

To page down

Press Enter key.

To page up

Type the minus (-) key, then press the Enter key.

To move forward x pages

Type the plus (+) key and number of pages, then press the Enter key.

For example, to move forward five pages, type +5 and press the Enter key.

To move backward x pages

Type the minus (-) key and number of pages, then press the Enter key.

For example, to move backward five pages, type -5 and press Enter.

Type q at the : (colon) prompt to exit the readme file.

Case-sensitivity in AIX

Everything in the AIX operating system is case-sensitive, which means that it distinguishes between uppercase and lowercase letters. For example, you can use the **ls** command to list files. If you type **LS**, the system responds that the command is "not found." Likewise, **FILEA**, **FiLea**, and **filea** are three distinct file names, even if they reside in the same directory. To avoid causing undesirable actions to be performed, always ensure that you use the correct case.

ISO 9000

ISO 9000 registered quality systems were used in the development and manufacturing of this product.

Related publications

The following publications contain additional information related to the installation and management of AIX 6.1:

- *Operating system and device management*
- *Networks and communication management*
- *AIX Version 6.1 Commands Reference*
- *AIX Version 6.1 Files Reference*
- *AIX Version 6.1 General Programming Concepts: Writing and Debugging Programs*
- *Security*

Installation and migration

This topic provides system administrators with complete information about how to perform such tasks as installing and maintaining the AIX® operating system and optional software on standalone systems, and on client systems from a resource server using the Network Install Management (NIM) interface. It also includes information about how to migrate a system, manage system backups, install AIX updates, use alternate disk installation, and troubleshoot problems with installation. This topic is available on the documentation media that is shipped with the operating system.

To view or download the PDF version of this topic, select Installation and migration.

How-To's for AIX Installation Tasks

The following how-to's contain instructions for performing common installation tasks.

Installing new and complete overwrite BOS from media

Using this scenario, you can install the AIX operating system for the first time or overwrite an existing version of the operating system.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

In this scenario, you will do the following:

- Boot from the AIX product media
- Set BOS Installation Settings
 - Perform a new and complete overwrite installation of AIX onto `hdisk0`
 - Use English as the primary language
 - Use the default options in the More Options menu
- Start the BOS Installation and Configure the System

If you are overwriting an existing system, gather the TCP/IP information from the system before you begin this scenario.

Attention: This procedure requires shutting down and reinstalling the base operating system. Whenever you reinstall any operating system, schedule your downtime when it least impacts your workload to protect yourself from a possible loss of data or functionality. Before you perform a new and complete overwrite installation, ensure you have reliable backups of your data and any customized applications or volume groups. For instructions on how to create a system backup, refer to *Creating system backups*.

The following steps show you how to use the system's built-in media device to perform a new and complete overwrite base operating system installation.

At this point, the BOS Installation is complete, and the initial configuration of the system is complete.

Step 1. Prepare your system

- There must be adequate disk space and memory available. AIX requires 256–512 MB of memory and 2.2 GB of physical disk space. For additional release information, see the *AIX 6.1 Release Notes*.
- Make sure your hardware installation is complete, including all external devices. See the documentation provided with your system unit for installation instructions.

- If your system needs to communicate with other systems and access their resources, make sure you have the information in the following worksheet before proceeding with installation:

Table 1. Network Configuration Information Worksheet

Network Attribute	Value
Network Interface	(For example: en0, et0)
Host Name	
IP Address	_____._____._____._____
Network Mask	_____._____._____._____
Nameserver	_____._____._____._____
Domain Name	
Gateway	_____._____._____._____

Step 2. Boot from the AIX product media

Booting the system from the AIX Product media.

1. Insert the *AIX Volume 1* media into the media device.
2. Make sure all external devices attached to the system (such as CD-ROM drives, tape drives, DVD drives, and terminals) are turned on. Only the media drive from which you will install AIX should contain the installation media.
3. Power on the system.
4. When the system beeps twice, press F5 on the keyboard (or 5 on an ASCII terminal). If you have a graphics display, you will see the keyboard icon on the screen when the beeps occur. If you have an ASCII terminal (also called a tty terminal), you will see the word keyboard when the beeps occur.

Note: If your system does not boot using the F5 key (or the 5 key on an ASCII terminal), refer to your hardware documentation for information about how to boot your system from an AIX product media.

5. Select the system console by pressing F1 (or 1 on an ASCII terminal) and press Enter.
6. Select the English language for the base operating system (BOS) Installation menus by typing a 1 in the **Choice** field. Press Enter to open the Welcome to Base Operating System Installation and Maintenance screen.
7. Type 2 to select **2 Change/Show Installation Settings and Install** in the **Choice** field and press Enter.

```

Welcome to Base Operating System
Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

>>> 1 Start Install Now with Default Settings
    2 Change/Show Installation Settings and Install
    3 Start Maintenance Mode for System Recovery
    4 Configure Network Disks (iSCSI)

    88 Help ?
    99 Previous Menu
>>> Choice [1]: 2

```

Step 3. Set and verify BOS installation settings

1. In the Installation and Settings screen, verify the installation settings are correct by checking the method of installation (new and complete overwrite), the disk or disks you want to install, the primary language environment settings, and the **more options** menu.

If the default choices are correct, type 0 and press Enter to begin the BOS installation. The system automatically reboots after installation is complete. Go to step 4.

Otherwise, go to sub-step 2.

2. To change the System Settings, which includes the method of installation and disk where you want to install, type 1 in the **Choice** field and press Enter.

```
Installation and Settings

Either type 0 and press Enter to install with current settings, or type the
number of the setting you want to change and press Enter.

 1 System Settings:
   Method of Installation.....New and Complete Overwrite
   Disk Where You Want to Install.....hdisk0

>>> Choice [0]: 1
```

3. Type 1 for New and Complete Overwrite in the **Choice** field and press Enter. The Change Disk(s) Where You Want to Install screen now displays.

```
Change Disk(s) Where You Want to Install

Type one or more numbers for the disk(s) to be used for installation and press
Enter. To cancel a choice, type the corresponding number and Press Enter.
At least one bootable disk must be selected. The current choice is indicated
by >>>.

      Name      Location Code  Size(MB)  VG Status  Bootable
-----
 1  hdisk0     04-B0-00-2,0    4296     none      Yes
 2  hdisk1     04-B0-00-5,0    4296     none      Yes
 3  hdisk2     04-B0-00-6,0   12288     none      Yes

>>> 0  Continue with choices indicated above

66  Disks not known to Base Operating System Installation
77  Display More Disk Information
88  Help ?
99  Previous Menu

>>> Choice [0]:
```

4. In the Change Disk(s) Where You Want to Install screen:
 - a. Select **hdisk0** by typing a 1 in the **Choice** field and press Enter. The disk will now be selected as indicated by >>>. To unselect the destination disk, type the number again and press Enter.
 - b. To finish selecting disks, type a 0 in the **Choice** field and press Enter. The Installation and Settings screen displays with the selected disks listed under System Settings.
5. Change the Primary Language Environment Settings to English (United States). Use the following steps to change the Cultural Convention, Language, and Keyboard to English.
 - a. Type 2 in the **Choice** field on the Installation and Settings screen to select the **Primary Language Environment Settings** option.
 - b. Type the number corresponding to English (United States) as the Cultural Convention in the **Choice** field and press Enter.
 - c. Select the appropriate keyboard and language options.

You do not need to select the **More Options** selection, because you are using the default options in this scenario. For more information about the installation options available in AIX, see BOS installation options.

6. Verify that the selections are correct in the Overwrite Installation Summary screen, as follows:

```
Overwrite Installation Summary

Disks: hdisk0
Cultural Convention: en_US
Language: en_US
Keyboard: en_US
JFS2 File Systems Created: Yes
Graphics Software: Yes
Desktop: CDE
System Management Client Software: Yes
Enable System Backups to install any system: Yes

Optional Software being installed:

>>> 1 Continue with Install
      88 Help ?
      99 Previous Menu

>>> Choice [1]:
```

The default options change based on machine, security, and console type.

7. Press Enter to begin the BOS installation. The system automatically reboots after installation is complete.

Step 4. Configure the system after installation

1. On systems with a graphics display, after a new and complete overwrite installation, the Configuration Assistant opens. On systems with an ASCII display, after a new and complete overwrite installation, the Installation Assistant opens.
2. Select the **Accept Licenses** option to accept the electronic licenses for the operating system.
3. Set the date and time, set the password for the administrator (root user), and configure network communications (TCP/IP).
Use any other options at this time. You can return to the Configuration Assistant or the Installation Assistant by typing `configassist` or `smitty assist` at the command line.
4. Select **Exit the Configuration Assistant** and select Next. Or, press F10 (or ESC+0) to exit the Installation Assistant.
5. If you are in the Configuration Assistant, select **Finish now, and do not start Configuration Assistant when restarting AIX** and select **Finish**.

Migrating your system from media

Using this scenario, you can migrate a system from AIX 5.1 to AIX Version 6.1.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

In this scenario, you will do the following:

- Perform a migration installation of AIX 5.1 to AIX Version 6.1
- Use English as the primary language
- Use the default options in the Advanced Options menu

Attention: This procedure requires shutting down and reinstalling the base operating system. Whenever you reinstall any operating system, schedule your downtime when it least impacts your workload to protect yourself from a possible loss of data or functionality. Before you perform a migration installation, ensure you have reliable backups of your data and any customized applications or volume groups. For instructions on how to create a system backup, refer to *Creating system backups* in *Installation and migration*.

Step 1. Prepare for the migration

Before starting the migration, complete the following prerequisites:

- Ensure that the root user has a primary authentication method of SYSTEM. You can check this condition by typing the following command:

```
# lsuser -a auth1 root
```

If needed, change the value by typing the following command:

```
# chuser auth1=SYSTEM root
```

- Before you begin the installation, other users who have access to your system must be logged off.
- Verify that your applications will run on AIX Version 6.1. Also, check if your applications are binary-compatible with AIX Version 6.1. If your system is an application server, verify that there are no licensing issues. Refer to your application documentation or provider to verify on which levels of AIX your applications are supported and licensed. You can also check the *Supported Products List* at the following Web address: <http://www-03.ibm.com/services/sl/products/>
- Check that your hardware microcode is up-to-date.
- All requisite hardware, including any external devices (such as tape drives or CD/DVD-ROM drives), must be physically connected and powered on. If you need further information, refer to the hardware documentation that accompanied your system.
- Use the **errpt** command to generate an error report from entries in the system error log. To display a complete detailed report, type the following:

```
# errpt -a
```

- There must be adequate disk space and memory available. AIX requires 256–512 MB of memory and 2.2 GB of physical disk space. For additional release information, see the *AIX 6.1 Release Notes*.
- Run the `pre_migration` script located in the **mount_point/usr/lpp/bos** directory on your media. To mount the media run the following command:

```
# mount -v cdrfs -o ro /dev/cdN /mnt
```

where "N" is your media drive number.

Note: Do not remove the data created by the `pre_migration` script, because it is used by the `post_migration` script.

- Make a backup copy of your system software and data. For instructions on how to create a system backup, refer to *Creating system backups*.
- Always refer to the release notes for the latest migration information.

Step 2. Boot from the AIX product media

1. If they are not already on, turn on your attached devices.
2. Insert the *AIX Volume 1* media into the media device.
3. Reboot the system by typing the following command:

```
# shutdown -r
```

4. When the system beeps twice, press F5 on the keyboard (or 5 on an ASCII terminal). If you have a graphics display, you will see the keyboard icon on the screen when the beeps occur. If you have an ASCII terminal (also called a tty terminal), you will see the word keyboard when the beeps occur.

Note: If your system does not boot using the F5 key (or the 5 key on an ASCII terminal), refer to your hardware documentation for information about how to boot your system from an AIX product media.

5. Select the system console by pressing F1 (or 1 on an ASCII terminal) and press Enter.
6. Select the English language for the BOS Installation menus by typing a 5 at the **Choice** field and press Enter. The Welcome to Base Operating System Installation and Maintenance menu opens.
7. Type 2 to select **2 Change/Show Installation Settings and Install** in the **Choice** field and press Enter.

```
                Welcome to Base Operating System
                Installation and Maintenance

Type the number of your choice and press Enter.  Choice is indicated by >>>.

    1 Start Install Now with Default Settings
    2 Change/Show Installation Settings and Install
    3 Start Maintenance Mode for System Recovery
    4 Configure Network Disks (iSCSI)

    88 Help ?
    99 Previous Menu
>>> Choice [1]: 2
```

Step 3. Verify migration installation settings and begin installation

1. Verify that migration is the method of installation. If migration is not the method of installation, select it now. Select the disk or disks you want to install.

```
1 System Settings:
   Method of Installation.....Migration
   Disk Where You Want to Install.....hdisk0
```

2. Select **Primary Language Environment Settings (AFTER Install)**.
3. Type 3 and press Enter to select **More Options**. To use the Help menu to learn more about the options available during a migration installation, type 88 and press Enter in the Installation Options menu. For more information about the installation options available in AIX Version 6.1, see BOS installation options.
4. Verify the selections in the Migration Installation Summary screen and press Enter.
5. When the Migration Confirmation menu opens, follow the menu instructions to list system information or continue with the migration by typing 0 and pressing Enter.

Migration Confirmation

Either type 0 and press Enter to continue the installation, or type the number of your choice and press Enter.

- 1 List the saved Base System configuration files which will not be merged into the system. These files are saved in /tmp/bos.
- 2 List the filesets which will be removed and not replaced.
- 3 List directories which will have all current contents removed.
- 4 Reboot without migrating.

Acceptance of license agreements is required before using system.
You will be prompted to accept after the system reboots.

```
>>> 0 Continue with the migration.  
88 Help ?
```

```
+-----  
WARNING: Selected files, directories, and filesets (installable options)  
from the Base System will be removed. Choose 2 or 3 for more information.
```

```
>>> Choice[0]:
```

Step 4. Verify system configuration after installation

After the migration is complete, the system will reboot. as follows:

1. On systems with a graphics display, after a migration installation, the Configuration Assistant opens. On systems with an ASCII display, after a migration installation, the Installation Assistant opens. For more information on the Configuration Assistant or the Installation Assistant, see Configuring AIX with the Configuration Assistant.
2. Select the **Accept Licenses** option to accept the electronic licenses for the operating system.
3. Verify the administrator (root user) password and network communications (TCP/IP) information. Use any other options at this time. You can return to the Configuration Assistant or the Installation Assistant by typing `configassist` or `smitty assist` at the command line.
4. Select **Exit the Configuration Assistant** and select **Next**. Or, press F10 (or ESC+0) to exit the Installation Assistant.
5. If you are in the Configuration Assistant, select **Finish now, and do not start Configuration Assistant when restarting AIX** and then select **Finish**.
6. When the login prompt displays, log in as the root user to perform system administration tasks.
7. Run the `/usr/lpp/bos/post_migration` script.

Creating and installing a software bundle

Using this scenario, you can create a user-defined software bundle and install its contents.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

A user-defined software bundle is a text file ending in `.bnd` that is located in the `/usr/sys/inst.data/user_bundles` path. By creating the software bundle file in the `/usr/sys/inst.data/user_bundles` path, SMIT (System Management Interface Tool) can locate the file and display it in the bundle selection screen.

In this scenario, you will do the following:

- Create a user-defined software bundle that contains the Web-based System Manager Security application, which is located on the Expansion Pack
- Install the software bundle
- Verify the installation of the software bundle was successful

Step 1. Creating a user-defined software bundle

1. Create a text file with the extension `.bnd` in the `/usr/sys/inst.data/user_bundles` path by running the following:

```
# vi /usr/sys/inst.data/user_bundles/MyBundle.bnd
```

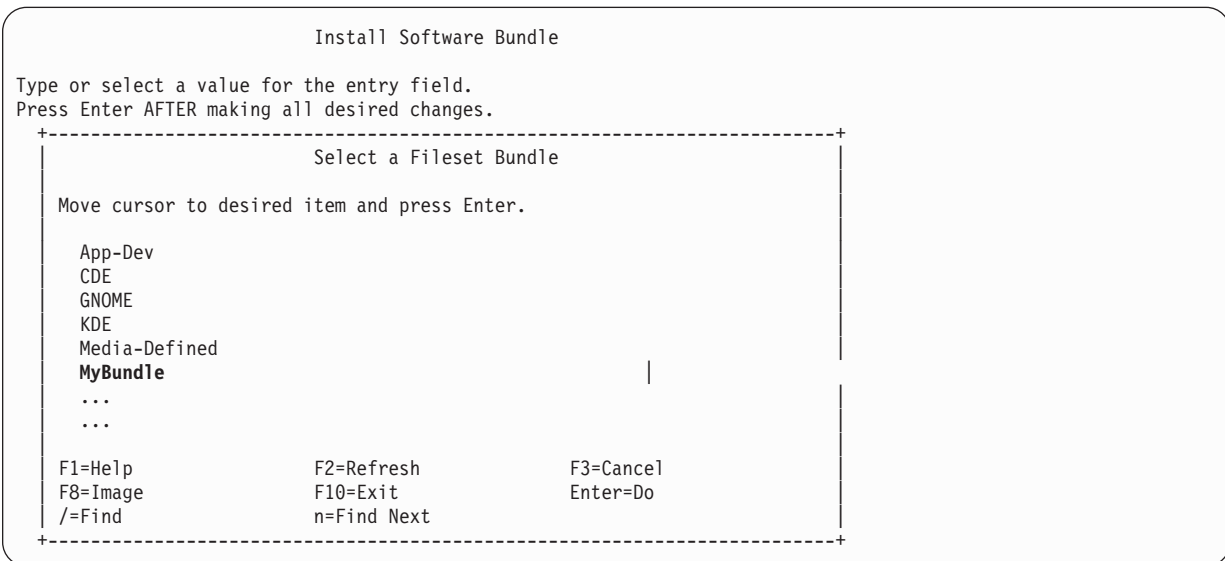
2. Add the software products, packages, or filesets to the bundle file with one entry per line. Add a format-type prefix to each entry. For this example, we are dealing with AIX installp packages, so the format-type prefix is `I:`. Type the following in the `MyBundle.bnd` file: `I:sysmgt.websm.security`.

For more information on installation format types, see Software product packaging.

3. Save the software bundle file and exit the text editor.

Step 2. Installing the software bundle

1. Type the following at the command line: `# smitty easy_install`
2. Enter the name of the installation device or directory.
3. From the selection screen, select the name of the user-defined software bundle, `MyBundle`, you created.



4. Change the values provided in the Install Software Bundle screen as appropriate to your situation. You can change the **PREVIEW only?** option to yes to preview the installation of your software bundle before you install it. You might also need to **accept new license agreements** if the software in your bundle has an electronic license.


```

      Install Software Bundle

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                [Entry Fields]
* INPUT device / directory for software      /cdrom
* BUNDLE                                     MyBundle          +
* SOFTWARE to install                        [all]             +
PREVIEW only? (install operation will NOT occur) no/yes    +
COMMIT software updates?                   yes              +
SAVE replaced files?                       no               +
AUTOMATICALLY install requisite software?   yes              +
EXTEND file systems if space needed?       yes              +
VERIFY install and check file sizes?      no               +
Include corresponding LANGUAGE filesets?   yes              +
DETAILED output?                          no               +
Process multiple volumes?                 yes              +
ACCEPT new license agreements?              no/yes          +
Preview new LICENSE agreements?            no               +

F1=Help      F2=Refresh      F3=Cancel    F4=List
Esc+5=Reset  F6=Command    F7=Edit     F8=Image
F9=Shell     F10=Exit      Enter=Do

```

5. Press Enter to continue.
6. Press Enter a second time to confirm your decision and begin the installation of your software bundle.

Step 3. Verify the installation of the software bundle

- Check the installation summary at the end of the installation output by scrolling to the end of the output. The output indicates whether the installation of your user-defined software bundle was successful. You might see output similar to the following:

```

+-----+
|               Summaries:               |
+-----+

Installation Summary
-----
Name                      Level      Part      Event      Result
-----
sysmgt.websm.security      6.1.0.0   USR       APPLY     SUCCESS
sysmgt.websm.security      6.1.0.0   ROOT      APPLY     SUCCESS

```

- You can also verify the installation at a later time by completing one of the following:
 - Run the following command:

```
ls1pp -Lb MyBundle
```

The output indicates whether the installation of your user-defined software bundle was successful. You might see output similar to the following:

Fileset	Level	State	Type	Description
sysmgmt.websm.security	6.1.0.0	C	F	WebSM Security Components

State codes:
A -- Applied.
B -- Broken.
C -- Committed.
E -- EFIX Locked.
O -- Obsolete. (partially migrated to newer version)
? -- Inconsistent State...Run lppchk -v.

Type codes:
F -- Installp Fileset
P -- Product
C -- Component
T -- Feature
R -- RPM Package
E -- Interim Fix

- Complete the following steps in SMIT:
 1. Type the following at a command line: `smitty list_installed`
 2. Select List Installed Software by Bundle.
 3. With your cursor at the BUNDLE name field, press F4 and select your bundle from the list.
 4. Press Enter. Output is shown similar to that in the preceding option.

Adding open source applications to your AIX system

Options for installing open source applications from the *AIX Toolbox for Linux® Applications* media.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

The *AIX Toolbox for Linux Applications* media that is shipped with your base operating system software contains the most commonly used open source applications that you can use with the AIX operating system. Your options for installing from this media include:

- Using the SMIT **install_software** fast path to install **RPM** packages from the *AIX Toolbox for Linux Applications* media.
- Using the **geninstall** command to install RPM packages from the *AIX Toolbox for Linux Applications* media.
- Installing a bundle. Bundles group the applications you need for a basic Linux operating environment, basic desktop use, GNOME or KDE desktop use, or application development.
- Installing from a directory of packages classified by function. These directory groupings cover a broad range of applications, shell environments, network applications, development tools, application libraries, and so on.
- Installing a single package for a particular application.

The following procedures provide examples of installing RPM packages from *AIX Toolbox for Linux Applications* media.

- To install the **cdrecord** and **mttools** RPM packages using SMIT, do the following:
 1. Run the SMIT **install_software** fast path.
 2. Enter the device name for the *AIX Toolbox for Linux Applications* media (for example, `/dev/cd0`), and press Enter.

3. Use the F4 key to list the contents of the device.
4. Select the **cdrecord** and **mttools** packages, and press Enter.
5. Accept the default values for the rest of the Install Software menu fields, and press Enter.
6. Confirm that you do want to install the software, and press Enter.

The software installation process begins at this point.

- To install the **cdrecord** and **mttools RPM** packages from the command line, type the following:

```
# geninstall -d/dev/cd0 R:cdrecord R:mttools
```

The software installation process begins at this point.

- Use the **rpm** command, which is automatically installed with the base operating system for AIX, to install the bundles required for the GNOME desktop and the **bc** application package. Complete instructions are available on the readme file for the *AIX Toolbox for Linux Applications*.
 1. With your system powered on and AIX running, insert the *AIX Toolbox for Linux Applications* media into the media drive of your system.
 2. With root authority, mount the media drive using the following command:

```
mount -vcdvfs -oro /dev/cd0 /mnt
```

The **-v** flag specifies the virtual file system type of **cdvfs**. The **-o** flag specifies the **ro** option, which means the mounted file is read-only. The device name is **/dev/cd0**. The directory in which you want to mount the media drive is **/mnt**.

3. Change to the **/mnt** directory by using the following command:
4. Use the **ls** command to list the contents of the media. The listing contains the following, which you can view or print:
 - The readme file contains complete instructions for installing from this media.
 - The CONTENTS file lists all packages available on this media and provides a short description of the purpose for each package.
5. In your Web browser, open the **/mnt/LICENSES/index.html** file to view software licensing information.
6. In your terminal window, change to the **ezinstall/ppc** directory by using the following command:

```
cd /mnt/ezinstall/ppc
```

In the next step, you use the **rpm** program to install GNOME by installing four bundles (Base, Desktop Base, GNOME Base, and GNOME Apps). Alternatively, you can install all necessary packages using the **smit install_bundle** fast path and selecting the GNOME bundle.

7. Install GNOME by using the following sequence of commands:

```
rpm -Uhv ezinstall/ppc/base/*
rpm -Uhv ezinstall/ppc/desktop.base/*
rpm -Uhv ezinstall/ppc/gnome.base/*
rpm -Uhv ezinstall/ppc/gnome.apps/*
```

The **-U** flag updates any earlier versions of each package that you might have on your system. The **-h** flag prints hash marks (#) at timed intervals to indicate that the installation is progressing. The **-v** flag displays relevant informational or error messages that occur during the installation. Your result will look similar to the following:

```
rpm -Uhv ezinstall/ppc/desktop.base/*
gdbm          #####
libjpeg       #####
libpng        #####
libtiff       #####
libungif      #####
readline      #####
zlib          #####
```

If your **rpm** command returns an error, it is probably caused by one of the following:

- Not enough space in your current file system. Resize the file system or change your mount point.
- Package is already installed. The **rpm** program discovered an existing package of the same name and version level, so it did not replace the package. A script on the media installs only those packages from a directory that are not already installed on your system, as shown in the following example:

```
/mnt/contrib/installmissing.sh ezinstall/ppc/desktop.base/*
```

- Failed dependencies. The packages listed in the error message must be installed before you can install this package or bundle.

8. Install the **bc** application package by using the following command:

```
rpm -Uhv RPMS/ppc/bc-*.rpm
```

Cloning a rootvg using alternate disk installation

Using this scenario, you can clone AIX running on **rootvg** to an alternate disk on the same system, install a user-defined software bundle, and run a user-defined script to customize the AIX image on the alternate disk.

Things to Consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

Because the **alternate disk installation** process involves cloning an existing **rootvg** to a target alternate disk, the target alternate disk must not be already assigned to a volume group.

In this scenario you will do the following:

- Prepare for the alternate disk installation
- Perform the alternate disk installation and customization
- Boot off the alternate disk
- Verify the operation

For information about alternate disk installation, see [Installing to an alternate disk](#). Also, refer to the **alt_disk_copy** man page.

Step 1. Prepare for the alternate disk installation

1. Check the status of physical disks on your system. Type:

```
# lspv
```

Output similar to the following displays:

```
hdisk0      0009710fa9c79877   rootvg   active
hdisk1      0009710f0b90db93   None
```

We can use **hdisk1** as our alternate disk because no volume group is assigned to this physical disk.

2. Check to see if the **alt_disk_copy** fileset has been installed by running the following:

```
# lsllp -L bos.alt_disk_copy.rte
```

Output similar to the following displays if the **alt_disk_copy** fileset is not installed:

```
lsllp: 0504-132 Fileset bos.alt_disk_copy.rte not installed.
```

3. Using volume 1 of the AIX installation media, install the **alt_disk_copy** fileset by running the following:

```
# geninstall -d/dev/cd0 bos.alt_disk_copy.rte
```

Output similar to the following displays:

```
+-----+
|                               Summaries:                               |
+-----+

Installation Summary
-----
Name                               Level           Part           Event          Result
-----
bos.alt_disk_copy.rte             5.3.0.0        USR            APPLY          SUCCESS
```

4. Create a user-defined bundle called **/usr/sys/inst.data/user_bundles/MyBundle.bnd** that contains the following filesets:

```
I:bos.content_list
I:bos.games
```

For more information on how to create a user-defined software bundle, refer to [Creating and installing a software bundle](#).

5. Create the **/home/scripts** directory:

```
mkdir /home/scripts
```

6. Create a user-defined customization script called **AddUsers.sh** in the **/home/scripts** directory:

```
touch /home/scripts/AddUsers.sh
chmod 755 /home/scripts/AddUsers.sh
```

7. Edit **/home/scripts/AddUsers.sh** to contain the following lines:

```
mkuser johndoe
touch /home/johndoe/abc.txt
touch /home/johndoe/xyz.txt
```

Step 2. Perform the alternate disk installation and customization

1. To clone the **rootvg** to an alternate disk, type the following at the command line to open the SMIT menu :

```
# smit alt_clone
```

2. Select **hdisk1** in the **Target Disk to Install** field.
3. Select the **MyBundle** bundle in the **Bundle to Install** field.
4. Insert volume one of the installation media.
5. Type **/dev/cd0** in the **Directory or Device with images** field.
6. Type **/home/scripts/AddUsers.sh** in the **Customization script** field.
7. Press Enter to start the alternate disk installation.
8. Check that the alternate disk was created, by running the following:

```
# lspv
```

Output similar to the following displays:

```
hdisk0          0009710fa9c79877    rootvg
hdisk1          0009710f0b90db93    altinst_rootvg
```

Step 3. Boot from the alternate disk

1. By default, the alternate-disk-installation process changes the boot list to the alternate disk. To check this run the following:

```
# bootlist -m normal -o
```

Output similar to the following displays:

```
hdisk1
```

2. Reboot the system. Type:

```
# shutdown -r
```

The system boots from the boot image on the alternate disk (hdisk1).

Step 4. Verify the operation

1. When the system reboots, it will be running off the alternate disk. To check this, type the following:

```
# lspv
```

Output similar to the following displays:

```
hdisk0      0009710fa9c79877    old_rootvg
hdisk1      0009710f0b90db93    rootvg
```

2. Verify that the customization script ran correctly, by typing the following:

```
# find /home/johndoe -print
```

Output similar to the following displays:

```
/home/johndoe
/home/johndoe/.profile
/home/johndoe/abc.txt
/home/johndoe/xyz.txt
```

3. Verify that the contents of your software bundle was installed, by typing the following:

```
# lspp -Lb MyBundle
```

Output similar to the following displays:

Fileset	Level	State	Description
-----	-----	-----	-----
bos.content_list	5.3.0.0	C	AIX Release Content List
bos.games	5.3.0.0	C	Games

Configuring NIM using EZNIM

Using this scenario, you will use the SMIT EZNIM option to configure the NIM environment for the first time.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

The SMIT EZNIM option installs the **bos.sysmgmt.nim.master** fileset and configures the NIM environment. The configuration involves creating the NIM database and populating it with several default entries. Several basic NIM resources will then be created and defined in the NIM database.

1. Type the following: `# smitty eznim`.
2. Select **Configure as a NIM Master**, and press Enter.
3. Select **Setup the NIM Master Environment**, and press Enter.
4. Verify that the default selections for software source, volume group, and file system are correct for your environment. Change the selections, if needed.
5. Press Enter to begin configuring the NIM environment.
6. To display the NIM resources that have been created, do the following:
 - a. Use the SMIT **eznim_master_panel** fast path to open the EZNIM Master menu.
 - b. Select **Show the NIM environment**, and press Enter.

Installing a client using NIM

Using this scenario, you can perform a new and complete BOS (base operating system) installation on a NIM client.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

It is assumed that you have already configured the NIM master, defined the basic NIM resources, and defined the NIM client you want to install.

For a guide on configuring the NIM environment and defining resources, see NIM Task Roadmap.

In this scenario, you will do the following:

1. Perform an BOS (**rte**) installation.
2. Use a **bosinst_data** resource to perform a nonprompted installation. For information on how to create a **bosinst.data** file for nonprompted installation, see Using the bosinst.data file.
3. Use a **resolv_conf** resource to configure the network nameserver and domain.

It is recommended that you first perform a system backup on the client to ensure safe system recovery. For instructions on how to create a system backup, see Creating system backups.

1. Type the following: `# smit nim_bosinst.`
2. Select the **lpp_source** resource for the BOS installation.
3. Select the **SPOT** resource for the BOS installation.
4. Select the **BOSINST_DATA to use during installation** option, and select a **bosinst_data** resource that is capable of performing a nonprompted BOS installation.
5. Select the **RESOLV_CONF to use for network configuration** option, and select a **resolv_conf** resource.
6. Select the **Accept New License Agreements** option, and select **Yes**. Accept the default values for the remaining menu options.
7. Press Enter to confirm and begin the NIM client installation.
8. To check the status of the NIM client installation, type: `# lsnim -l va09`. Output similar to the following displays:

```
va09:
  class           = machines
  type            = standalone
  default_res     = basic_res_grp
  platform        = chrp
  netboot_kernel = 64
  if1             = master_net va09 0
  cable_type1    = bnc
  Cstate         = Base Operating System installation is being performed
  prev_state     = BOS installation has been enabled
  Mstate         = in the process of booting
info           = BOS install 7% complete : 0% of operations completed.
  boot           = boot
  bosinst_data   = bid_tty_ow
  lpp_source     = 520lpp_res
  nim_script     = nim_script
  resolv_conf    = master_net_conf
  spot          = 520spot_res
  cpuid          = 0009710F4C00
  control        = master
  Cstate_result  = success
```

Network installation of a JS20 blade

Using this scenario, you can install AIX for the first time or overwrite an existing version of the operating system onto a JS20 blade.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

In this scenario, you will do the following:

- Gather the required TCP/IP information for your JS20 blade.
- Prepare your Network Installation Management (NIM) environment.
- Configure a NIM master.
- Create NIM installation resources.
- Define your JS20 blade as a NIM client.
- Prepare your JS20 blade for a network installation.
- Boot the JS20 blade off the network using a directed bootp or broadcast bootp method.

To perform a network install, you will need to configure a NIM master if you do not already have one configured. For instructions about how to create a NIM master, see [Configuring NIM and other basic operations](#)

Note: This procedure requires shutting down and reinstalling the base operating system. When you reinstall any operating system, schedule your downtime when it least impacts your workload to protect yourself from a possible loss of data or functionality. Before you perform a new and complete overwrite installation, ensure you have reliable backups of your data and any customized applications or volume groups. For instructions about how to create a system backup, see [Creating system backups](#).

Performing a broadcast bootp network installation

To perform a broadcast bootp, ensure that the NIM server is on the same subnet as the JS20 blade that you are installing. During a broadcast bootp, the JS20 blade sends a broadcast bootp packet to its subnet. The NIM server receives and responds to this packet. The JS20 blade NIM client definition on your NIM master must include the MAC address of the JS20 blade's network adapter used during the installation, or the NIM server will not respond to a broadcast bootp. If your NIM master is on a different subnet, and you want to perform a broadcast bootp, then you must set up another system on the client's subnet to forward broadcast bootp packets.

To set up a system to forward broadcast bootp packets, complete the following steps:

1. Add the IP address of your NIM server to the `/etc/dhcprd.cnf` file on the system that forwards the packets. For example, if your NIM server's IP address is 192.24.24.1, add `server 192.24.24.1` to `/etc/dhcprd.cnf`
2. Run `startsrc -s dhcprd`.

This system will now forward broadcast bootp packets to your NIM server that is on a different subnet. You must also install the latest firmware version onto your client for the client to correctly handle the bootp response from the system that is forwarding broadcast bootp packets.

Step 1: Prepare your NIM server

Performing a broadcast bootp is similar to a directed bootp. The steps are the same, except you that must obtain the MAC address of the JS20 blade's network adapter that you will use to network install.

1. Obtain the MAC address from the MM Web interface by completing the following steps:
 - a. Select **Monitor** → **Hardware VPD** .
 - b. Scroll down to **BladeCenter® Server MAC Addresses**.

- c. Find the JS20 blade that you plan to install and the MAC address that corresponds to the adapter you will use to perform the installation. Write this MAC address down.
2. Specify the MAC Address when you define the JS20 blade as a NIM client. If you are using the **smitty nim_mkmac** command, specify the MAC address on the **Network Adapter Hardware Address** SMIT screen. Do not include the colons (":") when you are specifying the MAC address. If the client is already defined, you can change the MAC address with the **smitty nim_chmac** command.
3. Set up your NIM master to install the JS20 blade, by completing the following steps:
 - a. Run the **smitty nim_bosinst** command.
 - b. Select the JS20 blade that is defined as your target .
 - c. Select the type of install that you want to perform and select the installation resources that you want to use to install the JS20 blade.

You can also prepare the JS20 blade to install using the **bos_inst** NIM operation on the command line. For more information on using the **bos_inst** operation, see Using the NIM **bos_inst** operation.

4. Power off the JS20 blade. If you do not want the JS20 blade to reboot automatically, set **Initiate reboot and installation now?** to **no** in the SMIT screen and press Enter.

Step 2: Initiate the installation from the management module

The bootp protocol allows you to install through a directed bootp or broadcast bootp request.

1. Ensure that the JS20 blade's boot list is set to install from the network in the MM Web interface by selecting **Blade Tasks** → **Configuration** and scroll down **Boot Sequence**.
2. Click the JS20 blade that you are installing and ensure the first device listed is **Network - BOOTP**. When the JS20 blade boots, it will install from the first network adapter that receives a bootp response.

Note: You should not have a serial over LAN connection open to the JS20 blade that you are attempting to install when you power on the JS20 blade.

3. Click **save**.
4. Power on the JS20 blade from the MM Web interface by selecting **Blade Tasks** → **Power/Restart**.
5. Select the JS20 blade that you are installing and click **Power On Blade**.

If you do not have an serial over LAN connection to the JS20 blade, you can view the status of the installation by running the following command from your NIM master:

```
lsnim -l js20_nim_name
```

For example, if the JS20 blade was defined as **JS20blade1**, run the following command:

```
lsnim -l JS20blade1
```

Note: If you run the AIX **bootlist** command to set the IP parameters for a network adapter and reboot the system, the IP parameters will be stored in NVRAM. When you reboot the JS20 blade from the MM with the boot sequence set to **Network-BOOTP**, the JS20 blade attempts to use the IP parameters stored in NVRAM instead of performing a broadcast bootp. To perform a broadcast bootp, run the **bootlist** command specifying 0.0.0.0 for each IP parameter and reboot from AIX using the **shutdown -Fr** command. For example, to perform a broadcast bootp over **ent1**, run the following commands.

```
# bootlist -m normal ent1 client=0.0.0.0 bserver=0.0.0.0 gateway=0.0.0.0 hdisk0
# shutdown -Fr
```

If you are unable to log into the AIX system, then follow the instructions for performing a directed bootp via the Open Firmware prompt, but specify "0.0.0.0" for each IP address. Once the JS20 blade installs successfully, the boot IP parameters are reset to "0.0.0.0".

Performing a directed bootp network installation

A directed bootp can be used to install a JS20 blade from a NIM server and does not require the NIM server to be on the same subnet as the JS20 blade.

This option does not require that you have the MAC address of the network adapter on the JS20 blade. To perform a directed bootp, you need a serial over LAN connection to the blade so that you can specify the IP parameters to Open Firmware. Currently you must have 2 network adapters to perform a NIM installation if you are using serial over LAN. You cannot install AIX over the same adapter that is using serial over LAN.

Step 1: Prepare your NIM server

1. Create a SPOT, **lpp_source**, and any other resources that you will need at the level of AIX that you want to install on your NIM server. Your NIM server is usually the NIM master, but you can also set up a NIM client as a NIM server. For instructions on how to create NIM resources, see *Configuring the NIM master and creating basic installation resources*.
2. Ensure that you have the information in the following worksheet for your JS20 blade before proceeding with the installation:

Table 2. Network Configuration Information Worksheet

Network Attribute	Value
Network Interface	(For example: ent1)
Host Name	
IP Address	_____._____._____._____
Network Mask	_____._____._____._____
Name server	_____._____._____._____
Domain Name	
Gateway	_____._____._____._____

3. Define the JS20 blade as a NIM client on your NIM master by running the **smitty nim_mkmac** command on the NIM master. This command creates a client definition for your JS20 blade. You can also define the JS20 blade using the **define** NIM operation on the command line.
4. If you want to set the JS20 blade's name server and domain name after the installation, use a **resolv_conf** resource. For more information on creating a **resolv_conf** resource, see *Using the nim_script resource*.
5. Set up your NIM master to install the JS20 blade, by running the **smitty nim_bosinst** command. Select the JS20 blade that you defined earlier as your target. Then select the type of install that you want to perform and select the installation resources that you want to use to install the JS20 blade. You can also prepare the JS20 blade to install using the **bos_inst** NIM operation on the command line.

Note:

- a. If the JS20 blade is powered off or has never been installed, set **Initiate reboot and installation now?** to **no** and press enter in the SMIT interface.
- b. If the JS20 blade is powered on and running AIX, set **Initiate reboot and installation now?** to **yes** in the SMIT interface. If you choose this option, a directed bootp is initiated by default and you can skip step 2. Before you run this command, ensure that the JS20 blade is a registered NIM client. To do this, run **smitty niminit** on the JS20 blade. Then specify the hostname of your NIM master and the interface you want to use for the installation. You can also initialize the JS20 blade using the **niminit** command on the command line.

Step 2: Specify a directed bootp from the JS20 blade

1. Open a Web interface to the MM by navigating to the IP address or hostname of the MM using a Web browser.
2. Enable serial over LAN to the JS20 blade from the MM Web interface by selecting **Blade Tasks** → **Serial Over LAN** .
3. Select the JS20 blade that you are installing and click **Enable Serial Over LAN**.
4. Power on the JS20 blade from the MM Web interface by selecting **Blade Tasks** → **Power/Restart**.
5. Select the JS20 blade that you are installing and click **Power On Blade**.
6. Open a serial over LAN connection to the JS20 blade by telnetting into the MM and running the **console** command. For example, if the JS20 blade is in slot 3, you would run the following command:

```
console -T blade[3]
```

The serial over LAN connection shows a series of LED numbers.

7. Press 8 on the keyboard when you see **E1F1** to go to the Open Firmware prompt.
8. Run **boot net:bootp,server_ip,,client_ip,gateway_ip** to boot from the network.
 - If you are using a **net** type boot, you would run a command similar to the following:
boot net:bootp,192.168.2.10,,192.168.1.11,192.168.1.1
 - If you are using **ent1**, then you would run a command similar to the following:
boot /pci@8000000f8000000/pci@0/ethernet@1,1:bootp,192.168.2.10,,192.168.1.11,192.168.1.1

Note: You must specify the full device path name with this command. To determine the full path to your device, list the device tree by running the **ls** command at the Open Firmware prompt. This command displays output similar to the following:

```
0 > ls
000000c87f18: /ibm,serial
000000c88840: /chosen
000000c88a98: /packages

...
000000d31488: /vdevice
000000d327a8: /vty@0
000000d32f88: /IBM,sp@4000
000000d33f10: /rtc@4001
000000d34a18: /pci@800000f8000000
000000d384d0: /pci@0
000000d4bbd0: /ethernet@1
000000d5af50: /ethernet@1,1
000000d3be00: /pci@3
000000d6a350: /usb@0
000000d845f8: /hub@1
000000d854b8: /usb@0,1
000000d9f760: /hub@1
000000d3f798: /pci@1f
000000d45ed8: /ide@4,1
000000d47b10: /disk@0
```

The highlighted items are the path to the second ethernet adapter. You would pass this information to the **boot** command to initiate a network boot from the second ethernet adapter

9. After you run the **boot** command, then network installation begins. Output similar to the following is displayed on the serial over LAN connection:

```
BOOTP: chosen-network-type = ethernet,auto,none,auto
BOOTP: server IP = 192.168.2.10
BOOTP: requested filename =
BOOTP: client IP = 192.168.1.11
BOOTP: client HW addr = 0 d 60 1e c cb
```

```

BOOTP: gateway IP =          192.168.1.1
BOOTP: device   /pci@8000000f8000000/pci@0/ethernet@1,1
BOOTP: loc-code U8842.P1Z.23A0984-P1-T7

BOOTP R = 1
FILE: /tftpboot/js20blade1.austin.ibm.com
Load Addr=0x0000000000004000, Max Size=0x0000000000bfc000
FINAL Packet Count = 21131
FINAL File Size = 10818623 bytes.
load-base=0x4000
real-base=0xc00000

Elapsed time since release of system processors: 2 mins 28 secs
...

```

Creating a system backup to tape

Using this scenario, you can create and verify a bootable system backup, also known as a *root volume group backup* or *mksysb image*

Things to Consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

Step 1. Prepare for system backup creation

Before creating system backups, complete the following prerequisites:

- Be sure you are logged in as root user.
- If you plan to use a backup image for installing other differently configured target systems, you must create the image *before* configuring the source system, or set the RECOVER_DEVICES variable to no in the **bosinst.data** file. For more information about the **bosinst.data** file, refer to The bosinst.data file in *Installation and migration*.
- Consider altering passwords and network addresses if you use a backup to make master copies of a source system. Copying passwords from the source to a target system can create security problems. Also, if network addresses are copied to a target system, duplicate addresses can disrupt network communications.
- Mount all file systems you want to back up. The **mksysb** command backs up only mounted JFS and JFS2 in the **rootvg**. To mount file systems, use the **mount** command.

Note: The **mksysb** command does not back up file systems mounted across an NFS network.

- Unmount any local directories that are mounted over another local directory.

Note: This backup procedure backs up files twice if a local directory is mounted over another local directory in the same file system. For example, if you mount **/tmp** over **/usr/tmp**, the files in the **/tmp** directory are then backed up twice. This duplication might exceed the number of files that a file system can hold, which can cause a future installation of the backup image to fail.

- Use the **/etc/exclude.rootvg** file to list files you do not want backed up.
- Make at least 40 MB of free disk space available in the **/tmp** directory. The **mksysb** command requires this working space for the duration of the backup.

Use the **df** command, which reports in units of 512-byte blocks, to determine the free space in the **/tmp** directory. Use the **chfs** command to change the size of the file system, if necessary.

For example, the following command adds 40 MB of disk space to the **/tmp** directory of a system with 4 MB partitions:

```
# chfs -a size=+80000 /tmp
```

- All hardware must already be installed, including external devices, such as tape and media drives.
- The **bos.sysmgt.sysbr** fileset must be installed. The **bos.sysmgt.sysbr** fileset is automatically installed in AIX. To determine if the **bos.sysmgt.sysbr** fileset is installed on your system, type:

```
# ls1pp -l bos.sysmgt.sysbr
```

If the **ls1pp** command does not list the **bos.sysmgt.sysbr** fileset, install it before continuing with the backup procedure. Type the following:

```
# installp -agqXd /dev/cd0 bos.sysmgt.sysbr
```

Step 2. Create a system backup to tape

1. Enter the `smit mksysb` fast path.
2. Select the tape device in the **Backup DEVICE or File** field.
3. If you want to create map files, select **yes** in the **Create Map Files?** field.

For more information, see Using map files for precise allocation in *Operating system and device management*.

Note: If you plan to reinstall the backup to target systems other than the source system, or if the disk configuration of the source system might change before reinstalling the backup, do not create map files.

4. To exclude certain files from the backup, select **yes** in the **Exclude Files** field.
5. Select **yes** in the **List files as they are backed up** field.
6. Select **yes** in the **Disable software packing of backup?** field, if you are running any other programs during the backup.
7. Use the default values for the rest of the menu options.
8. Press Enter to confirm and begin the system backup process.
9. The COMMAND STATUS screen displays, showing status messages while the system makes the backup image. When the backup process finishes, the **COMMAND:** field changes to **OK**.
10. To exit SMIT when the backup completes, press F10 (or Esc+0).
11. Remove the tape and label it. Write-protect the backup tape.
12. Record any backed-up root and user passwords. Remember that these passwords become active if you use the backup to either restore this system or install another system.

You have successfully created the backup of your **rootvg**. Because the system backup contains a boot image, you can use this tape to start your system if for some reason you cannot boot from hard disks.

Cloning a system using a system backup tape

With a **mksysb** image, you can clone one system image onto multiple target systems.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

The target systems might not contain the same hardware devices or adapters or be the same hardware platform as the source system.

All devices are installed by default during the base operating system (BOS) installation process. If the **Enable System Backups to install any system** selection in the Install Software menu was set to **yes**, you can create a **mksysb** image that boots and installs supported systems. Verify that your system is installed with all devices by typing the following:

```
# grep ALL_DEVICES_KERNELS /var/adm/ras/bosinst.data
```

Output similar to the following displays:

```
ALL_DEVICES_KERNELS = yes
```

Use this scenario if your system was not installed with all devices during BOS installation. Be sure to boot from the appropriate product media for your system and at the same maintenance or technology level of BOS (base operating system) as the installed source system on which the **mksysb** was made. For example, use BOS AIX media with a **mksysb** from a BOS AIX system. Use this how-to when installing a system backup tape to a different system.

In this scenario, you will do the following:

1. Boot the system with the *AIX Volume 1* media in the media drive and the system backup tape in the tape device.
2. Select **Start Maintenance Mode for System Recovery**.
3. Select **Install from a System Backup**.
4. Select the drive containing the backup tape, and press Enter.

The system reads the media and begins the installation.

You are then prompted for the BOS installation language, and the Welcome screen displays. Continue with the Prompted Installation, because cloning is not supported in nonprompted installations.

If you are cloning from the product media to restore a backup tape, do not remove the media from the media drive.

After the **mksysb** installation completes, the installation program automatically installs additional devices on your system, using the original product media you booted from. Information is saved in BOS installation log files. To view BOS installation log files, type `cd /var/adm/ras` and view the **devinst.log** file in this directory.

If the source system does not have the correct passwords and network information, you can make modifications on the target system now. Also, some products (such as graPHIGS) ship device-specific files. If your graphics adapter is different on the target system, verify that the device-specific filesets for graphics-related LPPs are installed.

Cleaning up a failed software installation

Using this scenario, you can clean up software products and service updates after an interrupted or failed installation.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.
--

The cleanup procedure attempts to delete items that were partially installed or left in an incomplete state. This scenario applies only to the update or installation of optional software products. If your AIX BOS installation was unsuccessful, see *Troubleshooting after a BOS installation*.

Note: It is recommended that you first perform a system backup before installing software updates to ensure safe system recovery. For instructions on how to create a system backup, refer to *Creating system backups*.

The cleanup procedure attempts to revert the update to its previous state. For example, when cleaning up an update that was interrupted in the **COMMITTING** state, the cleanup procedure attempts to return the update to its **APPLIED** state.

If an update installation is interrupted, run the **lslpp -l** command to see the current state of the update. For example, if you run **lslpp -l** on an interrupted update installation, it might report the update status as **APPLYING** rather than **APPLIED**.

If the interruption occurs during the initial state of an installation, then the cleanup procedure attempts to delete the installation entirely and restore the previous version of the product (if there is one). When the previous version is restored, it becomes the active version. When the previous version cannot be restored, the software is listed by the **lslpp -l** command as **BROKEN**.

When the product is deleted or **BROKEN**, you can attempt to reinstall the software. Any product in the **BROKEN** state cannot be cleaned up; it can only be reinstalled or removed.

To initiate a cleanup procedure using SMIT:

1. Type `smit maintain_software` on the command line.
2. Select **Clean Up After Failed or Interrupted Installation** and press Enter.

To initiate a cleanup procedure from the command line:

Type `installp -C` on the command line and press Enter.

If prompted to reboot (restart) the system after running the cleanup procedure, then do so now.

If you get a message indicating that no products were found that could be cleaned up, you may have executed the cleanup procedure when it was not needed. Try your installation again.

Installing AIX using the media device to install a partition with an HMC

In this procedure, you will perform a new and complete base operating system installation on a logical partition using the partition's media device. This procedure assumes that there is an HMC attached to the managed system.

Prerequisites

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

Note: For the installation method that you choose, ensure that you follow the sequence of steps as shown. Within each procedure, you must use AIX to complete some installation steps, while other steps are completed using the HMC interface.

Before you begin this procedure, you should have already used the HMC to create a partition and partition profile for the client. Assign the SCSI bus controller attached to the media device, a network adapter, and enough disk space for the AIX operating system to the partition. Set the boot mode for this partition to be SMS mode. After you have successfully created the partition and partition profile, leave the partition in the *Ready* state. For instructions about how to create a logical partition and partition profile, refer to the *Creating logical partitions and partition profiles* article in the IBM® eServer™ Hardware Information Center.

Step 1. Activate and install the partition (perform these steps in the HMC interface)

1. Activate the partition, as follows:
 - a. Insert the *AIX Volume 1* media into the media device of the managed system.
 - b. Right-click on the partition to open the menu.
 - c. Select **Activate**. The Activate Partition menu opens with a selection of partition profiles. Be sure the correct profile is highlighted.

- d. Select **Open a terminal window or console session** at the bottom of the menu to open a virtual terminal (vterm) window.
 - e. Select **Advanced** to open the Advanced options menu.
 - f. For the Boot mode, select **SMS**.
 - g. Select **OK** to close the Advanced options menu.
 - h. Select **OK**. A vterm window opens for the partition.
2. In the SMS menu on the vterm, do the following:
- a. Press the 5 key and press Enter to select **5. Select Boot Options**.

```

PowerPC Firmware
Version SF220_001
SMS 1.5 (c) Copyright IBM Corp. 2000, 2003 All rights reserved.
-----
Main Menu

1. Select Language
2. Setup Remote IPL (Initial Program Load)
3. Change SCSI Settings
4. Select Console
5. Select Boot Options

-----
Navigation Keys:

                X = eXit System Management Services
-----
Type the number of the menu item and press Enter or select Navigation Key: 5

```

- b. Press the 2 key and press Enter to select **2. Select Boot Devices**.
 - c. Press the 1 key and press Enter to select **1. Select 1st Boot Device**.
 - d. Press the 3 key and press Enter to select **3. CD/DVD**.
 - e. Select the media type that corresponds to the media device and press Enter.
 - f. Select the device number that corresponds to the media device and press Enter. The media device is now the first device in the Current Boot Sequence list.
 - g. Press the ESC key until you return to the Configure Boot Device Order menu.
 - h. Press the 2 key to select **2. Select 2nd Boot Device**.
 - i. Press the 5 key and press Enter to select **5. Hard Drive**.
 - j. If you have more than one hard disk in your partition, determine which hard disk you will use to perform the AIX installation. Select the media type that corresponds to the hard disk and press Enter.
 - k. Select the device number that corresponds to the hard disk and press Enter.
 - l. Press the x key to exit the SMS menu. Confirm that you want to exit SMS.
3. Boot from the *AIX Volume 1*, as follows:
- a. Select console and press Enter.
 - b. Select language for BOS Installation menus, and press Enter to open the Welcome to Base Operating System Installation and Maintenance menu.
 - c. Type 2 to select **Change/Show Installation Settings and Install** in the **Choice** field and press Enter.


```

Welcome to Base Operating System
Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

 1 Start Install Now with Default Settings
 2 Change/Show Installation Settings and Install
 3 Start Maintenance Mode for System Recovery
 4 Configure Network Disks (iSCSI)

88 Help ?
99 Previous Menu
>>> Choice [1]: 2

```

4. Verify or Change BOS Installation Settings, as follows:

- a. Type 1 in the **Choice** field to select the **System Settings** option.
- b. Type 1 for New and Complete Overwrite in the **Choice** field and press Enter.

Note: The installation methods available depend on whether your disk has a previous version of AIX installed.

- c. When the Change Disk(s) screen opens, you can change the destination disk for the installation. If the default shown is correct, type 0 in the **Choice** field and press Enter. To change the destination disk, do the following:
 - 1) Type the number for each disk you choose in the **Choice** field and press Enter. *Do not* press Enter a final time until you have finished selecting all disks. If you must deselect a disk, type its number a second time and press Enter.
 - 2) When you have finished selecting the disks, type 0 in the **Choice** field and press Enter. The Installation and Settings screen opens with the selected disks listed under **System Settings**.
- d. If needed, change the primary language environment. Use the following steps to change the primary language used by this installation to select the language and cultural convention you want to use.

Note: Changes to the primary language environment do not take effect until after the Base Operating System Installation has completed and your system is rebooted.

- 1) Type 2 in the **Choice** field on the Installation and Settings screen to select the **Primary Language Environment Settings** option.
- 2) Select the appropriate set of cultural convention, language, and keyboard options. Most of the options are a predefined combination, however, you can define your own combination of options.
 - To choose a predefined Primary Language Environment, type that number in the **Choice** field and press Enter.
 - To configure your own primary language environment, do the following:
 - a) Select **MORE CHOICES**.
 - b) Select **Create Your Own Combination**.
 - c) When the Set Primary Cultural Convention screen opens, type the number in the **Choice** field that corresponds to the cultural convention of your choice and press Enter.
 - d) When the Set Primary Language screen opens, type the number in the **Choice** field that corresponds to your choice for the primary language and press Enter.
 - e) When the Set Keyboard screen opens, type the number in the **Choice** field that corresponds to the keyboard attached to the system and press Enter.

- e. After you have made all of your selections, verify that the selections are correct. Press Enter to confirm your selections and to begin the BOS Installation. The system automatically reboots after installation is complete.
5. Switch the partition to Normal Mode, as follows:
 - a. Right-click on the partition profile to open the menu. Be sure the correct partition profile is highlighted.
 - b. Select **Properties**.
 - c. Select the **Settings** tab.
 - d. For the Boot Mode, select Normal.
 - e. Select **OK** to close the Properties menu.
 - f. Right-click on the partition to open the menu.
 - g. Select **Restart Partition**.
 - h. Select **Immediate** for the Restart Options.
 - i. Confirm that you want to restart the partition.
 - j. When the partition has restarted, right-click on the partition to open the menu.
 - k. Select **Open terminal window** to open a virtual terminal (vterm) window.
 6. Complete the BOS Installation, as follows:
 - a. Type vt100 as the terminal type.

```

                                Set Terminal Type
The terminal is not properly initialized. Please enter a terminal type
and press Enter. Some terminal types are not supported in
non-English languages.

    ibm3101          tvi912          vt330
    ibm3151          tvi920          vt340
    ibm3161          tvi925          wyse30
    ibm3162          tvi950          wyse50
    ibm3163          vs100          wyse60
    ibm3164          vt100          wyse100
    ibmpc            vt320          wyse350
    1ft              sun

+-----Messages-----+
| If the next screen is unreadable, press Break (Ctrl-c)
| to return to this screen.
88 Help ?
99 Exit

>>> Choice []: vt100

```

- b. In the License Agreement menu, select **Accept License Agreements**.
- c. Select **yes** to ACCEPT Installed License Agreements.
- d. Press F10 (or Esc+0) to exit the License Agreement menu.
- e. In the Installation Assistant main menu, select **Set Date and Time**.

```

                                Installation Assistant

Move cursor to desired item and press Enter.

    Set Date and Time
    Set root Password
    Configure Network Communications
    Install Software Applications
    Using SMIT (information only)

F1=Help          F2=Refresh          F3=Cancel          F8=Image
F9=Shell         F10=Exit            Enter=Do

```

- f. Set the correct date, time, and time zone. Press the F3 (or Esc+3) key to return to the Installation Assistant main menu.
- g. Select **Set root Password**. Set a root password for the partition.
- h. Select **Configure Network Communications**. Select **TCP/IP Startup**. Select from the Available Network Interfaces and press Enter. Enter the appropriate network information in the Minimum Configuration and Startup menu and press Enter. Use the F3 (or Esc+3) key to return to the Installation Assistant main menu.
- i. Exit the Installation Assistant by pressing F10 (or Esc+0).
- j. The vterm window displays a login prompt.

Step 2. Manage your partition (perform this step in the AIX environment)

When the installation has completed and the system has rebooted, the vterm window displays a login prompt.

At this point, you may want to perform several common system-administration procedures. The following table lists where to find information about performing these procedures.

Table 3. Common System Administration Procedures

Procedure	Location
Backing up and recovering system backups	"Creating and installing system backups" in <i>Installation and migration</i>
Managing users and groups	"Users, Roles, and Passwords" in <i>Security</i>
Installing software	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Installing fixes/updates	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Tuning the system for performance	"Performance tuning" in <i>Performance management</i>
Configuring printers	<i>Printers and printing</i>

Installing AIX using the media device to install a partition with an HMC

In this procedure, you will perform a new and complete base operating system installation on a logical partition using the partition's media device. This procedure assumes that there is an HMC attached to the managed system.

Prerequisites

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

Note: For the installation method that you choose, ensure that you follow the sequence of steps as shown. Within each procedure, you must use AIX to complete some installation steps, while other steps are completed using the HMC interface.

Before you begin this procedure, you should have already used the HMC to create a partition and partition profile for the client. Assign the SCSI bus controller attached to the media device, a network adapter, and enough disk space for the AIX operating system to the partition. Set the boot mode for this partition to be SMS mode. After you have successfully created the partition and partition profile, leave the partition in the *Ready* state. For instructions about how to create a logical partition and partition profile, refer to the *Creating logical partitions and partition profiles* article in the IBM eServer Hardware Information Center.

Step 1. Activate and install the partition (perform these steps in the HMC interface)

1. Activate the partition, as follows:
 - a. Insert the *AIX Volume 1* media into the media device of the managed system.
 - b. Right-click on the partition to open the menu.
 - c. Select **Activate**. The Activate Partition menu opens with a selection of partition profiles. Be sure the correct profile is highlighted.
 - d. Select **Open a terminal window or console session** at the bottom of the menu to open a virtual terminal (vterm) window.
 - e. Select **Advanced** to open the Advanced options menu.
 - f. For the Boot mode, select **SMS**.
 - g. Select **OK** to close the Advanced options menu.
 - h. Select **OK**. A vterm window opens for the partition.
2. In the SMS menu on the vterm, do the following:
 - a. Press the 5 key and press Enter to select **5. Select Boot Options**.

```
PowerPC Firmware
Version SF220_001
SMS 1.5 (c) Copyright IBM Corp. 2000, 2003 All rights reserved.
-----
Main Menu

1. Select Language
2. Setup Remote IPL (Initial Program Load)
3. Change SCSI Settings
4. Select Console
5. Select Boot Options

-----
Navigation Keys:

                X = eXit System Management Services
-----
Type the number of the menu item and press Enter or select Navigation Key: 5
```

- b. Press the 2 key and press Enter to select **2. Select Boot Devices**.
 - c. Press the 1 key and press Enter to select **1. Select 1st Boot Device**.
 - d. Press the 3 key and press Enter to select **3. CD/DVD**.
 - e. Select the media type that corresponds to the media device and press Enter.
 - f. Select the device number that corresponds to the media device and press Enter. The media device is now the first device in the Current Boot Sequence list.
 - g. Press the ESC key until you return to the Configure Boot Device Order menu.
 - h. Press the 2 key to select **2. Select 2nd Boot Device**.
 - i. Press the 5 key and press Enter to select **5. Hard Drive**.
 - j. If you have more than one hard disk in your partition, determine which hard disk you will use to perform the AIX installation. Select the media type that corresponds to the hard disk and press Enter.
 - k. Select the device number that corresponds to the hard disk and press Enter.
 - l. Press the x key to exit the SMS menu. Confirm that you want to exit SMS.
3. Boot from the *AIX Volume 1*, as follows:
 - a. Select console and press Enter.
 - b. Select language for BOS Installation menus, and press Enter to open the Welcome to Base Operating System Installation and Maintenance menu.

- c. Type 2 to select **Change/Show Installation Settings and Install** in the **Choice** field and press Enter.

```
                Welcome to Base Operating System
                Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

    1 Start Install Now with Default Settings
    2 Change/Show Installation Settings and Install
    3 Start Maintenance Mode for System Recovery
    4 Configure Network Disks (iSCSI)

    88 Help ?
    99 Previous Menu
>>> Choice [1]: 2
```

4. Verify or Change BOS Installation Settings, as follows:

- a. Type 1 in the **Choice** field to select the **System Settings** option.
- b. Type 1 for New and Complete Overwrite in the **Choice** field and press Enter.

Note: The installation methods available depend on whether your disk has a previous version of AIX installed.

- c. When the Change Disk(s) screen opens, you can change the destination disk for the installation. If the default shown is correct, type 0 in the **Choice** field and press Enter. To change the destination disk, do the following:
 - 1) Type the number for each disk you choose in the **Choice** field and press Enter. *Do not* press Enter a final time until you have finished selecting all disks. If you must deselect a disk, type its number a second time and press Enter.
 - 2) When you have finished selecting the disks, type 0 in the **Choice** field and press Enter. The Installation and Settings screen opens with the selected disks listed under **System Settings**.
- d. If needed, change the primary language environment. Use the following steps to change the primary language used by this installation to select the language and cultural convention you want to use.

Note: Changes to the primary language environment do not take effect until after the Base Operating System Installation has completed and your system is rebooted.

- 1) Type 2 in the **Choice** field on the Installation and Settings screen to select the **Primary Language Environment Settings** option.
- 2) Select the appropriate set of cultural convention, language, and keyboard options. Most of the options are a predefined combination, however, you can define your own combination of options.
 - To choose a predefined Primary Language Environment, type that number in the **Choice** field and press Enter.
 - To configure your own primary language environment, do the following:
 - a) Select **MORE CHOICES**.
 - b) Select **Create Your Own Combination**.
 - c) When the Set Primary Cultural Convention screen opens, type the number in the **Choice** field that corresponds to the cultural convention of your choice and press Enter.
 - d) When the Set Primary Language screen opens, type the number in the **Choice** field that corresponds to your choice for the primary language and press Enter.
 - e) When the Set Keyboard screen opens, type the number in the **Choice** field that corresponds to the keyboard attached to the system and press Enter.

- e. After you have made all of your selections, verify that the selections are correct. Press Enter to confirm your selections and to begin the BOS Installation. The system automatically reboots after installation is complete.
5. Switch the partition to Normal Mode, as follows:
 - a. Right-click on the partition profile to open the menu. Be sure the correct partition profile is highlighted.
 - b. Select **Properties**.
 - c. Select the **Settings** tab.
 - d. For the Boot Mode, select Normal.
 - e. Select **OK** to close the Properties menu.
 - f. Right-click on the partition to open the menu.
 - g. Select **Restart Partition**.
 - h. Select **Immediate** for the Restart Options.
 - i. Confirm that you want to restart the partition.
 - j. When the partition has restarted, right-click on the partition to open the menu.
 - k. Select **Open terminal window** to open a virtual terminal (vterm) window.
 6. Complete the BOS Installation, as follows:
 - a. Type vt100 as the terminal type.

```

                                Set Terminal Type
The terminal is not properly initialized. Please enter a terminal type
and press Enter. Some terminal types are not supported in
non-English languages.

    ibm3101          tvi912          vt330
    ibm3151          tvi920          vt340
    ibm3161          tvi925          wyse30
    ibm3162          tvi950          wyse50
    ibm3163          vs100          wyse60
    ibm3164          vt100          wyse100
    ibmpc            vt320          wyse350
    1ft              sun

+-----Messages-----+
| If the next screen is unreadable, press Break (Ctrl-c) |
| to return to this screen.                               |
88 Help ?
99 Exit
>>> Choice []: vt100

```

- b. In the License Agreement menu, select **Accept License Agreements**.
- c. Select **yes** to ACCEPT Installed License Agreements.
- d. Press F10 (or Esc+0) to exit the License Agreement menu.
- e. In the Installation Assistant main menu, select **Set Date and Time**.

```

                                Installation Assistant

Move cursor to desired item and press Enter.

    Set Date and Time
    Set root Password
    Configure Network Communications
    Install Software Applications
    Using SMIT (information only)

F1=Help          F2=Refresh          F3=Cancel          F8=Image
F9=Shell         F10=Exit            Enter=Do

```

- f. Set the correct date, time, and time zone. Press the F3 (or Esc+3) key to return to the Installation Assistant main menu.
- g. Select **Set root Password**. Set a root password for the partition.
- h. Select **Configure Network Communications**. Select **TCP/IP Startup**. Select from the Available Network Interfaces and press Enter. Enter the appropriate network information in the Minimum Configuration and Startup menu and press Enter. Use the F3 (or Esc+3) key to return to the Installation Assistant main menu.
- i. Exit the Installation Assistant by pressing F10 (or Esc+0).
- j. The vterm window displays a login prompt.

Step 2. Manage your partition (perform this step in the AIX environment)

When the installation has completed and the system has rebooted, the vterm window displays a login prompt.

At this point, you may want to perform several common system-administration procedures. The following table lists where to find information about performing these procedures.

Table 4. Common System Administration Procedures

Procedure	Location
Backing up and recovering system backups	"Creating and installing system backups" in <i>Installation and migration</i>
Managing users and groups	"Users, Roles, and Passwords" in <i>Security</i>
Installing software	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Installing fixes/updates	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Tuning the system for performance	"Performance tuning" in <i>Performance management</i>
Configuring printers	<i>Printers and printing</i>

Installing AIX using the media device to install a partition without an HMC

In this procedure, you will use the system's built-in media device to perform a new and complete Base Operating System Installation on the standalone system.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

This information contains procedures to install the AIX operating system. For more information on concepts and considerations involved when performing a base operating system installation of AIX, or concepts and requirements involved when using the Network Installation Manager (NIM) to install and maintain AIX, refer to *Installation and migration*.

At this point, the BOS Installation is complete, and the initial configuration of the system is complete.

Step 1. Prepare your system for installation

- There must be adequate disk space and memory available. AIX requires 256–512 MB of memory and 2.2 GB of physical disk space. For additional release information, see the *AIX 6.1 Release Notes*.
- Make sure your hardware installation is complete, including all external devices. See the documentation provided with your system unit for installation instructions.

- If your system needs to communicate with other systems and access their resources, make sure you have the information in the following worksheet before proceeding with installation:

Table 5. Network Configuration Information Worksheet

Network Attribute	Value
Network Interface	(For example: en0, et0)
Host Name	
IP Address	_____._____._____._____
Network Mask	_____._____._____._____
Nameserver	_____._____._____._____
Domain Name	
Gateway	_____._____._____._____

Step 2. Boot from the AIX product media

1. Insert the *AIX Volume 1* media into the media device.
2. Make sure all external devices attached to the system (such as CD-ROM drives, tape drives, DVD drives, and terminals) are turned on. Only the media drive from which you will install AIX should contain the installation media.
3. Follow whatever procedure is needed to power on the system to cause it to boot from an AIX product media. Consult your hardware documentation for instructions if necessary.

Note: Most older MicroChannel systems require the keylock to be set in the service position before powering on the system. Some older PCI systems require you to type 5 or press the F5 key (depending on whether you have an ASCII terminal or color graphics display console) when the system beeps and begins repeating IBM or RS/6000 on the console several seconds after being powered on. Most current PCI systems only require that you repetitively type the 5 key (regardless of what type of console you have) at these system prompts. Also, most current systems can be set to boot from alternate media before they are powered on using the service processor menu. Consult your hardware documentation for more information.

4. Select the system console when prompted by typing the key indicated by the prompt (1, 2, F1, F2, and so on).
5. Select the English language for the base operating system (BOS) Installation menus by typing a 1 in the **Choice** field. Press Enter to open the Welcome to Base Operating System Installation and Maintenance screen.
6. Type 2 to select **2 Change/Show Installation Settings and Install** in the **Choice** field and press Enter.

```

Welcome to Base Operating System
Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

 1 Start Install Now with Default Settings
 2 Change/Show Installation Settings and Install
 3 Start Maintenance Mode for System Recovery
 4 Configure Network Disks (iSCSI)

88 Help ?
99 Previous Menu
>>> Choice [1]: 2

```


Step 3. Set and verify BOS installation settings

1. In the Installation and Settings screen, verify the installation settings are correct by checking the method of installation (new and complete overwrite), the disk or disks you want to install, the primary language environment settings, and the advanced options.
2. To change the System Settings, which includes the method of installation and disk where you want to install, type 1 in the **Choice** field and press Enter.

```
Installation and Settings

Either type 0 and press Enter to install with current settings, or type the
number of the setting you want to change and press Enter.

  1 System Settings:
    Method of Installation.....New and Complete Overwrite
    Disk Where You Want to Install.....hdisk0

>>> Choice [0]: 1
```

3. Type 1 for New and Complete Overwrite in the **Choice** field and press Enter. The Change Disk(s) Where You Want to Install screen now displays.

```
Change Disk(s) Where You Want to Install

Type one or more numbers for the disk(s) to be used for installation and press
Enter. To cancel a choice, type the corresponding number and Press Enter.
At least one bootable disk must be selected. The current choice is indicated
by >>>.

      Name      Location Code  Size(MB)  VG Status  Bootable
-----
  1  hdisk0     04-B0-00-2,0    4296     none      Yes
  2  hdisk1     04-B0-00-5,0    4296     none      Yes
  3  hdisk2     04-B0-00-6,0   12288     none      Yes

>>> 0  Continue with choices indicated above

66 Disks not known to Base Operating System Installation
77 Display More Disk Information
88 Help ?
99 Previous Menu

>>> Choice [0]:
```

4. In the Change Disk(s) Where You Want to Install screen:
 - a. Select **hdisk0** by typing a 1 in the **Choice** field and press Enter. The disk will now be selected as indicated by >>>. To unselect the destination disk, type the number again and press Enter.
 - b. To finish selecting disks, type a 0 in the **Choice** field and press Enter. The Installation and Settings screen displays with the selected disks listed under **System Settings**.
5. Change the Primary Language Environment Settings to English (United States). Use the following steps to change the Cultural Convention, Language, and Keyboard to English.
 - a. Type 2 in the **Choice** field on the Installation and Settings screen to select the **Primary Language Environment Settings** option.
 - b. Type the number corresponding to English (United States) as the Cultural Convention in the **Choice** field and press Enter.
 - c. Select the appropriate keyboard and language options.
6. Verify that the selections are correct in the Overwrite Installation Summary screen, as follows:

```

Overwrite Installation Summary

Disks: hdisk0
Cultural Convention: en_US
Language: en_US
Keyboard: en_US
Desktop: CDE
Enable System Backups to install any system: Yes

Optional Software being installed:

>>> 1 Continue with Install
      88 Help ?
      99 Previous Menu

>>> Choice [1]:

```

7. Press Enter to begin the BOS installation. The system automatically reboots after installation is complete.

Step 4. Configure the system after installation

1. On systems with a graphics display, after a new and complete overwrite installation, the Configuration Assistant opens. On systems with an ASCII display, after a new and complete overwrite installation, the Installation Assistant opens.
2. Select the **Accept Licenses** option to accept the electronic licenses for the operating system.
3. Set the date and time, set the password for the administrator (root user), and configure network communications (TCP/IP).
Use any other options at this time. You can return to the Configuration Assistant or the Installation Assistant by typing `configassist` or `smitty assist` at the command line.
4. Select **Exit the Configuration Assistant** and select **Next**. Or, press F10 (or ESC+0) to exit the Installation Assistant.
5. If you are in the Configuration Assistant, select **Finish now, and do not start Configuration Assistant when restarting AIX** and select **Finish**.

Step 5. Manage your system

At this point, you may want to perform several common system-administration procedures. The following table lists where to find information about performing these procedures.

Table 6. Common System Administration Procedures

Procedure	Location
Backing up and recovering system backups	"Creating and installing system backups" in <i>Installation and migration</i>
Managing users and groups	"Users, Roles, and Passwords" in <i>Security</i>
Installing software	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Installing fixes/updates	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Tuning the system for performance	"Performance tuning" in <i>Performance management</i>
Configuring printers	<i>Printers and printing</i>

Installing AIX using the media device to install a partition without an HMC

In this procedure, you will use the system's built-in media device to perform a new and complete Base Operating System Installation on the standalone system.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

This information contains procedures to install the AIX operating system. For more information on concepts and considerations involved when performing a base operating system installation of AIX, or concepts and requirements involved when using the Network Installation Manager (NIM) to install and maintain AIX, refer to *Installation and migration*.

At this point, the BOS Installation is complete, and the initial configuration of the system is complete.

Step 1. Prepare your system for installation

- There must be adequate disk space and memory available. AIX requires 256–512 MB of memory and 2.2 GB of physical disk space. For additional release information, see the *AIX 6.1 Release Notes*.
- Make sure your hardware installation is complete, including all external devices. See the documentation provided with your system unit for installation instructions.
- If your system needs to communicate with other systems and access their resources, make sure you have the information in the following worksheet before proceeding with installation:

Table 7. Network Configuration Information Worksheet

Network Attribute	Value
Network Interface	(For example: en0, et0)
Host Name	
IP Address	_____ . _____ . _____ . _____
Network Mask	_____ . _____ . _____ . _____
Nameserver	_____ . _____ . _____ . _____
Domain Name	
Gateway	_____ . _____ . _____ . _____

Step 2. Boot from the AIX product media

1. Insert the *AIX Volume 1* media into the media device.
2. Make sure all external devices attached to the system (such as CD-ROM drives, tape drives, DVD drives, and terminals) are turned on. Only the media drive from which you will install AIX should contain the installation media.
3. Follow whatever procedure is needed to power on the system to cause it to boot from an AIX product media. Consult your hardware documentation for instructions if necessary.

Note: Most older MicroChannel systems require the keylock to be set in the service position before powering on the system. Some older PCI systems require you to type 5 or press the F5 key (depending on whether you have an ASCII terminal or color graphics display console) when the system beeps and begins repeating IBM or RS/6000 on the console several seconds after being powered on. Most current PCI systems only require that you repetitively type the 5 key (regardless of what type of console you have) at these system prompts. Also, most current systems can be set to boot from alternate media before they are powered on using the service processor menu. Consult your hardware documentation for more information.

4. Select the system console when prompted by typing the key indicated by the prompt (1, 2, F1, F2, and so on).

5. Select the English language for the base operating system (BOS) Installation menus by typing a 1 in the **Choice** field. Press Enter to open the Welcome to Base Operating System Installation and Maintenance screen.
6. Type 2 to select **2 Change/Show Installation Settings and Install** in the **Choice** field and press Enter.

```

Welcome to Base Operating System
Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

 1 Start Install Now with Default Settings
 2 Change/Show Installation Settings and Install
 3 Start Maintenance Mode for System Recovery
 4 Configure Network Disks (iSCSI)

88 Help ?
99 Previous Menu
>>> Choice [1]: 2

```

Step 3. Set and verify BOS installation settings

1. In the Installation and Settings screen, verify the installation settings are correct by checking the method of installation (new and complete overwrite), the disk or disks you want to install, the primary language environment settings, and the advanced options.
2. To change the System Settings, which includes the method of installation and disk where you want to install, type 1 in the **Choice** field and press Enter.

```

Installation and Settings

Either type 0 and press Enter to install with current settings, or type the
number of the setting you want to change and press Enter.

 1 System Settings:
   Method of Installation.....New and Complete Overwrite
   Disk Where You Want to Install.....hdisk0

>>> Choice [0]: 1

```

3. Type 1 for New and Complete Overwrite in the **Choice** field and press Enter. The Change Disk(s) Where You Want to Install screen now displays.

```

Change Disk(s) Where You Want to Install

Type one or more numbers for the disk(s) to be used for installation and press
Enter. To cancel a choice, type the corresponding number and Press Enter.
At least one bootable disk must be selected. The current choice is indicated
by >>>.

      Name      Location Code  Size(MB)  VG Status  Bootable
-----
1  hdisk0  04-B0-00-2,0    4296  none      Yes
2  hdisk1  04-B0-00-5,0    4296  none      Yes
3  hdisk2  04-B0-00-6,0   12288  none      Yes

>>> 0  Continue with choices indicated above

66  Disks not known to Base Operating System Installation
77  Display More Disk Information
88  Help ?
99  Previous Menu

>>> Choice [0]:

```

4. In the Change Disk(s) Where You Want to Install screen:
 - a. Select **hdisk0** by typing a 1 in the **Choice** field and press Enter. The disk will now be selected as indicated by >>>. To unselect the destination disk, type the number again and press Enter.
 - b. To finish selecting disks, type a 0 in the **Choice** field and press Enter. The Installation and Settings screen displays with the selected disks listed under **System Settings**.
5. Change the Primary Language Environment Settings to English (United States). Use the following steps to change the Cultural Convention, Language, and Keyboard to English.
 - a. Type 2 in the **Choice** field on the Installation and Settings screen to select the **Primary Language Environment Settings** option.
 - b. Type the number corresponding to English (United States) as the Cultural Convention in the **Choice** field and press Enter.
 - c. Select the appropriate keyboard and language options.
6. Verify that the selections are correct in the Overwrite Installation Summary screen, as follows:

```

Overwrite Installation Summary

Disks: hdisk0
Cultural Convention: en_US
Language: en_US
Keyboard: en_US
Desktop: CDE
Enable System Backups to install any system: Yes

Optional Software being installed:

>>> 1  Continue with Install
      88  Help ?
      99  Previous Menu

>>> Choice [1]:

```

7. Press Enter to begin the BOS installation. The system automatically reboots after installation is complete.

Step 4. Configure the system after installation

1. On systems with a graphics display, after a new and complete overwrite installation, the Configuration Assistant opens. On systems with an ASCII display, after a new and complete overwrite installation, the Installation Assistant opens.
2. Select the **Accept Licenses** option to accept the electronic licenses for the operating system.

3. Set the date and time, set the password for the administrator (root user), and configure network communications (TCP/IP).
Use any other options at this time. You can return to the Configuration Assistant or the Installation Assistant by typing `configassist` or `smitty assist` at the command line.
4. Select **Exit the Configuration Assistant** and select **Next**. Or, press F10 (or ESC+0) to exit the Installation Assistant.
5. If you are in the Configuration Assistant, select **Finish now, and do not start Configuration Assistant when restarting AIX** and select **Finish**.

Step 5. Manage your system

At this point, you may want to perform several common system-administration procedures. The following table lists where to find information about performing these procedures.

Table 8. Common System Administration Procedures

Procedure	Location
Backing up and recovering system backups	"Creating and installing system backups" in <i>Installation and migration</i>
Managing users and groups	"Users, Roles, and Passwords" in <i>Security</i>
Installing software	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Installing fixes/updates	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Tuning the system for performance	"Performance tuning" in <i>Performance management</i>
Configuring printers	<i>Printers and printing</i>

Configuring the AIX system after a new installation

Using the Configuration Assistant after a new and complete overwrite installation.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

- On systems with a graphics display, after a new and complete overwrite installation, the Configuration Assistant opens.
 1. Select the **Accept Licenses** option to accept the electronic licenses for the operating system.
 2. Set the date and time, set the password for the administrator (root user), and configure network communications (TCP/IP).
Use any other options at this time. You can return to the Configuration Assistant at any time by typing `configassist` at the command line.
 3. Select **Exit the Configuration Assistant** and select **Next**.
 4. If you are in the Configuration Assistant, select **Finish now, and do not start Configuration Assistant when restarting AIX** and select **Finish**.

At this point, the BOS Installation is complete, and the initial configuration of the system is complete.

- On systems with an ASCII display, after a new and complete overwrite installation, the Installation Assistant opens.
 1. If the Set Terminal Type menu appears, type `vt100` as the terminal type.

```

                                Set Terminal Type
The terminal is not properly initialized. Please enter a terminal type
and press Enter. Some terminal types are not supported in
non-English languages.

    ibm3101          tvi912          vt330
    ibm3151          tvi920          vt340
    ibm3161          tvi925          wyse30
    ibm3162          tvi950          wyse50
    ibm3163          vs100          wyse60
    ibm3164          vt100          wyse100
    ibmpc            vt320          wyse350
    lft              sun

+-----Messages-----+
| If the next screen is unreadable, press Break (Ctrl-c)
| to return to this screen.
88 Help ?
99 Exit

>>> Choice []: vt100

```

2. In the License Agreement menu, select **Accept License Agreements**.
3. Select **yes** to ACCEPT Installed License Agreements.
4. Press F10 (or Esc+0) to exit the License Agreement menu.
5. In the Installation Assistant main menu, select **Set Date and Time**.

```

                                Installation Assistant

Move cursor to desired item and press Enter.

    Set Date and Time
    Set root Password
    Configure Network Communications
    Install Software Applications
    Using SMIT (information only)

F1=Help          F2=Refresh          F3=Cancel          F8=Image
F9=Shell         F10=Exit            Enter=Do

```

6. Set the correct date, time, and time zone. Press the F3 (or Esc+3) key to return to the Installation Assistant main menu.
7. Select **Set root Password**. Set a root password for the partition.
8. Select **Configure Network Communications**. Select **TCP/IP Startup**. Select from the Available Network Interfaces and press Enter. Enter the appropriate network information in the Minimum Configuration and Startup menu and press Enter. Use the F3 (or Esc+3) key to return to the Installation Assistant main menu.
9. Exit the Installation Assistant by pressing F10 (or Esc+0).
10. The vterm window displays a login prompt.

At this point, the BOS Installation is complete, and the initial configuration of the system is complete.

Manage your AIX system after installation

At this point, you may want to perform several common system-administration procedures. The following table lists where to find information about performing these procedures.

Table 9. Common System Administration Procedures

Procedure	Location
Backing up and recovering system backups	"Creating and Installing System Backups" in <i>Installation and migration</i>
Managing users and groups	"Users, Roles, and Passwords" in <i>Security</i>

Table 9. Common System Administration Procedures (continued)

Procedure	Location
Installing software	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Installing fixes / updates	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Tuning the system for performance	<i>Performance management</i>
Configuring printers	<i>Printers and printing</i>

Installing the Base Operating System

There are multiple ways to install the AIX base operating system.

The Base Operating System (BOS) installation program first restores the run-time **bos** image, then installs the appropriate filesets, depending on your selections. The installation program automatically installs required message filesets, according to the language you choose.

For more information about the installation options, refer to "BOS installation options" on page 43.

The following installation methods are available on AIX:

New and Complete Overwrite

This method installs AIX 6.1 on a new machine or completely overwrites any BOS version that exists on your system.

For instructions on installing AIX 6.1 on a new machine or to completely overwrite the BOS on an existing machine, refer to "Installing new and complete BOS overwrite or preservation" on page 56.

Preservation

This method replaces an earlier version of the BOS but retains the root volume group, the user-created logical volumes, and the **/home** file system. The system file systems **/usr**, **/var**, **/tmp**, **/opt**, and **/** (root) are overwritten. Product (application) files and configuration data stored in these file systems will be lost. Information stored in other non-system file systems will be preserved.

For instructions on preserving the user-defined structure of an existing BOS, refer to "Installing new and complete BOS overwrite or preservation" on page 56.

Migration

This method upgrades from earlier versions of the AIX BOS to AIX 6.1 (see the release notes for restrictions). The migration installation method is used to upgrade from an existing version or release of AIX to a later version or release of AIX. A migration installation preserves most file systems, including the root volume group, logical volumes, and system configuration files. It overwrites the **/tmp** file system.

For instructions on migrating an existing version or release of AIX to a later version or release of AIX, refer to "Migrating AIX" on page 144.

The following table shows the differences in the installation steps among the installation methods.

Table 10. AIX BOS Installation Methods

Installation Steps	New and Complete Overwrite	Preservation	Migration
Create rootvg	Yes	No	No
Create file system / , /usr , /var	Yes	Yes	No
Create file system /home	Yes	No	No

Table 10. AIX BOS Installation Methods (continued)

Installation Steps	New and Complete Overwrite	Preservation	Migration
Save Configuration	No	No	Yes
Restore BOS	Yes	Yes	Yes
Install Additional Filesets	Yes	Yes	Yes
Restore Configuration	No	No	Yes

Using BOS menus

The available choices on the BOS menu window are described.

After you select the console and language to be used for the BOS menus, the Welcome to Base Operating System Installation and Maintenance window displays, as follows:

```

Welcome to Base Operating System
Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

>>> 1 Start Install Now with Default Settings
      2 Change/Show Installation Settings and Install
      3 Start Maintenance Mode for System Recovery
      4 Configure Network Disks (iSCSI)

      88 Help ?
      99 Previous Menu

>>> Choice [1]:

```

Note: To turn on the debug mode for the BOS installation process, type 911 in the **Choice** field and press Enter. The Welcome to Base Operating System Installation and Maintenance window refreshes and the BOS installation process runs in debug mode when the installation occurs. Continue the procedure for selecting options and specifying data until the installation begins. Debug output is sent to the client's display as the installation proceeds.

If you select **Start Install Now with Default Settings**, the BOS command determines the default installation method to use based on your system's configuration. A summary window displays, similar to the following, where you can confirm the installation method and installation options:

```

Overwrite Installation Summary

Disks: hdisk0
Cultural Convention: en_US
Language: en_US
Keyboard: en_US
JFS2 File Systems Created: Yes
Desktop:
Enable System Backups to install any system: Yes

Optional Software being installed:
Kerberos_5 (Expansion Pack)

>>> 1 Continue with Install
      88 Help ?
      99 Previous Menu

>>> Choice [1]:

```

If the selections are correct, press Enter to begin the BOS installation.

However, if you would like to change the installation method or options, select **Change/Show Installation Settings and Install** at the BOS welcome window. The Installation and Settings window displays, as follows:

```
Installation and Settings

Either type 0 and press Enter to install with current settings, or type the
number of the setting you want to change and press Enter.

 1 System Settings:
   Method of Installation.....New and Complete Overwrite
   Disk Where You Want to Install.....hdisk0

 2 Primary Language Environment Settings (AFTER Install):
   Cultural Convention.....English (United States)
   Language .....English (United States)
   Keyboard .....English (United States)
   Keyboard Type.....Default

 3 Security Model.....Default

 4 More Options (Software install options ...)

>>> 0 Install with the current settings listed above.

88 Help ?      |-----+-----
99 Previous Menu |      | WARNING: Base Operating System Installation will
                |      | destroy or impair recovery of SOME data on the
                |      | destination disk.
>>> Choice [0]:
```

For more information on the BOS menu options, refer to the Help at any time by typing 88 in the **Choice** field.

Electronic license agreements

AIX ships with software license agreements that can be viewed electronically.

If a product has an electronic license agreement, it must be accepted before software installation can continue. In the case of initial BOS installation, you can view and accept or reject license agreements in a license agreement dialog after the installation has occurred, but before the system is available for use as part of Configuration Assistant (graphics consoles) or Installation Assistant (ASCII consoles).

The AIX BOS has a license agreement, but not all software packages do. When you agree to the license agreement for BOS installation, you are also accepting all license agreements for any software installed automatically with the BOS. Some software, such as the GNOME or KDE desktops, can be optionally installed during BOS installation; the appropriate licensing information for such software is displayed separately.

If a customized **bosinst.data** file is used (usually for unattended installations, or *nonprompted installations*), the **ACCEPT_LICENSES** field in the **control_flow** stanza can be used to accept the license agreements so users are not prompted at reboot time. When performing a "push" installation using the Network Installation Management (NIM) environment, the licenses must be accepted, either from the choices made when initializing the installation or in a customized **bosinst.data** file, before the installation can continue. For more information about the **bosinst.data** file, refer to "The bosinst.data file" on page 46.

For additional software package installations, the installation cannot occur unless the appropriate license agreements are accepted. This option, as well as options to preview licenses, is offered in both the

System Management Interface Tool (SMIT) and the Web-based System Manager installation interfaces. When using the **installp** command, use the **-Y** flag to accept licenses and the **-E** flag to view license agreement files on the media.

For more information about license manipulation, refer to the **inulag** command description in the *AIX Version 6.1 Commands Reference, Volume 3*.

BOS installation options

The available options for installing BOS are described.

The installation options are available by typing 3 to change the **Security Model** and typing 4 to view the **More Options** field in the Installation and Settings window. These options vary based on installation type (overwrite, preservation, or migration) and security options.

The following choices are available:

Trusted AIX

Before you begin: Evaluate your system's needs for Trusted AIX with Multi Level Security (MLS) before choosing this installation option.

Applies only to overwrite and preservation installations. The **Trusted AIX** option installs the MLS version of the AIX operating system. The Trusted AIX environment enables label-based security functions in AIX, including support for:

- Labeled objects: such as files, Inter-Process Communication (IPC) objects, and network packets
- Labeled printers
- Trusted network: support for Revised Interconnection Protocol Security Option (RIPSO) and Commercial Internet Protocol Security Option (CIPSO) in Internet Protocol (IP) V4 and IP V6

After you have chosen this mode of installation, you cannot go back to a regular AIX environment without doing another overwrite install of regular AIX. For more information about Trusted AIX, see *Security*.

LSPP/EAL4+ configuration install *(only available with Trusted AIX)*

The **LSPP/EAL4+ configuration install** option installs Trusted AIX in LSPP/EAL4+ configured mode. LSPP/EAL4+ configured mode provides for further restrictive security as compared to the Trusted AIX installation.

Secure by Default

Applies only to overwrite installation. The **Secure by Default** option performs a minimal software installation, and removes all clear password access such as Telnet and rlogin. Secure by Default also applies the AIX Security Expert high-security settings. Secure by Default requires direct-connect access to the system, such as TTY or direct-connect display, or a secure means of remote access such as ssh or IPsec Virtual Private Network. For more information about Secure by Default or AIX Security Expert, see *Security*.

Trusted Computing Base install

The Trusted Computing Base (TCB) is the part of the system that is responsible for enforcing the information security policies of the system. All of the computer's hardware is included in the TCB, but a person administering the system should be concerned primarily with the software components of the TCB.

If you install the Trusted Computing Base option, you enable the trusted path, trusted shell, and system-integrity checking (**tcbck** command). These features can be enabled *only* during BOS installation.

The choices are **yes** and **no**. To enable the Trusted Computing Base, type 2 and press Enter. The default is **no**.

CAPP and EAL4+ Configuration install

Applies only to a new and complete overwrite installation. If you enable Controlled Access Protection Profile (CAPP) and Evaluation Assurance Level 4+ (EAL4+), there are restrictions on installation choices, such as:

- Desktop = CDE or NONE
- JFS2 = yes
- Enable system backups to install any system (installs all devices and kernels) = no
- Install more software options = no

For information about CAPP and EAL4+, see Controlled Access Protection Profile and Evaluation Assurance Level 4+ in *Security*.

Desktop

The default is **CDE** for new and complete overwrite installations. If you select **NONE**, a minimal configuration is installed including X11, Java™, perl, SMIT, and the Web-based System Manager (if **Graphics Software** is selected).

If you select **GNOME** or **KDE**, the BOS installation process prompts you for the *AIX Toolbox for Linux Applications* media. If this media is not available, you can type q to continue the installation without the *AIX Toolbox for Linux Applications* media. You can select additional desktops from the Install More Software menu.

Import User Volume Groups

Applies only to migration installation and preservation installation. You have the option to have user volume groups imported after the installation completes. These volume groups can be manually imported at a later time.

Create JFS2 File Systems

Applies only to new and complete overwrite installation, as well as preservation installation. Create enhanced journaled file systems during BOS installation.

Graphics Software

Applies only to new and complete overwrite installation, as well as preservation installation. Install graphics software support.

System Management Client Software

Installs web-based system management software, Java, service agent software, and System p™ Console runtime software.

Remove Java 1.1.8 Software

Applies only to migration installation. You have the option to have all Java version 1.1.8 software removed.

Enable System Backups

If you select **Enable System Backups** to install any system, all devices are installed, so that a system backup can be installed on a different system. For more information about installing a system backup to a different system, see Cloning a system backup.

Install More Software

Applies to new and complete overwrite installation method, as well as the preservation installation method. Select **Install More Software** to choose additional software to install after the BOS installation process finishes. A software bundle file corresponds to each selection that contains the required packages and filesets. The following software bundles are available:

```

Install More Software

1. Firefox (Firefox CD)..... No
2. Kerberos_5 (Expansion Pack)..... No
3. Server (Volume 2)..... No
4. GNOME Desktop (Toolbox for Linux Applications)..... No
5. KDE Desktop (Toolbox for Linux Applications)..... No

>>> 0 Install with the current settings listed above.

    88 Help ?
    99 Previous Menu

>>> Choice [0]:

```

The new and complete overwrite installation options (with no security models) are similar to the following:

```

Install Options

1. Create JFS2 File Systems..... Yes
2. System Management Client Software..... Yes
3. Graphics Software..... Yes
4. Desktop..... NONE, CDE, GNOME, KDE
5. Enable System Backups to install any system..... Yes
   (Installs all devices)
>>> 6. Install More Software

    0 Install with the current settings listed above.

    88 Help ?
    99 Previous Menu

>>> Choice [6]:

```

The migration installation options are the following:

```

Install Options

1. Import User Volume Groups..... Yes
2. Enable System Backups to install any system..... Yes
   (Installs all devices)
4. Remove Java 1.1.8 Software..... No

>>> 0 Install with the current settings listed above.

    88 Help ?
    99 Previous Menu

>>> Choice [0]:

```

Graphical Install menus

The Graphical Install menus provide a method to quickly begin a New and Complete Overwrite BOS Installation using a graphical user interface.

The Graphical Install menus are used only when the following conditions are met:

- The system has not been configured with any operating system.
- The system has a DVD drive.
- The system has hardware for graphics.

If these conditions are met, you can launch the Graphical Install menus by following these steps:

1. Insert the AIX DVD into the DVD drive.

2. Turn the system unit power switch from Off (0) to On (1).
3. When the system beeps twice, press **F5**. The keyboard icon displays on the screen when the beeps occur. The system starts from the installation media.
4. Select the system console by pressing **F1** and press Enter.
5. After the console is selected, the Graphical Install menus are loaded. The **Welcome to Base Operating System Installation** menu displays first. Use this menu to choose the language that you want to use during installation.
6. When the **Select the Type of Base Operating System Installation** menu displays, click **Traditional Install** to exit from the Graphical Install menus and load the Base Operating System (BOS) menus. Otherwise click the **Quick Install** button to continue.
7. Next, the **Summary of the BOS Installation** menu displays. This menu allows you to select the **Language**, **Cultural Convention**, and **Keyboard** for the Base Operating System. You can begin a default BOS installation by clicking **Start Quick Install**. To change any of the default BOS installation settings, choose the **Switch to Traditional Install** button to exit the Graphical Install menus and load the BOS menus.

The bosinst.data file

The content and use of the **bosinst.data** file is described.

bosinst.data file stanza descriptions

Stanza descriptions with example files are shown.

bosinst.data control_flow stanza descriptions:

The control_flow stanza contains variables that control the way the installation program works.

Variable	Description
CONSOLE	Specifies the full path name of the device you want to use as the console. If this value is Default , and you are performing a nonprompted installation, then the console is set to /dev/lft0 , if this device exists. If /dev/lft0 does not exist, the console is set to /dev/vty0 or /dev/tty0 depending on the system. (Instructions for which key to press are displayed on the screen.) If you change the PROMPT variable to no , you must specify a console here.
INSTALL_METHOD	Specifies a method of installation: migrate , preserve , erase_only , or overwrite (for a new and complete install). The default value is initially blank. The installation program assigns a value, depending on which version of AIX was previously installed. See "Installing the Base Operating System" on page 40 for more information. The default method of installation is migrate if a previous version of the operating system is on the machine. If no previous version exists, the default method is overwrite . The erase_only value specifies to erase the hard drives only and not to do an installation.

PROMPT

Specifies whether the installation program uses menus from which you make choices. The possible values are **yes** (default) and **no**. **Note:** You must fill in values for all variables in the locale stanza to uniquely identify the disk, if you set the **PROMPT** variable to **no**. Similarly, if **PROMPT** equals **no**, you must supply values for variables in the control_flow stanza, with two exceptions: the **ERROR_EXIT** and **CUSTOMIZATION_FILE** variables, which are optional.

Attention: Fill in values for enough variables in the target_disk_data stanza if you set the **PROMPT** variable to **no**. The BOS installation program assigns target disks for blank variables. You can lose data if the installation program assigns a disk where you store data.

EXISTING_SYSTEM_OVERWRITE

Confirms that the installation program can *overwrite* existing volume groups. This variable is applicable only for a nonprompted overwrite installation. The possible values are **no** (default), **yes**, and **any**.

no (Default) Only disks that are not part of a volume group can be used for the installation.

yes Disks that contain the root volume group is used first, and if additional disks are needed for the installation, then disks that contain no volume groups are used.

any Any disks can be used for the installation.

When the installation is nonprompted and the target_disk_data stanza is empty, the installation process uses the value of the **EXISTING_SYSTEM_OVERWRITE** field to determine the disks to install on.

When you do a prompted installation, this value is changed to **yes**, and is saved with other changes in the **/var/adm/ras/bosinst.data** file. Network Install Manager (NIM) creates a default **bosinst.data** file (NIM **bosinst_data** resource) with this value set to **yes**, and system backups use the **bosinst.data** file that is copied from the **/var/adm/ras** directory, so in most cases this value is already be set to **yes**. If this field is set to **no**, as seen in the **/usr/lpp/bosinst/bosinst.template** file, an error message informs you that there are not enough disks matching the criteria needed to complete the installation during a non-prompted install. The BOS installation is then changed to a prompted BOS installation, and the value of the **EXISTING_SYSTEM_OVERWRITE** field is set to **yes**.

INSTALL_X_IF_ADAPTER

Specifies whether a desktop should be installed or not. The possible values are **yes**, **all**, and **no**. The default value for this field is **yes**, meaning that if the system has a graphical console, and a **DESKTOP** is specified, the desktop is installed. If set to **all** and a **DESKTOP** is specified, the desktop is installed, whether the system has a graphical console or not. If set to **no** and a **DESKTOP** is specified, the desktop is not installed.

RUN_STARTUP

Starts the Configuration Assistant on first boot after the BOS installation completes, if the system has a graphical interface. Starts Installation Assistant if the machine has an ASCII interface. The possible values are **yes** (default) and **no**. The **no** value is valid only when the **ACCEPT_LICENSES** field is set to **yes**.

RM_INST_ROOTS	<p>Removes all files and directories in the /usr/lpp*/inst_roots directories. The possible values are no (default) and yes.</p> <p>The /usr/lpp/bos/inst_roots directories must remain if the machine is used as a network server or to create workload partitions. To save disk space, set this value to yes if the machine is not a workload partition or network server.</p>
ERROR_EXIT	<p>Starts an executable program if an error occurs in the installation program. The default value is blank, which signals BOS installation to use a command that is shipped on the installation media. The command starts an error message routine when the installation program halts because of an error. As an alternative to the default, you can enter the path name of your own script or command for a customized error routine.</p>
CUSTOMIZATION_FILE	<p>Specifies the path name of a customization file you create. The default value is blank. The customization file is a script that starts immediately after the installation program concludes.</p>
TCB	<p>Specifies whether you want to install the Trusted Computing Base (TCB). When you install the TCB, the trusted path, the trusted shell, and system integrity checking are installed. The TCB must be installed and initialized when the operating system is installed. The TCB cannot be installed later. By not installing the TCB, installation time is reduced. The possible values are no (default) and yes.</p>
INSTALL_TYPE	<p>If set to CC_EVAL, then CAPP and EAL4+ technology will be enabled. This is only allowed when INSTALL_METHOD is overwrite. If this is set, the CULTURAL_CONVENTION and MESSAGES fields of the locale stanza can only be en_US or C. Set CREATE_JFS2_FS to yes, ALL_DEVICES_KERNELS to no, and TCB to yes. DESKTOP can only be NONE or CDE. Set the additional software bundles to no (FIREFOX, HTTP_SERVER_BUNDLE, KERBEROS_5_BUNDLE, SERVER_BUNDLE and ALT_DISK_INSTALL_BUNDLE).</p>
BUNDLES	<p>Specifies what software bundles to install. Type the full path name of each bundle file. Be sure there is sufficient disk space and paging space on the target machine for the software you specify in the BUNDLES variable.</p> <p>This list of bundle file names is limited to 139 bytes. If your list of bundle file names is longer than 139 bytes, use the cat command to combine the bundle files into a single custom bundle file and enter the name of your custom bundle file in this field.</p> <p>If you are installing from tape, to specify system-defined bundles on the product media, use the full path name of each bundle file as follows:</p> <pre>/usr/sys/inst.data/sys_bundles/BundleFileName</pre> <p>If you are using a bosinst.data diskette to define your own bundle files, specify the full path name of each bundle file as follows:</p> <pre>././DirectoryName/BundleFileName.</pre> <p>For example, if you put a bundle file named mybundle in the root directory, the full path name would be ././mybundle.</p> <p>If you are using preservation installation, create bundle files before you start the installation. Create the files in /home and specify the full path name of each bundle file as follows:</p> <pre>/home/BundleFileName</pre>

RECOVER_DEVICES

Specifies whether to reconfigure the devices. The default value is **Default**. For **mksysb** installations, the ODM configuration database is saved in the image. The device names and attributes are automatically extracted from the database, and the BOS installation program attempts to recreate the devices the same way they were on the machine the **mksysb** was created on. This is normal procedure for regular **mksysb** restores on the same system. However, for cloning (installing the **mksysb** image on another system), you may not want these devices configured this way, especially for network configuration.

When the **mksysb** image is created, the CPU ID is saved. If you are reinstalling the same system, then the device information is recovered. If the **mksysb** image is used to install another system, device information is *not* recovered from the **mksysb** image.

The **Default** value can be overwritten. For example, if your system had the planar replaced, or you upgraded to another system, you might want to recover devices. In these cases, you can select **yes** in the Backup Restore menu to recover devices.

BOSINST_DEBUG

Specifies whether to show debug output during BOS installation. The value **yes** sends **set -x** debug output to the screen during BOS installation. The possible values are **no** (default) and **yes**.

ACCEPT_LICENSES

Specifies whether to accept software license agreements during the BOS installation. The default is **no**. To automatically accept them, set this value to **yes**. When the software licenses agreements are not accepted during BOS installation, Configuration Assistant or Installation Assistant prompts you to view and accept them. During a BOS installation, if this value is blank, the default of **no** is assumed.

For **mksysb** installations, when the **ACCEPT_LICENSES** field is **no**, the user is forced to accept the licenses again before continuing to use the system. When the **ACCEPT_LICENSES** field is set to **yes**, the licenses are automatically accepted for the user. If blank, the state of the licenses is the same as when the **mksysb** was created.

SYSTEM_MGMT_CLIENT_BUNDLE

Specifies whether to install Web-based System Management software, Java, service agent software, and System p Console software. The choices are **yes** and **no**.

TRUSTED_AIX

Specifies the MLS version of the operating system to be installed. This is valid only with overwrite and preservation installations, and restricts other variables. The choices are **yes** and **no**. The **DESKTOP** value must be **NONE**, **GRAPHICS_BUNDLE** must be **no**, and **CREATE_JFS2_FS** must be **yes**. All other software bundles must be **no**, except for **SYSTEM_MGMT_CLIENT_BUNDLE**. You can only turn off these options by installing a new operating system. For more information about Trusted AIX, see *Security*.

TRUSTED_AIX_LSPP

Specifies the MLS version of the operating system to be installed, in LSPP/EAL4+ configured mode. This is a more restrictive mode of Trusted AIX. The choices are **yes** and **no**. For more information about Trusted AIX, see *Security*.

SECURE_BY_DEFAULT	Specifies a minimal software installation and removes all clear password access such as telnet and rlogin. SECURE_BY_DEFAULT also applies the AIX Security Expert high security settings. This is only valid on an overwrite install. You must set DESKTOP to NONE , GRAPHICS_BUNDLE to yes , ALL_DEVICES_KERNELS to no , and SYSTEM_MGMT_CLIENT_BUNDLE to no . The choices are yes and no . For more information about AIX Security Expert, see <i>Security</i> .
DESKTOP	Specifies the desktop to be installed. The choice of available desktops are CDE (the default), NONE, GNOME, and KDE. If you choose GNOME or KDE, you will be prompted for the <i>AIX Toolbox for Linux Applications</i> CD.
INSTALL_DEVICES_AND_UPDATES	When installing a mksysb image to a system with a different hardware configuration, boot from product media to get any missing device drivers installed. In addition, if the product media is a later level of AIX than the mksysb , software in the mksysb image will be updated. To prevent either of these additional installations from occurring, set this field to no . The default is yes .
IMPORT_USER_VGS	Specifies whether you want any user volume groups to be automatically imported after the system has been installed. The choices are yes and no .
CREATE_JFS2_FS	Specifies whether you want to create enhanced journaled file systems. The choices are yes and no .
ALL_DEVICES_KERNELS	Specifies whether to install all device filesets. The choices are yes and no . If you select no , your system will be installed with the devices and kernel specific to your system configuration. If you select yes , when you create a system backup of your system, you can use that system backup to install any system.
GRAPHICS_BUNDLE	Specifies whether to install the graphics software bundle during the BOS installation. This software bundle contains the graphics support for the Web-based System Manager and Linux desktops. The choices are yes and no .
FIREFOX_BUNDLE	Specifies whether to install the Firefox software bundle during the BOS installation. This software bundle contains the Firefox Web browser software. The choices are yes and no .
KERBEROS_5_BUNDLE	Specifies whether to install the Kerberos 5 client software bundle during the BOS installation. This software bundle installs the Kerberos 5 client software. The choices are yes and no .
SERVER_BUNDLE	Specifies whether to install the AIX server software bundle during the BOS installation. This software bundle installs additional networking software, performance tools, and accounting services software. The choices are yes and no .
ALT_DISK_INSTALL_BUNDLE	Specifies whether to install the alternate disk installation software during the BOS installation. The choices are yes and no .
REMOVE_JAVA_118	Specifies whether to remove the Java 1.1.8 software from the current system when performing a migration installation. The choices are yes and no .
HARDWARE_DUMP	Creates a dump logical volume to contain firmware and hardware dump data. Dump logical volumes are only create on hardware that supports creation of firmware and hardware dump data. The choices are yes and no .
ERASE_ITERATIONS	Specifies the number of times to erase the chosen hard drives before the installation occurs. This field is only valid when the INSTALL_METHOD field is set to overwrite or erase_only . The choices for this field is a number from 0 to 8. If the field is set to 0 then no erasure of the hard drives will occur. The default is 0.

ERASE_PATTERNS	Specifies the patterns to write to the chosen hard drives. The value for this field is a comma separated list of the patterns to use for each erasure of the drives. A valid pattern is a hexadecimal value from 0 to fffffff. The number of patterns specified must be equal or greater to the number of iterations specified in ERASE_ITERATIONS . If ERASE_ITERATIONS is 0 then this field is ignored. ex: If ERASE_ITERATIONS = 3 then a valid entry for this field could be ERASE_PATTERNS = 00,ff,0a0a0a0a .
ADD_CDE	Adds CDE as an additional desktop. If the DESKTOP field is not CDE and ADD_CDE is set to yes , the CDE desktop is installed in addition to the desktop specified by the DESKTOP field. The default value is no . If DESKTOP is set to none , this attribute is ignored.
ADD_KDE	Adds KDE as an additional desktop. If the DESKTOP field is not KDE and ADD_KDE is set to yes , the KDE desktop is installed in addition to the desktop specified by the DESKTOP field. The default value is no . If DESKTOP is set to none , this attribute is ignored.
ADD_GNOME	Adds GNOME as an additional desktop. If the DESKTOP field is not GNOME and ADD_GNOME is set to yes , the GNOME desktop is installed in addition to the desktop specified by the DESKTOP field. The default value is no . If DESKTOP is set to none , this attribute is ignored.
MKSYSB_MIGRATION_DEVICE	When set, specifies the device to be used to restore the mksysb image for migration. Default is blank. Valid values are <i>/dev/cddevice number</i> for a mksysb image on a CD-DVD, and <i>/dev/rmtdevice number</i> for a mksysb image on tape. For a network installation, the valid value is the word <i>network</i> .

bosinst.data target_disk_data stanza:

The `target_disk_data` stanza contains variables for disks in the machine where the program is to install BOS.

The default **bosinst.data** file has one `target_disk_data` stanza, but you can add new stanzas to install BOS on multiple disks, one stanza for each disk.

Multiple `target_disk_data` stanzas can exist. They define the disks that are to contain the root volume group. Only one field (**PVID**, **PHYSICAL_LOCATION**, **SAN_DISKID**, **CONNECTION**, **LOCATION**, **SIZE_MB**, **HDISKNAME**) must be non-null for BOS installation to choose a disk. The order of precedence is **PVID** (Physical Volume ID), **PHYSICAL_LOCATION**, **SAN_DISKID**, then **CONNECTION** (parent attribute//connwhere attribute), then **LOCATION**, then **SIZE_MB**, and then **HDISKNAME**. The BOS installation process uses the following logic to determine how to use the `target_disk_data` stanza information:

- If **PVID** is set, BOS installation checks to see if a disk matches the value. If so, other attributes are ignored.
- If **PVID** is empty and **PHYSICAL_LOCATION** is set, then BOS installation checks to see if the parent and connwhere attributes (separated by `"/"`) match a disk. If they do, other attributes are ignored.
- If either **PVID** or **PHYSICAL_LOCATION** is set, and neither value matches a disk on the target system, and no other attributes are set, an error message is generated, and a disk must be explicitly selected.
- If **PVID** and **PHYSICAL_LOCATION** are empty, and **SAN_DISKID** is set, then, for fibre channel-attached disks, BOS installation interprets the **SAN_DISKID** as a World Wide Port Name and a Logical Unit ID (separated by `"/"`). The World Wide Port Name (**ww_name**) and Logical Unit ID (**lun_id**) can be obtained on a running system from the **lsattr** command.

The **SAN_DISKID** field is checked before the **CONNECTION** field.

- If the **ww_name** and **lun_id** match a disk, other attributes are ignored.

- If either **PVID** or **SAN_DISKID** is set, and neither value matches a disk on the target system, and no other attributes are set, an error message is generated and a disk must be explicitly selected.
- If **PVID** and **SAN_DISKID** are empty and **CONNECTION** is set, BOS installation verifies if the **parent** and **connwhere** attributes (separated by "//") match a disk. If this is true, other attributes are ignored.
- If **CONNECTION** is set, the value does not match a disk on the target system, and no other attributes are set, an error message is generated and a disk must be explicitly selected.
- If other attributes are specified, processing occurs as described below:
 - If **LOCATION** is set, BOS installation ignores **SIZE_MB** and **HDISKNAME**.
 - If **LOCATION** is not set and **SIZE_MB** is, BOS installation selects disks based on **SIZE_MB** and ignores **HDISKNAME**.
 - If **LOCATION** and **SIZE_MB** are both empty, BOS installation chooses the disk specified in **HDISKNAME**.
 - If all fields are empty, BOS installation chooses a disk for you.

For the **PVID**, **PHYSICAL_LOCATION**, **SAN_DISKID**, and **CONNECTION** fields, the BOS installation process uses the following logic to determine how to use the target_disk_data stanza information:

- Does the information in one or more of the **PVID**, **PHYSICAL_LOCATION**, **SAN_DISKID**, and **CONNECTION** fields match the disk information?
- If the disk information matches the information in one of these four fields, use that information.
- If the disk information does *not* match the information in one of these four fields, and if the **LOCATION**, **SIZE_MB**, and **HDISKNAME** fields are not set, display an error message and prompt the user for the correct disk information.

The **PHYSICAL_LOCATION** information can be retrieved using the **lsdev** command. For example:

```
# lsdev -Cc disk -l hdisk0 -F "name physloc"
```

returns the hdisk0 diskname and the P2/Z1-A8 physical location.

Attention: If **prompt=no**, do not leave the target_disk_data stanzas empty, unless it is unimportant which disk BOS installation overwrites. This is because the algorithm that determines the default disk for the installation is not always predictable.

The **SIZE_MB** field can contain either a size or the word **largest**. If a size is listed, BOS installation does a "best-fit" on the disks. If the word **largest** is in that field, BOS installation selects the largest disk. If there is more than one target_disk_data stanza, BOS installation selects the two "largest" disks, and so on.

PVID	Specifies the 16-digit physical volume identifier for the disk.
PHYSICAL_LOCATION	The physical location code provides a way to identify fibre channel disks during BOS Install. For fibre channel disks the PHYSICAL_LOCATION field includes the World Wide Port Name and Lun ID that are included in the SAN_DISKID field. The information in the PHYSICAL_LOCATION field supercedes the information in the SAN_DISKID field.
SAN_DISKID	Specifies the World Wide Port Name and a Logical Unit ID for fibre channel-attached disks. The ww_name and lun_id are separated by two slashes (/). This information can be obtained on a running system from the lsattr command.
CONNECTION	Specifies the combination of the parent attribute and the connwhere attribute associated with a disk. The parent and connwhere values are separated by two slashes (/). If the parent value is scsi0 and the connwhere value is 0,1 , then the CONNECTION value is scsi0//0,1 . An example of the CONNECTION value for a SSA disk would be ssar//000629CCC07300D . In the example, the parent attribute is represented by ssar and the ConnectionLocation (15-character unique identity) of the disk drive 000629CCC07300D is used for the connwhere attribute.

SIZE_MB	Specifies the formatted size of the disk, in megabytes, where the program is to install BOS. The default value is blank. You can specify the size of your target disk by typing the number of megabytes available on the formatted disk. Also, you can type <code>largest</code> if you want to use the largest disk (that has not already been selected) found by the installation program.
LOCATION	Specifies a location code for the disk where the program is to install BOS. The default value is blank. If you do not specify a value, the installation program assigns a value based on the next two variables. For more information about physical location codes, refer to the <i>Diagnostic Information for Multiple Bus Systems</i> guide.
HDISKNAME	Specifies the path name of the target disk. The default value is blank. To name a target disk, use the <i>hdiskname</i> format, where <i>hdiskname</i> is the device name of your disk (for example, hdisk0).

bosinst.data target_iscsi_data stanza:

The optional `target_iscsi_data` stanza contains variables for the parent iSCSI adapter of the disks in the system where the program resides to install the Base Operating System.

The **bosinst.data** file contains a `target_iscsi_data` stanza only if the root volume group includes an iSCSI disk. Only one `target_iscsi_data` stanza can exist. It defines the iSCSI target for the disks that are to contain the root volume group. The `target_iscsi_data` stanza must be located after all the `target_disk_data` stanzas to ensure correct processing.

Variable	Description
ADAPTER_NAME	Specifies the name of the iSCSI TOE adapter (for example, <code>ics0</code>) or the iSCSI software solution protocol device (for example, <code>ics0</code>) to which this iSCSI target will be configured. This is a required field.
ISCSI_GROUP	This field should be set to the static value.
TARGET_NAME	Specifies the iSCSI target name of the iSCSI target. The mkiscsi command will not do normalizing on the <code>TARGET_NAME</code> .
INITIATOR_NAME	Specifies the iSCSI initiator name of the iSCSI Initiator.
PORT_NUMBER	Specifies the TCP port number of the iSCSI target.
IP_ADDRESS	Specifies the IP address of the iSCSI target.
SW_INITIATOR<yes, no>	Specifies whether the adapter is an iSCSI software solution protocol device. If the adapter is an iSCSI software protocol device, the network interface that was configured by NIM is used to connect to the iSCSI target.
DISC_POLICY	Set the value of odm .
ADAPTER_IP	Specifies the IP address of the iSCSI TOE adapter when SW_INITIATOR is set to no .
ADAPTER_GW	Specifies the IP address of the gateway that is used by the iSCSI TOE adapter when SW_INITIATOR is set to no .
ADAPTER_SNM	Specifies the subnet mask that is used by the iSCSI TOE adapter when SW_INITIATOR is set to no .

The following example shows a `target_iscsi_data` stanza for a configuration where the adapter is a software initiator adapter:

```
target_iscsi_data:
ADAPTER_NAME = iscsi0
ISCSI_GROUP = static
TARGET_NAME = iqn.sn1234.iscsi_hw1
INITIATOR_NAME= iqn.2000-01.ibm.boot
```

```

PORT_NUMBER = 3260
IP_ADDRESS = 10.1.1.130
SW_INITIATOR = yes
DISC_POLICY = odm

```

The following example shows a `target_iscsi_data` stanza using an iSCSI TOE adapter:

```

target_iscsi_data:
ADAPTER_NAME = ics0
ISCSI_GROUP = static
TARGET_NAME = iqn.sn1234.iscsi_hw1
INITIATOR_NAME= iqn.2000-01.ibm.boot
PORT_NUMBER = 3260
IP_ADDRESS = 10.1.1.130
SW_INITIATOR = no
DISC_POLICY = odm
ADAPTER_IP = 10.1.2.115
ADAPTER_GW = 10.1.2.1
ADAPTER_SNM = 255.255.255.0

```

bosinst.data file locale stanza:

The locale stanza contains variables for the primary language that the installed machine is to use.

Refer to *Understanding Locale Categories in AIX Version 6.1 National Language Support Guide and Reference*, which provides information about locales and the format to use when editing variables.

BOSINST_LANG	Specifies the language that the installation program uses for prompts, menus, and error messages. The default value is blank.
CULTURAL_CONVENTION	Specifies the primary locale to install. The default value is blank.
MESSAGES	Specifies the locale for message catalogs to install. The default value is blank.
KEYBOARD	Specifies the keyboard map to install. The default value is blank.

bosinst.data large_dumplv stanza:

The optional **large_dumplv** stanza specifies characteristics used if a dedicated dump device is to be created on the systems.

A dedicated dump device is only created for systems with 4 GB or more of memory. The following characteristics are available for a dedicated large dump device:

DUMPDEVICE	Specifies the name of the dedicated dump device.
SIZEGB	Specifies the size of the dedicated dump device in gigabytes.

If the stanza is not present, the dedicated dump device is created when required. A dedicated dump device is created in machines with at least 4 Gigabytes of real memory during an overwrite install. By default, the name of the dedicated dump device is **lg_dumplv** and its size is determined by the following formula:

4>= RAM < 12	size of dump device= 1 GB
12>= RAM < 24	size of dump device= 2 GB
24>= RAM < 48	size of dump device= 3 GB
RAM >= 48	size of dump device= 4 GB

bosinst.data dump stanza:

The dump stanza specifies system dump characteristics.

PRIMARY	Specifies the primary dump device to be set by sysdumpdev -P -p device .
SECONDARY	Specifies the secondary dump device to be set by sysdumpdev -P -s device .

COPYDIR	Specifies the directory to which the dump is copied at system boot.
FORCECOPY	Specifies whether the system boots into menus that allow copy of the dump to external media if the copy fails.
ALWAYS_ALLOW	Specifies whether the key mode switch can be ignored when a dump is requested.

If the stanza is not present in the **bosinst.data** file, no additional dump-device handling occurs beyond what is already in place. Checking on the values of the fields is limited; if the device specified for a dump device is not valid, any error processing comes from the **sysdumpdev** command and is sent to the console and stored in the BOS installation log.

- If **FORCECOPY** is specified and no **COPYDIR** is specified, the value field of the **autocopydump** attribute from **/etc/objrepos/SWservAt** is retrieved and used for the **sysdumpdev -[dID] copydir operation**.
- If only the **COPYDIR** is specified without **FORCECOPY** being specified, **forcecopy** defaults to yes. The **sysdumpdev -d (FORCECOPY = no)** or **sysdumpdev -D (FORCECOPY = yes)** is used to set the copy directory.
- If **ALWAYS_ALLOW=yes**, run **sysdumpdev -K**. Otherwise, run **sysdumpdev -k**.
- If any values other than yes and no are specified for **FORCECOPY** or **ALWAYS_ALLOW**, the default actions occur, and processing continues.
- If no value is specified for a particular dump field, no analogous **sysdumpdev** operation is performed. This leaves the system values in the appropriate state, even for a migration or system backup image installation. If a **COPYDIR** is specified but **FORCECOPY** is not specified, the value of the **forcecopydump** attribute is retrieved from the **/etc/objrepos/SWservAt** file to determine the correct form of **sysdumpdev** to invoke.

Using the bosinst.data file

The values in the **bosinst.data** file for this example are not specific to a network installation and can be applied for other types of installations, such as a **mksysb** installation.

Note: The depicted values illustrate formatting only and do not apply to your installation.

For information about a **bosinst.data** variable or values, see “bosinst.data file stanza descriptions” on page 46.

To check the contents of your customized **bosinst.data** file, use the **bicheck** command, as follows:

```
/usr/lpp/bosinst/bicheck filename
```

bosinst.data file nonprompted network installation:

An example of a modified **bosinst.data** file is shown that might be used in a nonprompted network installation.

```
control_flow:
  CONSOLE = Default
  INSTALL_METHOD = overwrite
  PROMPT = no
  EXISTING_SYSTEM_OVERWRITE = yes
  INSTALL_X_IF_ADAPTER = yes
  RUN_STARTUP = yes
  RM_INST_ROOTS = no
  ERROR_EXIT =
  CUSTOMIZATION_FILE =
  TCB = no
  INSTALL_TYPE =
  BUNDLES =
  RECOVER_DEVICES = no
  BOSINST_DEBUG = no
  ACCEPT_LICENSES = yes
```

```
DESKTOP = NONE
INSTALL_DEVICES_AND_UPDATES = yes
IMPORT_USER_VGS =
CREATE_JFS2_FS = Default
ALL_DEVICES_KERNELS = yes
GRAPHICS_BUNDLE = yes
MOZILLA_BUNDLE = no
KERBEROS_5_BUNDLE = no
SERVER_BUNDLE = no
REMOVE_JAVA_118 = no
HARDWARE_DUMP = yes
ADD_CDE = no
ADD_GNOME = no
ADD_KDE = no
ERASE_ITERATIONS = 0
ERASE_PATTERNS =
```

target_disk_data:

```
LOCATION =
SIZE_MB =
HDISKNAME =
```

locale:

```
BOSINST_LANG =
CULTURAL_CONVENTION =
MESSAGES =
KEYBOARD =
```

mksysb_migration_device

The device type or name where the mksysb image can be located when describing how to perform a **mksysb** or migration operation.

For a network installation, the **mksysb** image device must be a network resource and the value of "network" needs to be specified with this variable. For an installation from media, the mksysb image device needs to be specified using the device logical name as known to AIX (such as **/dev/cd0**, **/dev/rmt0**).

Installing new and complete BOS overwrite or preservation

Use these steps to install Base Operating System new and complete overwrite or preservation.

Step 1. Completing the prerequisites

Complete these prerequisites before starting the BOS installation.

Before starting the installation, complete the following prerequisites:

- There must be adequate disk space and memory available. AIX requires 256–512 MB of memory and 2.2 GB of physical disk space. For additional release information, see the *AIX Release Notes* that correspond to the level of your AIX operating system.
- All requisite hardware, including any external devices (such as tape drives, CD-ROM or DVD-ROM drives), must be physically connected. If you need further information, refer to the hardware documentation that accompanied your system.
- The installation media must be loaded in the boot device.
- The system *must be* set to boot from the device in which the installation media is loaded. Refer to the hardware documentation that accompanied your system for instructions on setting the boot device.
- Before you begin the installation, other users who have access to your system must be logged off.
- If the system you are installing is currently running, create or locate a backup of the system. For instructions on how to create a system backup, refer to "Creating system backups" on page 155.
- If your system needs to communicate with other systems and access their resources, make sure you have the information in the following worksheet before proceeding with installation:

Table 11. Network Configuration Information Worksheet

Network Attribute	Value
Network Adapter	
Host Name	
IP Address	_____._____._____._____
Network Mask	_____._____._____._____
Nameserver	_____._____._____._____
Domain Name	
Gateway	_____._____._____._____

Step 2. Preparing your system for installation

Prepare for a new and complete overwrite or preservation installation.

Do the following:

1. Insert the *AIX Volume 1* media into the media device.
2. Shut down your system. If your machine is currently running, power it off by following these steps:
 - a. Log in as the root user.
 - b. Type the following command:

```
shutdown -F
```
 - c. If your system does not automatically power off, place the power switch in the Off (0) position.
Attention: You *must not* turn on the system unit until instructed to do so in “Step 4. Booting from your installation media” on page 58.
3. Turn on all attached external devices. These include the following:
 - Terminals
 - CD-ROM or DVD-ROM drives
 - Tape drives
 - Monitors
 - External disk drives

Turning on the external devices first is necessary so the system unit can identify each peripheral device during the startup (boot) process.

Step 3. Setting up an ASCII terminal

Follow these criteria for setting the communications, keyboard, and display options on an ASCII terminal.

If you are using a graphics terminal, skip directly to “Step 4. Booting from your installation media” on page 58.

If you are using an ASCII terminal, use the criteria listed below and your terminal reference documentation to set the communications, keyboard, and display options. The following settings are typical, but your terminal might have different option names and settings than those listed here.

Note: If your terminal is an IBM 3151, 3161, or 3164, press the Ctrl+Setup keys to display the Setup Menu and follow the on-screen instructions to set these options.

Communication Options	
Option	Setting
Line Speed (baud rate)	9600
Word Length (bits per character)	8

Communication Options	
Parity	no (none)
Number of Stop Bits	1
Interface	RS-232C (or RS-422A)
Line Control	IPRTS

Keyboard and Display Options	
Option	Setting
Screen	normal
Row and Column	24x80
Scroll	jump
Auto LF (line feed)	off
Line Wrap	on
Forcing Insert	line (or both)
Tab	field
Operating Mode	echo
Turnaround Character	CR
Enter	return
Return	new line
New Line	CR
Send	page
Insert Character	space

Step 4. Booting from your installation media

Follow this procedure for booting from your installation media.

1. Turn the system unit power switch from Off (0) to On (|).
2. When the system beeps twice, press F5 on the keyboard (or 5 on an ASCII terminal). If you have a graphics display, you will see the keyboard icon on the screen when the beeps occur. If you have an ASCII terminal (also called a tty terminal), you will see the word keyboard when the beeps occur.

Note: If your system does not boot using the F5 key (or the 5 key on an ASCII terminal), refer to your hardware documentation for information about how to boot your system from an AIX product media.

The system begins booting from the installation media.

3. If you have more than one console, each might display a window that directs you to press a key to identify your system console. A different key is specified for each console displaying this window. If this window displays, press the specified key *only* on the console you want to use for the installation. (The system console is the keyboard and display device used for installation and system administration.)
A window displays, asking you to select a language to be used during installation.
4. Select the language you prefer to use during installation.
5. When the Welcome to Base Operating System Installation and Maintenance window displays, type 2 in the **Choice** field to select **Change/Show Installation Settings and Install** and press Enter. Go to “Step 5. Verifying or changing the installation settings” on page 59 for instructions on verifying or changing installation settings.

Step 5. Verifying or changing the installation settings

Follow this procedure for verifying or changing the installation settings.

Verify the default installation settings from the Installation and Settings window. If the installation and system settings are correct, type 0 in the **Choice** field and press Enter. Confirm that the selections on the installation summary window are correct, and press Enter to begin the BOS installation. Go to “Step 6. Finishing the BOS installation” on page 60.

To change the installation settings, use the following procedure:

1. Select either **New and Complete Overwrite Installation** or **Preservation Installation**.

- a. Type 1 in the **Choice** field to select the **System Settings** option.
- b. When the Change Method of Installation window displays, type the number corresponding to desired installation (either 1 for New and Complete Overwrite or 2 for Preservation) in the **Choice** field and press Enter.

Note: Available installation methods depend on whether your system has a previous version of AIX installed.

If you only want to install the next recommended maintenance or technology level of AIX, see “Preparing to install optional software products and service updates” on page 86. You can also use the SMIT **update_all** fast path or the **install_all_updates** command to update existing filesets to the next recommended maintenance or technology level.

- c. When the Change Disk(s) window displays, you can change the destination disk for the installation. If you selected the preservation installation, the window lists only disks containing a **rootvg**.

The disk name, the location, the size of the disk, and the root volume group status is displayed for each available disk. The Bootable column indicates whether the disk is bootable. Type 77 to select **Display More Disk Information** to view additional disk attributes such as physical volume identifier, device adapter connection location, or World Wide Port Name//Lun ID.

If the default shown is correct, type 0 in the **Choice** field and press Enter. To change the destination disk, use the following procedure:

- 1) Type the number for each disk you choose in the **Choice** field and press Enter. *Do not* press Enter a final time until you have finished selecting all disks. If you need to deselect a disk, type its number a second time and press Enter.
 - You can specify a supplemental disk by typing 66 and pressing the Enter key for the **Disks not known to Base Operating System Installation** option. This option opens a new menu that prompts for a device support media for the supplemental disk. The device-support media is only needed when the device cannot configure with the generic SCSI or bus-attached device drivers. BOS installation configures the system for the disk and then returns to the Change Disk window.
 - If this is an overwrite installation, you can specify to erase the disks chosen to be installed before the installation occurs by typing 55 and pressing the Enter key for the More Disk Options option. This option opens a new menu that prompts for the number of patterns to write, which is the number of times the drive will be overwritten. If you choose 0 for the number of patterns to write, the disks will not be erased prior to installation. This menu also prompts for the patterns to be used for each disk erasure. The patterns are a choice of the hexadecimal values 00, a5, 5a, or ff. For example, a pattern of 00 will write all zeros to the drive. Erasing a drive is a time consuming process and only drive types that are supported by the **diag** command can take advantage of this option (for example, erasure of IDE drives are not supported).

- 2) When you have finished selecting the disks, type 0 in the **Choice** field and press Enter. The Installation and Settings window displays with the selected disks listed under System Settings.

2. Change the primary language environment, if needed. Use the following steps to change the primary language used by this installation.

Note: Changes to the primary language environment do not take effect until after BOS is installed and your system is rebooted.

- a. Type 2 in the **Choice** field on the Installation and Settings window to select the **Primary Language Environment Settings** option.
- b. Select the appropriate set of cultural convention, language, and keyboard options. Most of the options are a predefined combination, however, you can define your own combination of options.
 - To select a predefined Primary Language Environment, type that number in the **Choice** field and press Enter.
 - To configure your own primary language environment:
 - 1) Select **MORE CHOICES**.
 - 2) Page through the choices and select the **Create Your Own Combination** option.
 - 3) When the Set Primary Cultural Convention window displays, type the number in the **Choice** field that corresponds to the cultural convention of your choice and press Enter.
 - 4) When the Set Primary Language window displays, type the number in the **Choice** field that corresponds to your choice for the primary language and press Enter.
 - 5) When the Set Keyboard window displays, type the number in the **Choice** field that corresponds to the keyboard attached to the system and press Enter.
3. Change the installation options by typing 3 to change the **Security Model** or 4 to select **More Options** and press Enter. These options will vary based on install type (overwrite, preservation, or migration) and security choices. For more information on the installation options, see “BOS installation options” on page 43.
4. Verify your selections in the installation summary window and press Enter to begin the BOS installation process.

Your system automatically reboots after installation is complete. Go to “Step 6. Finishing the BOS installation.”

Step 6. Finishing the BOS installation

Follow this procedure for finishing the BOS installation.

1. The Installing Base Operating System window displays with the status of your installation.

For AIX installations on Itanium-based systems, a few minutes into the installation a message displays that lets you install extended hardware drivers. The *Extended Hardware Drivers* media contains additional hardware drivers not contained on the AIX product media. If you have not installed any extended hardware drivers and want to do so at this time, follow the instructions in the message. To continue without installing extended hardware drivers, press Enter. If you do not press any key within three minutes, the installation process continues.

Note: Unless you install the drivers from the *Extended Hardware Drivers* media, your video and ethernet equipment might not work properly. We highly recommend installing your hardware drivers at this time.

After the base run-time environment is installed, status information displays about other software that is being installed.
2. The Installing Base Operating System window displays the status of your installation.

After the base run-time environment is installed, status information displays about other software that is being installed.
3. The system automatically reboots.
4. After the system has restarted, you are prompted to configure your installation. For information on configuring your system after a BOS installation process, refer to “Configuring AIX” on page 142.

Note: If the system being installed has 4 GB or more of memory and you have performed an overwrite installation, then a dedicated dump device is created for you. If so, the device name is **/dev/lg_dumplv**, and its size is based on the following formula:

4>= RAM < 12	size of dump device= 1 GB
12>= RAM < 24	size of dump device= 2 GB
24>= RAM < 48	size of dump device= 3 GB
RAM >= 48	size of dump device= 4 GB

Related information

Links to information related to BOS installation are listed.

- For additional release information, see the *AIX Release Notes* that correspond to your level of AIX.
- For late-breaking information, which might include information about the configuration process and installed software, refer to the readme files.
- For information about installing optional software, refer to “Preparing to install optional software products and service updates” on page 86.

AIX Relocatable Installation

AIX Relocatable Installation is supported with the native AIX installation utilities, such as **installp**, **instfix**, **lspp**, and **lppchk**. The use of relocation is of particular interest to applications that need to be installed within a Workload Partition because default System WPAR configurations do not include a writeable **/usr** or **/opt** file system. Application installations might need to be retargeted to locations other than the traditional **/usr** or **/opt** placement.

In addition to being able to install filesets in the default installation location, the system administrator can install relocatable packages into alternate root install locations. This enables the system administrator to:

- Install and maintain multiple installations of the same **installp** package in a single instance of the AIX operating system.
- Install and maintain multiple versions of the same **installp** package in a single instance of the AIX operating system.
- Use native **installp** tracking tools (such as **lppchk**, **lspp**, **instfix**, and **inulag**) to verify and report installation data on all relocated installation instances.
- Attach and detach preinstalled software locations on a given system (such as application hosting).

User Specified Installation Location (USIL)

A User Specified Installation Location (USIL) is a tracked relocated installation path that is created by the system administrator. This location is tracked by the system and can be used as an alternate installation path for packages that support relocation.

Multiple instances and/or versions of the same software package can be installed on a single system by delegating each installation to a separate USIL. An existing USIL instance can be attached or detached from any given system.

Each USIL instance maintains its own set of Software Vital Product Data (SWVPD) in all three current **installp** parts:

- **<InstallRoot>/etc/objrepos**
- **<InstallRoot>/usr/lib/objrepos**
- **<InstallRoot>/usr/share/lib/objrepos**

Each USIL instance mirrors the default SWVPD structure within the relocated path.

USIL Management Commands	Description
/usr/sbin/mkusil	<p>Creates or attaches a new USIL instance.</p> <pre>mkusil -R <RelocatePath> -c <Comments> [XFa]</pre> <p>Flags:</p> <ul style="list-style-type: none"> -a Attach an existing installation as a USIL instance -c Comments to include in the USIL definition (visible with the lsusil command) -R Path to a new USIL location; must be a valid directory -X Automatically expands to space needed
/usr/sbin/lsusil	<p>Lists existing USIL instance(s).</p> <pre>lsusil [-R *!ENTITY!*RelocatePath> "ALL"]</pre> <p>Flags:</p> <ul style="list-style-type: none"> -R Path to an existing USIL location
/usr/sbin/rmusil	<p>Removes an existing USIL instance.</p> <pre>rmusil -R <RelocatePath></pre> <p>Flags:</p> <ul style="list-style-type: none"> -R Path to an existing USIL location <p>Note: The rmusil command only removes the USIL reference in the SWVPD. The USIL installation path does not use any remote files.</p>
/usr/sbin/chusil	<p>Changes an attribute of an existing USIL instance.</p> <pre>chusil -R <RelocatePath> -c <NewComments> [X]</pre> <p>Flags:</p> <ul style="list-style-type: none"> -c New comments to include in the USIL definition (visible with the lsusil command) -R Path to an existing USIL location -X Automatically expands to space needed

Listing all install paths

Use the **lspp/lspp_r** and **lppchk/lppchk_r** commands to execute listing operations on all install locations when the **-R "ALL"** syntax is used.

Attach/Detach operations

You can use the attach operation to integrate an existing detached USIL path into the SWVPD.

For example, the administrator creates a "master" USIL instance with various relocatable applications installed for the purposes of application hosting. The administrator then copies or NFS mounts this USIL instance to various systems and uses the attach feature to integrate the USIL instance into the SWVPD.

The detach operation removes reference to the USIL instance.

installp licensing

A new USIL instance starts out with an empty LAG (**installp** license agreement ODM object class). Any installation of filesets or LPPs that require a license will require the license acceptance with the usual **installp** conventions. The license acceptance does not span USIL instances.

Trusted Computing Base (TCB)

Installing USIL instances is currently not supported on TCB enabled systems.

Relocatable installation utilities on AIX 5.3

To preserve code isolation, all USIL changes are isolated to separately compiled modules.

The relocation specific modules are suffixed with the `_r` characters. The relocated installation utilities include the following user level modules:

- `/usr/sbin/mkusil`
- `/usr/sbin/rmusil`
- `/usr/sbin/lusil`
- `/usr/sbin/chusil`
- `/usr/sbin/inulag_r`
- `/usr/sbin/installp_r`
- `/usr/sbin/instfix_r`
- `/usr/bin/lppchk_r`
- `/usr/bin/lslpp_r`
- `/usr/sbin/inutoc_r`

Note: Each utility takes the `-R <RelocatePath>` flag. You must use these utilities when working with relocatable **installp** packages on AIX.

Relocatable applications packaging

The application packaging must support relocatable installation.

The following are recommended guidelines:

- A relocatable application package cannot deliver (write) inventory objects outside of its root install location.
- A relocatable application package cannot deliver (write) data using packaging customization outside of its root install location.
- The relocatable application package must contain the **RELOCATABLE** extended packaging attribute for each relocatable fileset. The fileset is the smallest installable unit that can be relocated.
- The relocatable application package cannot have requisites that are located in external relocated paths. It can have requisites to filesets installed in the default install path or in its own install path.

Relocatable requisites

A new packaging semantic indicates relocatable requisite location. A packager can specify that a given requisite should be found in the default install path or in the relocated install path.

The following are the new requisite semantics that apply:

prereq_r

prereq in relocated install path

o ifreq_r

ifreq in relocated install path

coreq_r

coreq in relocated install path

instreq_r

instreq in relocated install path

The currently defined requisites types (**prereq**, **ifreq**, **coreq**, and **instreq**) are all default requisites (requisites that apply to the default install location).

TOC changes for relocatable packages

The following is a sample of the new requisite sections in the TOC file:

```
sscp.rte.1.0.0.5.U.PRIVATE.bff 4 R S sscp {
sscp.rte 01.00.0000.0005 1 N B En_US Sscp
[
*coreq bos.games 1.1.1.1 <-- default requisite in default requisite section
*prereq bos.rte 1.1.1.1 <-- default requisite in default requisite section
%
/usr/bin 20
/etc 20
INSTWORK 72 40
%
%
%
IY99999 1 APAR text here.
%
RELOCATABLE <-- attribute tag to denote relocatable package
%
*prereq bos.rte 1.1.1.1 <-- default requisite in relocated requisite section
*coreq_r bos.games 1.1.1.1 <-- relocated requisite in relocated requisite section
]
}
```

- If the relocatable requisite section is present during a relocated installation, it is used as the requisite section for the installation.
- If the relocatable requisite section is not present during a relocated installation, the default requisite section is used. This means all requisites will be default requisites.
- A default installation (non-relocated) does not use the relocatable requisite section.

Relocatable application execution

The application design must support execution from an installation environment.

The following are requirements for relocatable application execution:

- The application must have a method to determine its root install location or function such that it has no dependency on the install location.
- The application must reference all application specific executable components relative to its root install location.
- The application must reference all application specific data components relative to its root install location or it must be designed to share the data with other application instances.
- The application should not make any persistent changes outside of its root install location.

USIL connector ODM class object

The USIL connector Object Data Manager (ODM) class object resides in the `/etc/objrepos/usilc` directory and contains data that links the default Software Vital Product Data (SWVPD) with all USIL instances.

The following is the object class that is contained in the `swvpd.cre` file:

```
/* User Install Location Connector */
/* Connects the default install path to all relocated install paths. */
class usilc {
```



```

vchar  path[1024];      /* USIL path      */
vchar  comments[2048]; /* USIL Comments */
long   flags;          /* USIL flags     */
};

```

Note: The current SWVPD object classes include the following: **product**, **lpp**, **inventory**, **history**, **fix**, **vendor**, and **lag**.

iSCSI disk installation

With AIX, you can install the Base Operating System to an iSCSI disk.

To configure an iSCSI disk for Base Operating System use, you must supply several parameters before beginning the installation. Gather the following parameters:

Adapter Name

Name of network adapter used for iSCSI. For iSCSI TOE adapters, this field is formatted `ics#`, where `#` is a number. For the iSCSI SW Initiator, this field is the Ethernet interface name and is formatted `en#`, where `#` is a number.

IP Address of Adapter

IP address that is assigned to the adapter specified by Adapter Name.

IP Address of Gateway

IP address of the gateway that is used by the adapter specified by Adapter Name.

Subnet Mask

Subnet mask that is assigned to the adapter specified by Adapter Name.

iSCSI Target Name

Name that is configured for the iSCSI Target.

iSCSI Initiator Name

Initiator name that is configured for the iSCSI Target.

Port Number

Port Number that is configured for the iSCSI Target.

IP Address of Target

IP Address that is configured for the iSCSI Target.

Note: Consult your iSCSI vendor's documentation for more information.

For prompted installs of AIX, these parameters can be submitted using the iSCSI configuration menus. For non-prompted installs of AIX, these parameters can be supplied using the **bosinst.data file stanza descriptions**.

Only one iSCSI target can be configured for the root volume group used to install the Base Operating System. The root volume group cannot be created by combining iSCSI disks with non-iSCSI disks.

Using the iSCSI configuration menus

The iSCSI configuration menus can be accessed from the main menu of Base Operating System menus.

To access the iSCSI configuration menus, perform the following steps:

1. From the Base Operating System (BOS) menus, select **Welcome to Base Operating System Installation and Maintenance**.
2. Choose the **Configure Network Disks (iSCSI)** option to load the iSCSI configuration menus.
3. At the **Configure iSCSI SMIT** menu, select the **iSCSI Configuration** option.
4. Enter the iSCSI parameters and press Enter.

After the menu is submitted, you can see the output from the configuration commands, as well as output listing the iSCSI disks that have successfully been configured.

5. If the correct iSCSI disks have been configured, proceed to BOS installation by pressing **F10** to exit to BOS menus.
6. Select **Change/Show Installation Settings and Install** to select the iSCSI disks for installation.

Accessing maintenance mode to recover iSCSI parameters

If you are unable to start the BOS from an iSCSI disk, you might need to access maintenance mode to reconfigure the iSCSI parameters used during boot.

Access maintenance mode using a CD or DVD boot with the installation media. For more information, see [Accessing the system if unable to boot from the hard disk](#). Maintenance mode can also be accessed by starting the network using NIM. For more information, see [Booting in maintenance mode](#). After you have accessed maintenance mode, perform the following steps:

1. Select **Configure Network Disks (iSCSI)**. The iSCSI configuration menus are launched.

Note: If you supplied all of the iSCSI parameters through a **bosinst.data** file using NIM, this step might not be required.

When the correct disk has been configured, exit the iSCSI configuration menus.

2. At the Maintenance menu, save the iSCSI configuration parameters for the disk configured in the previous step to the root volume group on the disk. Select option 1, **Access a Root Volume Group**. The Warning screen is displayed.
3. Read the information displayed on the Warning screen. When you are ready to continue, type 0 and press Enter. The Access a Root Volume Group menu is displayed.
4. Select the root volume group on the disk that was configured in Step 2. After entering your selection, the Volume Group Information menu is displayed.

Note: Reviewing the disk and location code information on the Volume Group Information menu enables you to determine whether the volume group you selected was the root volume group. You can return to the Access a Root Volume Group screen if the choice you made was not the root volume group. If you have not chosen a root volume group, you cannot continue beyond the Volume Group Information menu.

5. Select **Choice 1** from the Volume Group Information menu and press Enter. A shell and system prompt is displayed.
6. At the system prompt, run the **update_iscsi** command to save the iSCSI configuration to the root volume group. The system can now be restarted using the updated iSCSI parameters.

For more information, see [Using the iSCSI configuration menus](#).

Installing to an alternate disk

Alternate disk installation lets you install the operating system while it is still up and running, which reduces installation or upgrade downtime considerably.

Alternate disk installation also allows large facilities to better manage an upgrade because systems can be installed over a longer period of time. While the systems are still running at the previous version, the switch to the newer version can happen at the same time.

Alternate disk installation filesets

An alternate disk installation uses these filesets.

bos.alt_disk_install.boot_images
bos.alt_disk_install.rte

Must be installed for alternate disk **mksysb** installations.

Must be installed for **rootvg** cloning and alternate disk **mksysb** installations.

Installing an alternate mksysb disk

Alternate **mksysb** installation involves installing a **mksysb** image that has already been created from a system, onto an alternate disk of the target system. The alternate disk or disks cannot contain a volume group.

The **mksysb** image is created on a system that either was the same hardware configuration as the target system, or had all the device and kernel support installed for a different machine type or platform, or different devices. The installed device and kernel support would be as follows:

- **devices.***
- **bos.mp64**

Note: In AIX, all device and kernel support is automatically installed during a base operating system installation.

When the **alt_disk_mksysb** command is run, the **image.data** file from the **mksysb** image is used by default (unless a customized **image.data** is given) to create the logical volumes and file systems. The prefix **alt_** is added to the logical volume names, and the file systems are created with a prefix of **/alt_inst.** For example, **hd2** would be created as **alt_hd2**, and its file system, ¹, would be created as **/alt_inst/usr**. These names are changed back to their original names at the end of the alternate disk installation process.

The **mksysb** image is then restored into the alternate file system. A prepopulated boot image is then copied to the boot logical volume of the **altinst_rootvg**, and the boot record of the boot disk is modified to allow booting from the disk.

At this point, a script can be run to allow for any customization before the system is rebooted. The alternate file systems are still mounted as **/alt_inst/real_file_system** (for example: **/alt_inst/usr**, **/alt_inst/home**). Files can be accessed at this point, but nothing can be installed into the alternate file system because the kernels and libraries of the **mksysb** image may not match those of the running system.

After the optional script is run, the file systems are unmounted, and the logical volume and file system names are changed to match the **image.data** file's names (for example, **alt_inst_hd6** is changed to **hd6** in the volume group descriptor area). The logical volumes are exported from the Object Data Manager (ODM), but the **altinst_rootvg** is only varied off. It is left in the ODM as a placeholder so the disk is not accidentally overwritten. The default action of the **alt_disk_mksysb** command is to set the bootlist so that the next time the system boots, it boots from this newly installed volume group. This default action can be turned off. If specified, the system reboots at this point, and the system reboots from the new **rootvg**. The boot process proceeds to a certain point, with the new **rootvg**'s file systems mounted, and the **bosboot** command is called to rebuild a "normal" boot logical volume. The system then reboots.

After rebooting from the new alternate disk, the former **rootvg** volume group is contained in an **lspv** listing as **old_rootvg**, and includes all disk(s) in the original **rootvg**. This former **rootvg** volume group is set to not varyon at reboot and should *only* be removed with the **-X** flag. For example:

```
alt_rootvg_op -X old_rootvg
```

If a return to the original **rootvg** is necessary, the **bootlist** command is used to change the bootlist to reboot from the original **rootvg**.

If it is unclear which disk is the boot disk for a specific volume group, use the **-q** flag to determine the boot disk. This flag can be useful when a volume group comprises multiple disks and a change in the bootlist is necessary.

1. /usr

Cloning the rootvg to an alternate disk

Cloning the **rootvg** to an alternate disk has many advantages. One advantage is having an online backup available, in case of a disk crash. Keeping an online backup requires an extra disk or disks to be available on the system.

Another benefit of **rootvg** cloning occurs when applying new maintenance or technology level updates. A copy of the **rootvg** is made to an alternate disk, then updates are applied to that copy. The system runs uninterrupted during this time. When it is rebooted, the system boots from the newly updated **rootvg** for testing. If updates cause problems, the **old_rootvg** can be retrieved by resetting the bootlist and then rebooting.

By default, calling the **alt_disk_install** command does the following:

1. Creates an **/image.data** file based on the current **rootvg**'s configuration. A customized **image.data** file can be used.
2. Creates an alternate **rootvg** (**altinst_rootvg**).
3. Creates logical volumes and file systems with the **alt_inst** prefix.
4. Generates a backup file list from the **rootvg**, and if an **exclude.list** file is given, those files are excluded from the list.
5. Copies the final list to the **altinst_rootvg**'s file systems.
6. If specified, the **installp** command installs updates, fixes, or new filesets into the alternate file system.
7. The **bosboot** command creates a boot logical volume on the alternate boot disk.
8. If a customization script is specified, it runs at this point.
9. The file systems are then unmounted, and the logical volumes and file systems are renamed.
10. The logical volume definitions are exported from the system to avoid confusion with identical ODM names, but the **altinst_rootvg** definition is left as an ODM placeholder.
11. By default, the bootlist is set to the new cloned **rootvg** for the next reboot.

Performing an alternate disk phased installation:

For AIX 5.1 and later, alternate disk installation can be performed in stages.

The installation is broken down into three phases. The default is to perform all three phases in the same invocation. The phases are as follows:

Phase 1	Creates the altinst_rootvg volume group, the alt_ logical volumes, and the /alt_inst file systems. Also restores the mksysb or rootvg data.
Phase 2	Runs any specified customization script. For cloning only, installs updates, new filesets, fixes, or bundles. Also copies a resolv.conf file (if specified) and necessary files to remain a NIM client (if specified).
Phase 3	Unmounts the /alt_inst file systems, renames the file systems and logical volumes, removes the alt_ logical volume names from ODM, and varies off the altinst_rootvg . It also sets the bootlist and reboots (if specified).

As an alternative to running all three phases, the phases can be completed by one of the following methods:

- Each phase separately
- Phases 1 and 2 together
- Phases 2 and 3 together (Phase 2 can be run multiple times before Phase 3 is run.)

You must run Phase 3 to obtain a usable **rootvg**. Running Phases 1 and 2 leave the **/alt_inst** file systems mounted. Any time during the phase process and before rebooting, the **altinst_rootvg** can be removed, and disk cleanup occurs using the following command:

alt_rootvg_op -X

Performing an alternate disk migration installation

Alternate disk migration installation allows you to create a copy of **rootvg** to a free disk, or disks, and simultaneously migrate it through Network Installation Management (NIM) to a new release level.

Using alternate disk migration installation compared to a conventional migration provides the following advantages:

- Reduced downtime; the migration is performed while the system is up normally, and there is no need to boot from any media.
- Quick recovery in case of migration failure.
- High degree of flexibility and customization.

Reduced downtime. The migration is performed while the system is up and functioning. There is no requirement to boot from install media, and the majority of processing occurs on the NIM master.

Quick recovery in the event of migration failure. Because you are creating a copy of **rootvg**, all changes are performed to the copy (**altinst_rootvg**). In the event of serious migration installation failure, the failed migration is cleaned up, and there is no need for the administrator to take further action. In the event of a problem with the new (migrated) level of AIX, the system can be quickly returned to the premigration operating system by booting from the original disk.

High degree of flexibility and customization in the migration process. This is done with the use of optional NIM customization resources including **image_data**, **bosinst_data**, **exclude_files**, premigration script, **installp_bundle**, and post-migration script.

Network Install Manager Alternate Disk Migration (nimadm) is a utility that allows you to do the following:

- Create a copy of **rootvg** to a free disk, or disks, and simultaneously migrate it to a new version or release level of AIX.
- Using a copy of **rootvg**, create a new **nim mksysb** resource that has been migrated to a new version or release level of AIX.
- Using a **nim mksysb** resource, create a new **nim mksysb** resource that has been migrated to a new version or release level of AIX.
- Using a **nim mksysb** resource, restore to a free disk, or disks, simultaneously migrating it to a new version or release level of AIX.

nimadm uses NIM resources to perform these functions.

For more information about the **nimadm** command, refer to the *AIX Version 6.1 Commands Reference*.

Preparing for an alternate disk migration:

These are the requirements for an alternate disk migration installation.

- Configured NIM master running AIX.
- The NIM master must have **bos.alt_disk_install.rte** installed in its **rootvg** and the **SPOT** which will be used.
- The level of the NIM master **rootvg**, **lpp_source**, and **SPOT** must be at the same level.
- The client must have a disk (or disks) large enough to clone the **rootvg** and an additional 500 MB (approximately) of free space for the migration. The total amount of required space will depend on original system configuration and migration customization.
- The client must be a registered NIM client to the master.
- The **nim** master must be able to execute remote commands on the client using the **rshd** protocol.

- The client must have a minimum of 256–512 MBs of memory.
- A reliable network, which can facilitate large amounts of NFS traffic, must exist between the NIM master and the client.
- The client's hardware should support the level it is migrating to and meet all other conventional migration requirements.

Note: If you cannot meet the alternate disk migration installation requirements 1-10, perform a conventional migration. For information on the conventional migration installation method, see "Migrating AIX" on page 144. If you cannot meet requirement 11, no migration installation is possible.

Before performing an alternate disk migration installation, you are required to agree to all software license agreements for software to be installed. You can do this by specifying the **-Y** flag as an argument to the alternate disk migration command or setting the **ADM_ACCEPT_LICENSES** environment variable to **yes**.

Alternate disk migration limitations:

These limitations apply to alternate disk migration installations.

The limitations are:

- If the client's **rootvg** has the Trusted Computing Base option enabled, either disable it (permanently) or perform a conventional migration. TCB must access file metadata that is not visible over NFS.
- All NIM resources used must be local to the NIM master.
- During the migration, the client's active **rootvg** may experience a small performance decrease due to increased disk I/O, **nfsd** activity, and some CPU usage associated with **alt_disk_install** cloning.
- NFS tuning may be required to optimize performance.

Alternate disk migration installation usage:

The syntax for the alternate disk migration installation command is described.

The syntax is:

```
nimadm -l lpp_source -c NIMClient -s SPOT -d TargetDisks [ -a
  PreMigrationScript ] [ -b installp_bundle ] [ -z PostMigrationScript ] [
  -e exclude_files ] [ -i image_data ] [ -m NFSMountOptions
  ] [ -o bosinst_data ] [-P Phase] [ -j VGname ] [-Y ] [ -F ] [ -D ] [ -E
  ] [ -V ] [ { -B | -r } ]
```

Use the **nimadm** command to target the *aix1* NIM client, using the *spot1* NIM **SPOT** resource, the *lpp1* NIM **lpp_source** resource, and *hdisk1* and *hdisk2* target disks, by typing the following:

```
nimadm -c aix1 -s spot1 -l lpp1 -d "hdisk1 hdisk2" -Y
```

Use the **-Y** flag to agree to all required software license agreements for the software being installed

Cleanup alternate disk migration on client:

The syntax is:

```
nimadm -C -c NIMClient -s SPOT [ -F ] [ -D ] [ -E ]
```

Wake-up volume group:

The syntax is:

```
nimadm -W -c NIMClient -s SPOT -d TargetDisks [-m NFSMountOptions ] [-z
  PostMigrationScript ] [ -F ] [ -D ] [ -E ]
```

Put-to-sleep volume group:

The syntax is:

```
nimadm -S -c NIMClient -s SPOT [ -F ] [ -D ] [ -E ]
```

Synchronize alternate disk migration software:

The syntax is:

```
nimadm -M -s SPOT -l lpp_source [ -d device ] [ -P ] [ -F ]
```

mksysb to client migration:

The syntax is:

```
nimadm -T NIMmksysb -c NIMClient -s SPOT -l lpp_source -d TargetDisks  
-j VGname -Y [ -a PreMigrationScript ] [ -b installpBundle ] [ -z  
PostMigrationScript ] [ -i ImageData ] [ -m NFSMountOptions ] [ -o  
bosinst_data ] [ -P Phase ] [ -F ] [ -D ] [ -E ] [ -V ] [ -B | -r ]
```

mksysb to mksysb migration:

The syntax is:

```
nimadm -T NIMmksysb -O mksysbfile -s SPOT -l lpp_source -j VGname -Y [ -N NIMmksysb ] [ -a PreMigrationScript ] [ -b installp_bundle ] [ -z PostMigrationScript ] [ -i image_data ] [ -m NFSMountOptions ] [ -o bosinst_data ] [ -P Phase ] [ -F ] [ -D ] [ -E ] [ -V ]
```

Client to mksysb migration:

The syntax is:

```
nimadm -c nim_client -O mksysbfile -s SPOT -l lpp_source -j VGname -Y [ -N NIMmksysb ] [ -a PreMigrationScript ] [ -b installp_bundle ] [ -z PostMigrationScript ] [ -i image_data ] [ -m NFSMountOptions ] [ -o bosinst_data ] [ -P Phase ] [ -e exclude_files ] [ -F ] [ -D ] [ -E ] [ -V ]
```

Installing alternate disk migration:

The **nimadm** command performs a migration in 12 phases.

Each phase can be executed individually using the **-P** flag. Before performing a migration in phases, you should have a good understanding of the **nimadm** process. The **nimadm** phases are as follows:

1. The master issues the **alt_disk_install** command to the client, which makes a copy of the **rootvg** to the target disks (this is Phase 1 of the **alt_disk_install** process). In this phase, **altinst_rootvg** (alternate **rootvg**) is created. If a target mksysb has been specified, the mksysb is used to create a **rootvg** using local disk caching on the NIM master.
2. The master runs remote client commands to export all of the **/alt_inst** file systems to the master. The file systems are exported as read/write with root access to the master. If a target mksysb has been specified, the cache file systems are created based on the image.data from the mksysb.
3. The master NFS mounts the file systems exported in Phase 2. If a target mskysb has been specified, the mksysb archive is restored into the cache file systems created in Phase 2.
4. If a premigration script resource has been specified, it is executed at this time.
5. System configuration files are saved. Initial migration space is calculated and appropriate file system expansions are made. The **bos** image is restored and the device database is merged (similar to a conventional migration). All of the migration merge methods are executed and some miscellaneous processing takes place.

6. All system filesets are migrated using **installp**. Any required RPM images are also installed during this phase.
7. If a **post-migration** script resource has been specified, it is executed at this time.
8. The **bosboot** command is run to create a client boot image, which is written to the client's boot logical volume (**hd5**).
9. All mounts made on the master in phase 3 are removed.
10. All client exports created in phase 2 are removed.
11. The **alt_disk_install** command is called again (phase 3 of **alt_disk_install**) to make final adjustments and put **altinst_rootvg** to sleep. The bootlist is set to the target disk (unless the **-B** flag is used). If an output mksysb has been specified, the cache is archived into a mksysb file, and made a nim mksysb resource.
12. Cleanup is executed to end the migration. The client is rebooted, if the **-r** flag is specified.

Note: The **nimadm** command supports migrating several clients at the same time.

Accessing data between the original rootvg and the new alternate disk

You can initiate data access between the original rootvg and the new alternate disk.

A volume group "wake-up" can be accomplished, on the non-booted volume group. The "wake-up" puts the volume group in a **post alt_disk_install** Phase 1 state. For example, the **/alt_inst** file system is then mounted.

The volume group that experiences the "wake-up" is renamed **altinst_rootvg**. When data access is no longer needed, the volume group can be "put to sleep."

Note:

1. The running operating system's version must be greater than or equal to the version of the volume group that undergoes the "wake-up." This might mean that it is necessary to boot from the **altinst_rootvg** and "wake-up" the **old_rootvg**.

This limitation is caused by a journaled file system (JFS) log entry incompatibility. It is possible to "wake-up" a volume group that contains a more recent version, but the volume group cannot have ever been the system **rootvg**. If this was true, the volume group would have made JFS log entries that could not be interpreted by an older version **rootvg**, when the volume group was experiencing a "wake-up."

The **alt_disk_install** command does not allow a "wake-up" to occur on a volume group with a more recent version, unless the **FORCE** environment variable is set to **yes**.

2. The volume group that experiences a "wake-up" *must* be put to sleep before it can be booted and used as the **rootvg**.

Attention: If a **FORCE** "wake-up" is attempted on a volume group that contains a more recent version of the running operating system, and the "waking" volume group has been a system **rootvg**, errors occur.

Installing to an alternate disk using Web-based System Manager

The graphical interface provides access to Web-based System Manager options for installing a **mksysb** to an alternate disk and for cloning a rootvg to the alternate disk.

At any time during the following procedures, you can view extended help by selecting **Contents** from the Help menu.

To install a mksysb to an alternate disk, do the following:

1. Start the Web-based System Manager by typing **wsm** on the command line.
2. Select the Software container.

3. From the pulldown, select **Alternate Disk Install** → **Install Mksysb on an Alternate Disk**.

To clone the rootvg to an alternate disk, do the following:

1. Start the Web-based System Manager by typing `wsm` on the command line.
2. Select the Software container.
3. From the pulldown, select **Alternate Disk Install** → **Clone the Rootvg to an Alternate Disk**.

Running alternate disk installation using SMIT

The procedure for running alternate disk installation using SMIT is described.

To run alternate disk **mksysb** installation, do the following:

1. At the system prompt, type the **smit alt_mksysb** fast path.
2. Type or select values in the entry fields. Press Enter after making all desired changes.

To run alternate disk **rootvg** cloning, do the following:

1. At the system prompt, type the **smit alt_clone** fast path.
2. Type or select values in the entry fields. Press Enter after making all desired changes.

Installing an alternate disk through dynamic logical partitioning

On a system that supports dynamic logical partitioning (DLPAR), you can dynamically add an adapter with disks to a running logical partition (LPAR). You can then install a new rootvg volume group to these newly added target disks using the **alt_disk_install** command with either the clone or **mksysb** option.

If you are running the **alt_disk_install** command with dynamically added target disks on an LPAR system, the following flags might be used:

- O If the target disk will be used to boot an LPAR other than the one where the operation is being executed, use the **-O** flag to reset the device information.
- B This flag prevents the **bootlist** command from being run. A general limitation of dynamically added disks is that you can not specify them as a boot device (before an initial reboot operation). If you are attempting to boot an LPAR from dynamically added disks, set the boot list in the system management services (SMS) menus.
- g This flag causes the **alt_disk_install** command to run without checking if the disk is bootable. Dynamically added disks do not appear bootable to AIX until after a reboot operation. The user will need to verify that the newly added adapter and disks are bootable.

Installing an alternate disk: examples

Examples of alternate disk installation are shown.

To install an alternate disk, perform one of the following procedures:

1. To clone the **rootvg** running a lower technology level to `hdisk1` and update that clone with the latest maintenance level that is on `cd0`, run the following command:

```
alt_disk_copy -b update_all -l /dev/cd0 -d hdisk1
```

In SMIT, use the **smit alt_clone** fast path and select **hdisk1** from the listing for Target Disk(s) to install, select the **update_all** bundle from the listings in the **Bundle to Install** field, and **/dev/cd0** from the listing in the **Directory or Device with images** field.

2. To clone the **rootvg** running 5.3.2 to `hdisk3`, then update to the latest fixes that are mounted from another system on `/533fixes`, and run a customized script named `/tmp/finish_alt_install`, run the following command:

```
alt_disk_copy -b update_all -l /533fixes \  
-s /tmp/finish_alt_copy -d hdisk3
```

In SMIT, use the **smit alt_clone** fast path and select **hdisk3** from the listing for Target Disk(s) to install, select the **update_all** bundle from the listings in the **Bundle to Install** field, type **/533fixes** in the **Directory or Device with images** field, and type **/tmp/finish_alt_copy** in the **Customization script** field.

3. To install an AIX **mksysb** tape that was created from a machine with the same hardware configuration as the target, to **hdisk1**, run the following command:

```
alt_disk_mksysb -m /dev/rmt0 -d hdisk1
```

In SMIT, use the **smit alt_mksysb** fast path and select **hdisk1** from the listing for **Target Disk(s)** to install field and select **/dev/rmt0** from the listing for **Device** or image name field.

4. To install an AIX **mksysb** image that is NFS mounted on file system **/mksysbs** to the alternate disk **hdisk2** using a customized **image.data** file and an exclude file containing **^./tmp/**, type the following command:

```
alt_disk_mksysb -m /mksysbs/my_53_mksysb -i /mksysbs/my_53_image.data \  
-e /mksysbs/my_exclude_file -d hdisk2
```

Using the **^./tmp/** pattern does not backup files in the **/tmp** directory, but does backup files in the **/var/tmp** directory.

Note: All files are backed up relative to the current directory. This directory is represented by a **.** (dot character). If it is important that the search match the string at the beginning of the line when excluding a file or directory, it is necessary to use a **^**. (caret followed by a dot character) as the first part of the search string, followed by the filename or directory to be excluded. The form is as follows:

```
^./filename
```

If the file name or directory being excluded is a substring of another file name or directory, use a **^**. (caret followed by a dot character) for the search to start at the beginning of the line and the **\$** (dollar symbol) to have the search finish at the end of the line.

In SMIT, use the **smit alt_mksysb** fast path and select **hdisk2** in the **Target Disk(s) to install** field. Next, type **/mksysbs/my_53_mksysb** in the **Device** or image name field, **/mksysbs/my_53_image.data** in the **image.data** file field, and **/mksysbs/my_exclude_file** in the **Exclude** list field.

5. To "wake-up" an original rootvg, after booting from the new alternate disk, run the following command:

```
alt_rootvg_op -W -d hdisk0
```

The following example illustrates the output that might display when running the command discussed above:

```
# lspv  
hdisk0      000040445043d9f3    old_rootvg  
hdisk1      00076443210a72ea    rootvg
```

```
# alt_rootvg_op -W hdisk0
```

```
# lspv  
hdisk0      000040445043d9f3    altinst_rootvg  
hdisk1      00076443210a72ea    rootvg
```

At this point, the **altinst_rootvg** volume group is varied-on and the **/alt_inst** file systems are mounted.

6. To "put-to-sleep" a volume group that had experienced a "wake-up," type the following command:

```
alt_rootvg_op -S
```

The following example illustrates the output that might display when running the command previously discussed:

```
# lspv  
hdisk0      000040445043d9f3    altinst_rootvg  
hdisk1      00076443210a72ea    rootvg
```

```
# alt_rootvg_op -S
```

```
# lspv
hdisk0      000040445043d9f3  altinst_rootvg
hdisk1      00076443210a72ea  rootvg
```

The **altinst_rootvg** is no longer varied on and the **/alt_inst** file systems are no longer mounted. If necessary for the **altinst_rootvg** volume group name to be changed back to **old_rootvg**, do this task with the **-v** flag.

Using the multibos utility

The **multibos** utility allows you, as root, to create multiple instances of AIX on the same root volume group (rootvg).

The **multibos** setup operation creates a standby Base Operating System (BOS) that boots from a distinct Boot Logical Volume (BLV). This creates two bootable instances of BOSes on a given rootvg. You can boot from either instance of a BOS by specifying the respective BLV as an argument to the **bootlist** command, or using system firmware boot operations.

You can simultaneously maintain two bootable instances of a BOS. The instance of a BOS associated with the booted BLV is the *active* BOS. The instance of a BOS associated with the BLV that has not been booted is the *standby* BOS. Only two instances of BOS are supported per rootvg.

The **multibos** utility allows you to access, install, maintain, update, and customize the standby BOS either during setup or during any subsequent customization operations. Installing maintenance or technology level updates to the standby BOS does not change system files on the active BOS. This allows for concurrent update of the standby BOS, while the active BOS remains in production.

The **multibos** utility has the ability to copy or share logical volumes and file systems. By default, the **multibos** utility copies the BOS file systems (currently the **/**, **/usr**, **/var**, **/opt**, and **/home** directories), associated log devices, and the boot logical volume. You can make copies of additional BOS objects (see the **-L** flag). All other file systems and logical volumes are shared between instances of the BOS. Separate log device logical volumes (those not contained within the file system) are not supported for copy and will be shared.

Requirements of the multibos utility

The **multibos** utility has requirements for operating system, space, and logical volumes.

Following are the general requirements and limitations:

- The **multibos** utility is supported on AIX 5L Version 5.3 with the 5300-03 Recommended Maintenance package and higher versions.
- The current rootvg must have enough space for each BOS object copy. BOS object copies are placed on the same disk or disks as the original.
- The total number of copied logical volumes cannot exceed 128. The total number of copied logical volumes and shared logical volumes are subject to volume group limits.

Standby BOS setup operation

The standby BOS setup operation is described.

The **multibos** setup operation, using the **-s** flag, performs the following steps:

1. The **multibos** methods are initialized.
2. If you provide a customized **image.data** file, it is used for the logical volume attributes. Otherwise, a new one is generated. You can use the customized **image.data** file to change BOS object (logical volume or file systems) attributes. You cannot use the customized **image.data** file to add or delete BOS logical volumes or file systems.

3. The standby logical volumes are created based on **image.data** attributes. The active and standby logical volumes are marked with unique tags in the logical volume control block. The **multibos** utility uses these tags to identify copied logical volumes. If the active logical volume names are *classic* names, such as hd2, hd4, hd5, and so on, then the **bos_** prefix is prepended to create a new standby name. If the active logical volume names have the **bos_** prefix, the prefix is removed to create a new standby name.

Note: The Logical Volume Manager (LVM) limits the maximum length of a logical volume name to 15 characters. This means that any logical volume classic name may not exceed 11 characters. You can rename logical volumes that have classic names that exceed 11 characters using the **chlv** command. If the active logical volume name already has the **bos_** prefix, then the prefix is removed in the standby name.

4. The standby file systems are created based on **image.data** attributes. The active and standby file systems are marked with unique tags in the hosting logical volume control block and **/etc/filesystems**. The **multibos** utility uses these tags to identify copied logic volumes. The **/bos_inst** prefix is prepended to the original active file system name to create the standby file system name. The standby file system name may not exceed the system's **PATH_MAX** limit. The standby file systems appear as standard entries in the active BOS **/etc/filesystems**.
5. The standby file systems are mounted.
6. A list of files that will be copied from the active BOS is generated. This list is comprised of the current files in copied active BOS file systems, less any files that you excluded with the optional exclude list (see the **-e** flag).
7. The list of files generated in the previous step is copied to the standby BOS file systems using the backup and restore utilities.
8. Any optional customization is performed. This can include installation of fileset updates or other software.
9. The standby boot image is created and written to the standby BLV using the AIX **bosboot** command. You can block this step with the **-N** flag. Only use the **-N** flag if you are an experienced administrator and have a good understanding the AIX boot process.
10. The standby BLV is set as the first boot device, and the active BLV is set as the second boot device. You can skip this step using the **-t** flag.

Automatic file system expansion

Run all **multibos** operations with the **multibos -X** flag auto-expansion feature. This flag allows for automatic file system expansion, if space is necessary to perform **multibos**-related tasks.

Booting the standby BOS

The **bootlist** command supports multiple BLVs.

As an example, to boot from disk hdisk0 and BLV bos_hd5, you would enter the following: `# bootlist -m normal hdisk0 blv=bos_hd5`. After the system is rebooted from the standby BOS, the standby BOS logical volumes are mounted over the usual BOS mount points, such as **/**, **/usr**, **/var**, and so on.

The set of BOS objects, such as the BLV, logical volumes, file systems, and so on that are currently booted are considered the active BOS, regardless of logical volume names. The previously active BOS becomes the standby BOS in the existing boot environment.

Mounting the standby BOS

It is possible to access and modify the standby BOS by mounting its file systems over the standby BOS file system mount points. The **multibos** mount operation, using the **-m** flag, mounts all standby BOS file systems in the appropriate order.

Automatic file system expansion

Run all **multibos** operations with the **multibos -X** flag auto-expansion feature. This flag allows for automatic file system expansion, if space is necessary to perform **multibos**-related tasks.

Preview option

The preview option, using the **-p** flag, applies to the setup, remove, mount, unmount, and customization operations. If you specify the preview option, then the operation provides information about the action that will be taken, but does not perform actual changes.

Unmounting the standby BOS

The **multibos unmount** operation, using the **-u** flag, unmounts all standby BOS file systems in the appropriate order.

Automatic file system expansion

The **multibos -X** flag auto-expansion feature allows for automatic file system expansion, if space is necessary to perform **multibos**-related tasks. You should execute all **multibos** operations with this flag.

Preview option

The preview option, using the **-p** flag, applies to the setup, remove, mount, unmount, and customization operations. If you specify the preview option, then the operation provides information about the action that will be taken, but does not perform actual changes.

Customizing the standby BOS

You can use the **multibos** customization operation, with the **-c** flag, to update the standby BOS.

The customization operation requires an image source (**-I device or directory** flag) and at least one installation option (installation by bundle, installation by fix, or **update_all**). The customization operation performs the following steps:

1. The standby BOS file systems are mounted, if not already mounted.
2. If you specify an installation bundle with the **-b** flag, the installation bundle is installed using the **geninstall** utility. The installation bundle syntax should follow **geninstall** conventions. If you specify the **-p** preview flag, **geninstall** will perform a preview operation.
3. If you specify a fix list, with the **-f** flag, the fix list is installed using the **instfix** utility. The fix list syntax should follow **instfix** conventions. If you specify the **-p** preview flag, then **instfix** will perform a preview operation.
4. If you specify the **update_all** function, with the **-a** flag, it is performed using the **install_all_updates** utility. If you specify the **-p** preview flag, then **install_all_updates** performs a preview operation.

Note: It is possible to perform one, two, or all three of the installation options during a single customization operation.

5. The standby boot image is created and written to the standby BLV using the AIX **bosboot** command. You can block this step with the **-N** flag. You should only use the **-N** flag if you are an experienced administrator and have a good understanding the AIX boot process.
6. If standby BOS file systems were mounted in step 1, they are unmounted.

Automatic file system expansion

The **multibos -X** flag auto-expansion feature allows for automatic file system expansion, if space is necessary to perform **multibos**-related tasks. You should run all **multibos** operations with this flag.

Preview option

The preview option, using the **-p** flag, applies to the setup, remove, mount, unmount, and customization operations. If you specify the preview option, then the operation provides information about the action that will be taken, but does not perform actual changes.

Removing the standby BOS

The remove operation, using the **-R** flag, deletes all standby BOS objects, such as BLV, logical volumes, file systems, and so on.

You can use the remove operation to make room for a new standby BOS, or to clean up a failed **multibos** installation. The remove operation performs standby tag verification on each object before removing it. The remove operation will only act on BOS objects that **multibos** created, regardless of name or label. You always have the option of removing additional BOS objects using standard AIX utilities, such as **Rmlv**, **rmfs**, **rmpls**, and so on. The **multibos** remove operation performs the following steps:

1. All boot references to the standby BLV are removed.
2. The bootlist is set to the active BLV. You can skip this step using the **-t** flag.
3. Any mounted standby BLVs are unmounted.
4. Standby file systems are removed.
5. Remaining standby logical volumes are removed.

Automatic file system expansion

The **multibos -X** flag auto-expansion feature allows for automatic file system expansion, if space is necessary to perform **multibos**-related tasks. You should execute all **multibos** operations with this flag.

Preview option

The preview option, using the **-p** flag, applies to the setup, remove, mount, unmount, and customization operations. If you specify the preview option, then the operation provides information about the action that will be taken, but does not perform actual changes.

Rebuilding the standby BOS boot image

The rebuild boot image operation, using the **-B** flag, enables you to rebuild the standby BOS boot image.

The new boot image will be based on standby BOS system files and written to the standby BLV. The **multibos** build boot image operation performs the following steps:

1. The standby BOS file systems are mounted, if they are not already.
2. The standby boot image is created and written to the standby BLV using the AIX **bosboot** command.
3. If the standby BOS file systems were mounted in step 1, they are unmounted.

Automatic file system expansion

The **multibos -X** flag auto-expansion feature allows for automatic file system expansion, if space is necessary to perform **multibos**-related tasks. You should execute all **multibos** operations with this flag.

Using the standby BOS shell operation

The **multibos** shell operation **-S** flag enables you to start a limited interactive chroot shell with standby BOS file systems.

This shell allows access to standby files using standard paths. For example, **/bos_inst/usr/bin/ls** maps to **/usr/bin/ls** within the shell. The active BOS files are not visible outside of the shell, unless they have been mounted over the standby file systems. Limit shell operations to changing data files, and do not make

persistent changes to the kernel, process table, or other operating system structures. Only use the BOS shell if you are experienced with the chroot environment.

The **multibos** shell operation performs the following steps:

1. The standby BOS file systems are mounted, if they are not already.
2. The **chroot** utility is called to start an interactive standby BOS shell. The shell runs until an exit occurs.
3. If standby BOS file systems were mounted in step 1, they are unmounted.

Here is an example of some operations that can be performed in the **multibos** shell:

```
MULTIBOS> lppchk -v # check system fileset consistency
MULTIBOS> installp -ug bos.games # removes bos.games
MULTIBOS> oslevel -r # reports recommended maintenance level for standby BOS
```

Automatic file system expansion

The **multibos -X** flag auto-expansion feature allows for automatic file system expansion, if space is necessary to perform **multibos**-related tasks. Start all **multibos** operations with this flag.

Additional multibos options

You can specify additional logical volumes, file systems, paging space, and so on to be copied to a standby BOS.

Preview option

The preview option, using the **-p** flag, applies to the setup, remove, mount, unmount, and customization operations. If you specify the preview option, then the operation provides information about the action that will be taken, but does not perform actual changes.

Exclude list file

You can use an optional exclude list with the setup operation. The rules for exclusion follow the pattern-matching rules of the **egrep** command.

For example, to exclude the contents of the **/tmp** directory, and avoid excluding any other directories that have **/tmp** in the path name, edit the exclude file to read as follows: `^./tmp/`

Note: All files are backed-up relative to the current working directory ("."). To exclude any file or directory for which it is important to have the search match the string at the beginning of the line, use the caret character (^) as the first character in the search string, followed by the dot character (.), followed by the filename or directory to be excluded. If the file name or directory being excluded is a substring of another file name or directory, then use the caret character followed by the dot character (^.) to indicate that the search starts at the beginning of the line. Use the dollar sign (\$) to indicate that the search stops at the end of the line.

Specifying additional BOS objects

By default, only a subset of the BOS file systems are copied to the standby BOS. These file systems currently are **/**, **/usr**, **/var**, **/opt**, and **/home**. The boot logical volume is also copied to the standby BOS. You can specify additional logical volumes, file systems, paging space, and so on to be copied to the standby BOS with the **-L AddFile** flag. The *AddFile* file needs to contain the logical volume names associated with the active BOS object. For example, if you intended to copy the **/mylocal** file system, then you would include the name of the logical volume that is mounted over **/mylocal** (for example, Lv01). See the **lsfs** command for details about how to match file system mount points to logical volumes. Separate log devices (those not contained within the file systems) are not supported for copy and will not be copied even if listed in the *AddFile* file.

Note: Only LVM-based objects (that is, objects associated with logical volumes) are supported for **multibos** copying.

Automatic file system expansion

The **multibos -X** flag auto-expansion feature allows for automatic file system expansion, if space is necessary to perform **multibos**-related tasks. Run all **multibos** operations with this flag.

Customizing your installation

You can customize your AIX installation. Customizing an installation requires you to edit the **bosinst.data** file and use it with your installation media.

The first time you install, the Base Operating System (BOS) installation program presents menus from which you must choose setup options. This initial installation also automatically starts a post-installation configuration program, either the graphical Configuration Assistant or the ASCII Installation Assistant. For more information about Configuration Assistant and Installation Assistant, refer to “Configuring AIX” on page 142.

For subsequent installations, you can change many aspects of the default BOS install program by editing the **bosinst.data** file. For example, to install the BOS without menus, you can specify that no prompts be provided. You can also customize a BOS installation to bypass Configuration Assistant or Installation Assistant and start your own configuration script. Also, the **bosinst.data** file can be used to replicate one set of installation settings on other machines. For example, system administrators can create a **bosinst.data** file with settings that can be used to install all the machines they support that have the same configuration. In AIX, you can use the Web-based System Manager Reinstall Base Operating System wizard to install systems from product or backup media. This application lets you customize your installation by answering prompts before installation and creates a **bosinst.data** file appropriate for the type of installation wanted. For more information on the **bosinst.data** file, refer to “The bosinst.data file” on page 46.

If you run your own configuration script from a **bosinst.data** file or from the Network Installation Management (NIM) interface, the environment that is in place at the time the script is run is a *single-user environment*. This environment is not available as a multiuser environment, and thus, there are limits to what can be run from a configuration script. The **/etc/init** file is not running, so no process management can take place. All available memory cannot be made available because the RAM file system still exists, so devices that require large amounts of memory to run might fail to configure. In addition, signal handling is not available.

Because of the single-user environment, use the following guidelines for configuration scripts:

- Base devices can be configured, but devices that require daemons or more complex configuration should be started at reboot time by adding the necessary code to the end of the **/etc/firstboot** script.
- Daemons should not be started.
- Items such as NIS configuration, which uses system resource controller (SRC) commands, should be done by creating a separate entry in the **/etc/inittab** file and running a configuration script at reboot time.
- The BOS installation process automatically creates and extends paging space based on available memory.

The **bosinst.data** file directs the actions of the BOS installation program. The file resides in the **/var/adm/ras** directory on the installed machine only, and it is not accessible on the commercial tape or the media on which you received AIX.

The **bosinst.data** file contains stanzas with variables set to default values. Each variable is on a new line, in the *Variable=Value* form. A blank line separates each stanza. These stanzas provide the installation

program with information such as the method and type of installation, the disks in the machine, and the language used. By editing the file with an ASCII text editor, you can substitute new values for the default variables.

Another installation file, **image.data**, can also be modified and used during BOS installation. The **image.data** file contains information describing the root volume group image created during the BOS installation process. This information includes the sizes, names, maps, and mount points of logical volumes and file systems in the root volume group. The installation program also takes input from the **image.data** file regarding defaults for the machine being installed. For a description of the **image.data** file, see *AIX Version 6.1 Files Reference*. The procedure for using the **bosinst.data** file to customize BOS installation can also be used for the **image.data** file. The modified files can be used together to override BOS installation defaults.

You can also use the instructions in this chapter to create a supplemental diskette, a CD-R, or a DVD-RAM containing a modified **preserve.list** file, which is used during a preservation Installation. For more information about a preservation installation, see “Installing the Base Operating System” on page 40.

Customizing and using the bosinst.data file

You must install the BOS before you can access and modify the default **bosinst.data** file.

You can use the Web-based System Manager **Reinstall Base Operating System** wizard to prepare your next installation and to customize the **bosinst.data** file. You can also edit the **bosinst.data** file like any other ASCII file.

For information about the contents of the file and examples of edited files, refer to “bosinst.data file stanza descriptions” on page 46 and “Using the bosinst.data file” on page 55. To verify the contents of your modified **bosinst.data** file, use the **bicheck** command.

Note: If you are customizing the **/bosinst.data** file so that it becomes part of a system backup (**mksysb**), beginning with AIX 4.3.3, the **mksysb** command always updates the **target_disk_data** stanzas to reflect the current disks in the **rootvg**. If you do not want this update to occur, you must create the file **/save_bosinst.data_file**. The existence of this file is checked by the **mksysb** command, before the **target_disk_data** stanzas are updated.

To edit and use the **bosinst.data** file, use one of the following procedures:

Using a customized bosinst.data file with NIM

You can use a customized **bosinst.data** file for network installations.

Create one customized **bosinst.data** file for each client, and using Network Installation Management (NIM), define the files as NIM resources. For more information about how to use the **bosinst.data** file as a resource in network installations, refer to “The bosinst.data file” on page 46.

Creating and using a supplementary bosinst.data media

Use this procedure to create the supplementary media and use it in future installation.

1. Customize the **bosinst.data** file and create a signature file by completing the following steps:
 - a. Use the **mkdir** command to create a directory called **/tmp/mycd**: `mkdir /tmp/mycd`.
 - b. Use the **cd** command to change your directory to the **/tmp/mycd** directory: `cd /tmp/mycd`.
 - c. Copy the **/var/adm/ras/bosinst.data** file to **/tmp/mycd**.
 - d. Copy the **/var/adm/ras/bosinst.data** file to **/tmp/mycd**.
 - e. Edit the **bosinst.data** file with an ASCII editor to customize it.
 - f. Create a signature file: `echo data > signature`.
 - g. Change the permissions on the file using the following command: `# chmod 777 *`.
2. Create the customized media by completing the following steps:

- a. Use the **cd** command to change your directory to the **/** directory.
 - b. Create the customized media using the following command (where **/dev/cd1** varies depending on your CD writer device): `# mkcd -d /dev/cd1 -r /tmp/mycd`
3. Use the customized media for installation by completing the following steps:

If you have only one media drive and you are installing from CD or DVD, complete the following:

- a. Insert the installation media in the media drive of the machine where you are installing AIX.
- b. Boot the machine from the installation media.
- c. Type 311 at the BOS welcome screen. You will be prompted to insert the customized media.
- d. Insert the customized media. The BOS installation program uses the **bosinst.data** file on the media, rather than the **bosinst.data** file on the boot media. For more information on the **bosinst.data** file, see “The bosinst.data file” on page 46.

If you are performing a network installation or tape **mksysb** installation, or if you have more than one media drive, complete the following:

- a. Insert the customized media in the media drive of the machine where you are installing AIX.
- b. Boot the machine from the network or a tape.
- c. Type 311 at the BOS welcome screen. The installation continues for a non-prompted installation, or the menus display for a prompted installation.

The BOS installation program uses the **bosinst.data** file on the media, rather than the **bosinst.data** file from the boot media. For more information on the **bosinst.data** file, refer to “The bosinst.data file” on page 46.

Creating and using a supplementary bosinst.data diskette

You can create a supplementary **bosinst.data** diskette to use for customized installations.

Complete the following process to create the supplementary diskette:

1. Customize the **bosinst.data** file and create a signature file by completing the following steps:
 - a. Use the **mkdir** command to create a directory called **/tmp/mydiskette**: `mkdir /tmp/mydiskette`
 - b. Use the **cd** command to change your directory to the **/tmp/mydiskette** directory: `cd /tmp/mydiskette`
 - c. Copy the **/var/adm/ras/bosinst.data** file to **/tmp/mydiskette**.
 - d. Edit the **bosinst.data** file with an ASCII editor to customize it.
 - e. Create a signature file: `echo data > signature`
2. Create the diskette and use it for installation by completing the following steps
 - a. Back up the edited **bosinst.data** file and the new **signature** file to diskette with the following command: `ls ./bosinst.data ./signature | backup -iqv`
OR
If you create a bundle file named **mybundle**, back up the edited **bosinst.data** file, the new **signature** file, and the bundle file to diskette with the following command: `ls ./bosinst.data ./signature ./mybundle | backup -iqv`
 - b. Insert the diskette in the diskette drive of the target machine you are installing.
 - c. Boot the target machine from the installation media (tape, CD or DVD-ROM, or network) and install the operating system. The BOS installation program uses the diskette file, rather than the default **bosinst.data** file shipped with the installation media. For more information on the **bosinst.data** file, see “The bosinst.data file” on page 46.

Installing AIX on a system with many disks

Save time on AIX installations by specifying the disks on which you want the system installed.

In general, if you do not specify the disk (root volume group) on which you want the AIX system installed, the operating system is installed on a disk that was previously installed with AIX. If you have many disks

that contain data volume groups, and these data volume groups are discovered before the previous root volume group is found, the installation can be delayed until a suitable disk is found. Beginning with AIX 5L Version 5.3 with the 5300-03 Recommended Maintenance package, first specify the disk on which you want to install the system, and you will save time. You can specify the installation disk by using one of the following methods:

- Specify the installation disk in the **bosinst.data** file by physical location code (PHYSICAL_LOCATION) or physical volume identifier (PVID):
 1. To determine the physical location on a running system, type:

```
lsdev -F "name physloc" -l hdisk
```
 2. To determine the physical volume identifier on a running system, type:

```
lsattr -E -0 -a pvid -l hdisk
```
 3. If you are using a fibre-channel disk for the installation, you can use the following command in the **bosinst.data** file:

```
SAN_DISKID=worldwide_portname//lun_id
```
- Specify the installation disk in the ² file through either an installation from CD or DVD, or through a network installation.
 1. For a network installation, specify the installation disk in the **bosinst.data** file by typing the following command:

```
nim -o bos_inst -a bosinst_data=value ...
```
 2. For an installation from CD or DVD, specify the installation disk in the **bosinst.data** file by following the procedures at “Customizing and using the bosinst.data file” on page 81.

If you do not specify the characteristics of the disk in the **bosinst.data** file on the target system, the installation disk is chosen based on the flags in the control_flow stanza of the **bosinst.data** file. Unless you specify EXISTING_SYSTEM_OVERWRITE=no, the first suitable root volume group is chosen for the installation. For overwrite or preserve installations, any root volume group is acceptable. For migration, the volume group must be installed with a version of the operating system that can be migrated to the level being installed. If you specify EXISTING_SYSTEM_OVERWRITE=no in the control_flow stanza of the **bosinst.data** file, then the installation goes to the first unused disk.

Related information

Links to information related to customizing your BOS installation are shown.

For more information about the **bosinst.data** file, refer to “The bosinst.data file” on page 46.

For a description of the **image.data** file, see *AIX Version 6.1 Files Reference*.

Optional products and service updates

After the Base Operating System (BOS) is installed, you might want to install optional software or service updates.

Note: The **cdromd** CD and DVD automount facility, which is included in the **bos.cdmount** fileset, is provided in AIX. To determine if the **cdromd** daemon is enabled on your system, run the following command:

```
# lssrc -s cdromd
```

The **cdromd** daemon can interfere with scripts, applications, or instructions that attempt to mount the CD or DVD device without first checking to see if the device is already enabled. A resource or device busy error occurs in such a condition. Use the **cdumount** or **cdeject** command to unmount the device. Then mount the device as specified in the program or instructions. Alternatively, use the

2. bosinst.data

cdcheck -m or **mount** command to determine the current mount point of the device. For further information, see the **cdromd** command documentation in the *AIX Version 6.1 Commands Reference*.

The installation code allows for this automatic mounting. If **cdromd** is enabled and the **mkcd** command is run, the CD-R or DVD-RAM is ejected after the image is completed. If you do not want to have the media ejected, then the **cdromd** daemon must be put in the inoperative state with the following command:

```
# stopsrc -s cdromd
```

Optionally installed software

What constitutes optionally installed software is described.

Optionally installable software includes:

- **Optional Software Products:** Software that is not automatically installed on your system when you install the BOS. Software products include those shipped with the operating system and those purchased separately. The BOS is divided into subsystems that can be individually updated, such as **bos.rte.install**. Any update that begins with **bos.rte** updates a BOS subsystem.
- **Service Updates:** Software that corrects a defect in the BOS or in an optional software product. Service updates are organized by filesets. This type of update always changes part of a fileset.

Software products can be divided into the following categories:

Licensed Program

A licensed program (LP) is also known as a *licensed program product* (LPP) or a *product*. An LP is a complete software product including all packages associated with that licensed program. For example, **bos** (the base operating system) is a licensed program.

Package

A group of separately installable units that provide a set of related functions. For example, **bos.net** is a package.

Fileset

An individually installable option. Filesets provide a specific function. An example of a fileset is **bos.net.nfs.client 5.1**. For more information on fileset packaging, see “Fileset installation packages” on page 174.

Fileset Update

An individually installable update. Fileset updates either enhance or correct a defect in a previously installed fileset.

Bundle

A collection of packages, products, or individual filesets that suit a specific purpose, such as providing personal productivity software or software for a client machine in a network environment. A set of bundles is provided with BOS that contain a specific set of optional software. For more information on bundle packaging, see “Packaging software bundles” on page 175.

A product can be composed of several packages, which in turn can be composed of different filesets. A product might be installed in its entirety, or only certain packages or filesets for the product might be installed. Software products are subdivided in this way, because many software products are large and have many pieces that can be used independently. Dividing a product into separately installable filesets allows you to install only those filesets you need.

You can install all the filesets included in a package or the entire product, or you can install only *selected* filesets, especially if you have limited hard disk space on your system.

Identifying software products

The product name, level number, and product identification fields are described.

The product name and level number identify a software product. The format for a software product level in AIX is as follows:

versionnumber.releasenumbr.modificationlevel.fixlevel

Each field in the software product identification is defined as follows:

- The *versionnumber* field consists of 1 to 2 digits that identify the version number.
- The *releasenumbr* field consists of 1 to 2 digits that identify the release number.
- The *modificationlevel* field consists of 1 to 4 digits that identify the modification level.
- The *fixlevel* field consists of 1 to 4 digits that identify the fix level.

For example, 05.01.0000.0000 is a software product level number, and 05.01.0000.0032 is a software product update level. It is not necessary to include the leading zeroes in the version, release, modification level, and fix level fields of the level. Level 05.01.0000.0000 can also be written as 5.1.0.0.

Software licensing

The types of software licensing that can be implemented in the software purchase are run-time licensing and acceptance of software license agreements.

Normally, software requiring run-time licenses is only selected for installation when you have a license to use that software. Although the Web-based System Manager and System Management Interface Tool (SMIT) allow you to install licensed software even if you do not own a license, you might be prevented from using the newly installed software until you have obtained the appropriate license.

Accepting software license agreements requires that the license agreement be accepted as part of the installation process. If software installed as part of your BOS installation requires accepting a software license agreement, you cannot exit the Configuration Assistant (or the Installation Assistant for non-graphics consoles) until the license agreement has been accepted. You can view as well as accept the license agreement. The BOS installation can be customized to automatically accept software licenses. For more information, refer to “Customizing your installation” on page 80.

For optional software installation, you can preview the license agreements on the installation media using the **smit license_on_media** fast path or the **installp -EI** command. During the installation process, you can use the menu item to accept the software license, or you can use the **installp** command with the **-Y** flag. To view accepted license agreements on a system, you can use the SMIT **smit installed_license** fast path or the **lspp -E** command. To view licenses using the Web-based System Manager, type **wsm** to start the application, and select **Software**. When a product is uninstalled, the license agreement acceptance is changed to the inactive state. If the product is reinstalled, you will not be prompted to reaccept the license agreement.

After completing the prerequisites in the next section, your next step is deciding whether to install software with the Web-based System Manager or with SMIT. Descriptions of both applications are included in this chapter.

Before you install optional software and service updates, refer to the specific instructions that accompany your installation media. If you ever need to reinstall your system, refer to the installation media instructions.

Note: For information about developing software products that are installed using the **installp** command, refer to Packaging Software for Installation in *AIX Version 6.1 General Programming Concepts: Writing and Debugging Programs*.

Preparing to install optional software products and service updates

The prerequisites for installing optional software or service updates are described.

If either of the following conditions applies to you, go to the referenced section. Otherwise, continue with the procedures in this chapter.

- If you need to commit updates or remove previously installed software, go to “Maintaining optional software products and service updates” on page 90.
- If you are using a network installation server, refer to “Installing with Network Installation Management” on page 177.

Complete the Prerequisites

Before installing optional software or service updates, complete the following prerequisites:

- You must be logged in to the system as the root user.
- AIX BOS must be installed on your system. If the BOS is not yet installed on your system, go to “Installing the Base Operating System” on page 40, or if you are installing over a network, refer to Installing with Network Installation Management.
- Either insert the media that contains the optional software or service updates into the appropriate drive or know the local or routed path to the software.
- If you are installing service updates and do not have a current backup of your system, use the procedures in “Creating system backups” on page 155. To create a system backup, you must have the backup fileset (**bos.sysmgt.sysbr**) installed on your system.
- If system files have been modified, back them up separately before updates are applied, because the update process might replace configuration files.
- If you are installing from CD or DVD and have a mounted documentation disk in the same media drive that you want to install from, run the following commands in the sequence shown:

```
# unlnkbasecd
# umount /infocd
```
- To eject the documentation disk, press the eject button on the media drive for at least two seconds.

Checking fileset build dates

The **installp** command has been enhanced to check the “build date” of filesets being installed to ensure that an older fileset is not installed on top of a new fileset.

For example, using the sample build dates shown below (0723 represents the 23rd week of the year 2007), a Technology Level 7 fileset at level 5.3.7.0 is prevented from installing on top of Technology Level 6 fileset at level 5.3.0.80 even though 5.3.7.0 has a higher VRMF (Version, Release, Modification, Fix). Previously, only a VRMF comparison needed to be run to determine installation eligibility. Now the “build date” of the installed fileset is checked to verify that the fileset to be installed is not older.

YYWW	0723	0746	0816
TL7		5.3.7.0	5.3.7.10
TL6	5.3.0.60	5.3.0.70	5.3.0.80

The following is an example of an error message from the **installp** output:

```
+-----+
          BUILDDATE Verification...
+-----+
Verifying build dates...
0503-465 installp: The build date requisite check failed for fileset bos.rte.install.
Installed fileset build date of 0816 is more recent than the selected fileset build date of 0746.
installp: Installation failed due to BUILDDATE requisite failure.
```

For more information about AIX service and support strategy, see Service and support best practices.

Installing optional software products or service updates

Optional software products and service updates can be installed using system management tools provided with the operating system.

To view the files as they are being installed, do the following:

- In SMIT, you can set the **DETAILED Output** field to yes to list the files being restored during an installation.
- In Web-based System Manager, expand the **Software** container and select **Installed Software**. From the **Software** menu, select **New Software (Install/Update)** → **Install Additional Software** → **Advanced Method**. In the resulting screen, select the source drive and click on **Advanced**. In the resulting dialog, click beside **Show detailed messages**.
- You can also use the **installp** command with the verbose option (**-V2**) to show which files have been updated.

Installing optional software or service updates with Web-based System Manager

Use the Web-based System Manager to install optional software products or service updates.

The graphics interface provides access to Web-based System Manager options for installing the following:

- Optional software
- Service updates
- Software bundles

The Web-based System Manager allows you to install software, as well as to change the system's default install settings and specify other options. By default, the Web-based System Manager *applies* and *commits* any software updates you are installing. However, you can change this default setting and have the software updates applied only.

Note: Base software applications are always committed. If a previous version of the software is installed, it cannot be saved.

Installing optional software with Web-based System Manager:

Follow this procedure for installing optional software with Web-based System Manager.

1. Start the Web-based System Manager by typing `wsm` on the command line.
2. Expand the machine name.
3. Expand **Software** in the Navigation area.
4. Select **Overview and Tasks**.
5. Select **Install Software**.

Installing service updates with Web-based System Manager:

Follow this procedure for installing service updates with Web-based System Manager.

1. Start the Web-based System Manager by typing `wsm` on the command line.
2. Expand the machine name.
3. Expand **Software** in the Navigation area.
4. Select **Overview and Tasks**.
5. Select **Update Software to the Latest Level**.

Installing software bundles with Web-based System Manager:

Follow this procedure for installing software bundles with Web-based System Manager.

1. Start the Web-based System Manager by typing `wsm` on the command line.

2. Expand the machine name.
3. Expand **Software** in the Navigation area.
4. Select **Installed Software**.
5. From the **Software** menu, select **New Software (Install/Update)** → **Install Bundles (Easy)**.

Installing optional software and service updates using SMIT

Use SMIT to install optional software and service updates.

The following installation paths are available in SMIT:

Install Software

Install or update software from the latest levels of software available on the media. To shorten the list of software displayed, message and locale software are omitted from the list. To use this option, type `smit install_latest` on the command line.

Update Installed Software to Latest Level

Update all currently installed software to the latest level available on the installation media. To use this option, type `smit update_all` on the command line.

Beginning in AIX 5L Version 5.2 with the 5200-01 Recommended Maintenance package, if you select the option to install all devices and kernels during a BOS installation, then during subsequent **update_all** processing, any new **devices.*** filesets are installed from the installation media. This option can be turned off by setting the **ALL_DEVICES_KERNELS** variable in the **/var/adm/ras/bosinst.data** file to `no`.

Install Software Bundle

Install complete bundles of software simply by specifying the input device and which bundle you are installing. You can also preview a bundle installation to see what software will be installed and how much space is required in the file system to install the bundle. To use this option, type `smit install_bundle` on the command line.

Update Software by Fix

Install a specific fix for a problem. This menu allows you to list all service fixes on the media and select a fix to install. You can also preview the installation to see what software will be updated and how much space is required in the file system to apply the fix. To use this option, type `smit update_by_fix` on the command line.

Install and Update from ALL Available Software

Install or update software from all software available on the media. To use this option, type `smit install_all` on the command line.

Note: If a problem occurs during the installation of optional software that causes the installation process to halt abnormally, you might have to complete a *cleanup* procedure to remove the partially installed software from the system before attempting to reinstall it. If the system instructs you to do a cleanup, go to “Cleaning up optional software products and service updates” on page 93.

Completing the SMIT installation and reading the status messages

The system activity and actions that you must take after the installation process has begun is described.

Perform the following steps:

1. When you press Enter to start the installation, the COMMAND STATUS screen displays. As the installation proceeds, a series of messages display. The amount of time that the installation takes varies depending on your system and the software you are installing and updating.

Note: The system might prompt you to insert the volume of the installation media, with a message similar to the following:

```
Mount volume 2 on /dev/cd0.  
Press the Enter key to continue.
```


When this message displays, insert the specified media and press Enter.

When the installation finishes, the **Command: status** field on the COMMAND STATUS screen changes to **OK** or **failed**. **OK** indicates that the installation ran to completion, although some filesets may not have installed successfully. The **failed** status means that there was a problem with the installation. Although a preview installation always finishes with an **OK** status, always check the summaries.

For information about error messages, refer to “Interpreting installation-related system and error messages” on page 130.

2. When the installation halts or finishes, the screen returns to the top of the list of messages that display during installation. You can review the message list as described in the next step, or you can exit SMIT and review the **smit.log** file (**/smit.log** or **/home/user_id/smit.log**).
3. Review the message list for error messages on software products or service updates that may not have been successfully installed. Use the following procedure to correct any errors in the installation:
 - a. Look at the pre- and post-installation summaries at the end of the message list to see whether any installation failure occurred.
 - b. Use the message list to determine problems and which software products or service updates were involved. For example, space limits might have been exceeded or the requisites might not have been met for some software. The system lists how much extra space is needed and which requisite software products or service updates to install.
 - c. Any product that is marked as *FAILED*, *BROKEN*, or *CANCELLED* can be reinstalled after the condition that caused the failure has been corrected. You do not need to reinstall any service update or software product that was marked as *SUCCESS* in the Installp Summary report. If you need to perform the installation again, change installation settings as appropriate. For example, if requisites were missing, set **AUTOMATICALLY install requisite software?** to **yes**. If there was not enough space to complete the installation, set **EXTEND file systems if space needed?** to **yes**.

If you need to install again and you have AIX BOS multivolume media, insert volume 1 of the AIX product CDs. Press F3 to return to the previous screen, then restart the installation. See “Interpreting installation-related system and error messages” on page 130 for information about **bosboot** command errors that may occur while the installation program is running, and about recovery procedures for these errors.

Attention: If the system log files show the following message, indicating that a reboot is required, perform the reboot as indicated in Step 6:

```
*** ATTENTION ***
System boot image has been updated. You should reboot the
system as soon as possible to properly integrate the changes
and to avoid disruption of current functionality.
```

- d. If the installation was interrupted (for example, a power failure), you might need to use the cleanup procedure before continuing. Press F10 (or Esc+0) to exit SMIT, and refer to “Cleaning up optional software products and service updates” on page 93.
 - e. If the software has been installed successfully, and you have no other software to install, go to Step 4.

If you have additional software to install from a different installation media, remove the media that is in that drive and insert the new media.

Press F3 (or Esc+3) to return to the previous screen and continue installing the software product or service update.
4. Press F10 (or Esc+0) to exit SMIT.
 5. Remove all installation media from the drives.
 6. When you are directed, reboot your system by typing: `# shutdown -Fr`

Updating installed software from the command line

The **install_all_updates** command updates installed system software to the latest level that is on the media, and verifies the current recommended technology level.

Beginning in AIX 5L Version 5.2 with the 5200-01 Recommended Maintenance package, if you select the option to install all devices and kernels during a BOS installation, then during subsequent **update_all** processing, any new **devices.*** filesets are installed from the installation media. This option can be turned off by setting the **ALL_DEVICES_KERNELS** variable in the **/var/adm/ras/bosinst.data** file to no.

If the **ALL_DEVICES_KERNELS** variable is set to no, the **install_all_updates** command does *not* install any filesets that are present on the installation media but not installed on the system, unless these filesets are installed as requisites of other selected filesets.

For **installp** images, all **installp** requisites are enforced.

The following example shows how to install all **installp** updates on the **/dev/cd0** device and to verify the current recommended technology level:

```
# install_all_updates -d /dev/cd0
```

For more information about the **install_all_updates** command, refer to the *AIX Version 6.1 Commands Reference*.

Checking modifications to configuration files

The **geninstall** command provides an easy way to see what modifications have been made to the configuration files listed in **/etc/check_config.files**.

When these files have been changed during a **geninstall** installation or update operation, the differences between the old and new files is recorded in the **/var/adm/ras/config.diff** file. If **/etc/check_config.files** requests that the old file be saved, the old file can be found in the **/var/adm/config** directory. The **/etc/check_config.files** file can be edited and used to specify whether old configuration files that have been changed should be saved (indicated by s) or deleted (indicated by d), and has the following format:

```
d /etc/inittab
```

Maintaining optional software products and service updates

During and after installation, the following major maintenance actions can be taken with optional software products and service updates.

Whether a particular action can be taken depends on whether the action is being applied to the entire software product, or only to a service update that has had a previous action taken on it.

You can perform these actions using either the Web-based System Manager or the System Management Interface Tool (SMIT) or by using commands directly from the command line. The following sections briefly describe how to do each action using Web-based System Manager, SMIT, or a command. Both Web-based System Manager and SMIT provide online help to guide you through each process.

Applying a service update

When installing a service update, it can be left in the *applied* state.

In this state, the former version of that software product is saved in the **/usr/lpp/PackageName** directory. Service Updates in the applied state allow you to restore the former version of the software without having to reinstall it.

Only service updates can be placed in the applied state. In contrast, after you install an entire software product, the product is left in the *committed* state. Software products in the committed state do not save the previous version of the software, because two versions of the same software product cannot be installed at the same time.

Applying a service update using Web-based System Manager

1. Start the Web-based System Manager by typing `wsm` on the command line.
2. Expand the machine name.
3. Expand **Software**.
4. Select **Overview and Tasks**.
5. Select **Update Software to the Latest Level**.

Applying a service update using SMIT:

Type `smit update_by_fix` on the command line.

Applying a service update from the command line:

Use the `installp -a` command to only apply the update.

Committing a service update using Web-based System Manager

Committing a service update removes the previous version of a product from the system, which conserves disk space.

After a software product or update has been committed, it cannot be deleted from the system except by removing the entire software product (the base level product and all of its updates) or by force-installing it back to a previous level. To do a force-installation, you must have the base level of the fileset available on media.

Although applying and committing a service update are separate actions, both can be accomplished while installing the update. In fact, the default action under Web-based System Manager and SMIT is to both apply and commit the service update during installation. This default can be changed to just apply the update.

Committing a service update using Web-based System Manager:

1. Start the Web-based System Manager by typing `wsm` on the command line.
2. Expand the machine name.
3. Expand the **Software** container.
4. Select **Installed Software**.
5. From the **Software** menu, choose **Software Utilities** → **Commit Applied Updates**.

You can list all service updates in the applied state by selecting **List Installed Software** → **Updates in Applied State** from the Software menu.

Committing a service update using SMIT:

Type `smit commit` on the command line.

You can list all service updates in the applied state by typing `smit list_installed` on the command line.

Committing a service update from the command line:

Use the `installp -c` command to commit applied updates.

You can list all service updates in the applied state by typing `installp -s` on the command line.

Rejecting a service update using Web-based System Manager or SMIT

When you reject an applied service update, the update files are removed from the system and the previous version of the software is restored.

Only service updates in the applied state can be rejected. You can use the Web-based System Manager or SMIT to reject applied service updates.

Rejecting a service update using Web-based System Manager:

1. Start the Web-based System Manager by typing `wsm` on the command line.
2. Expand the machine name.
3. Expand the **Software** container.
4. Select **Installed Software**.
5. From the **Software** menu, choose **Software Utilities** → **Reject Applied Updates**.

Rejecting a service update using SMIT:

Type `smit reject` on the command line.

Rejecting a service update from the command line:

Use the `installp -r` command to reject an applied update.

Attention: After the reject completes, if the system log files show the following message, indicating that a reboot is required, perform the reboot as soon as possible:

```
*** ATTENTION ***  
System boot image has been updated. You should reboot the  
system as soon as possible to properly integrate the changes  
and to avoid disruption of current functionality.
```

Removing a software product using Web-based System Manager or SMIT

When you remove a software product, that product's files are removed from the system, and the Software Vital Product Data information is changed to indicate that the product is removed.

The remove process also attempts to restore the system's configuration to its previous state, although this is dependent on the product and might not always be complete. After a product is removed, no version of that product remains running on the system.

Use the Web-based System Manager or SMIT to remove software products. In either application, if you set the **Remove dependent software?** field to **yes**, any requisite software (software that is dependent on the product you are removing) is also removed, unless it is required by other software on your system.

Removing a software product using Web-based System Manager:

1. Start the Web-based System Manager by typing `wsm` on the command line.
2. Expand the machine name.
3. Expand the **Software** container.
4. Select **Installed Software**.
5. Select the software product you want to remove.
6. From the **Selected** menu, choose **Remove Software**.

Removing a software product using SMIT:

Type `smit remove` on the command line.

Removing a software product from the command line:

Use the `geninstall -u` command to remove the product.

Copying a software bundle to the hard disk for future installation

The Copy Software Bundle to Hard Disk for Future Installation option allows you to copy a software bundle from a specified source to a location on your local system.

Installation software bundles include the following:

- Alt_Disk_Install
- App-Dev

- cas_client
- cas_server
- CC_EVAL.Graphics
- CDE
- devices
- GNOME
- Graphics
- KDE
- Kerberos_5
- Mozilla Firefox
- openssh_client
- openssh_server
- PerfTools
- SbD.Graphics
- Server
- wsm_remote
- Trusted_AIX
- Trusted_AIX_SYSMGT

Cleaning up optional software products and service updates

The cleanup procedure attempts to delete items that were partially installed or left in an incomplete state. For example, after an update is interrupted, the **islpp -l** command might report the update status as **APPLYING** rather than **APPLIED**.

Note: This procedure applies only to the update or installation of optional software products. If your AIX BOS installation was unsuccessful, see “Troubleshooting a system that does not boot from the hard disk” on page 126 for more information.

The cleanup procedure attempts to revert the update to its previous state. For example, when cleaning up an update that was interrupted in the **COMMITTING** state, the cleanup procedure attempts to return the update to its **APPLIED** state.

If the interruption occurs during the initial state of an installation, then the cleanup procedure attempts to delete the installation entirely and restore the previous version of the product (if there is one). When the previous version is restored, it becomes the active version. When the previous version cannot be restored, the software is listed by the **islpp -l** command as **BROKEN**.

When the product is deleted or **BROKEN**, you can attempt to reinstall the software. Any product in the **BROKEN** state cannot be cleaned up; it can only be reinstalled or removed.

The system automatically initiates a cleanup when an installation fails or is interrupted. Normally, you must initiate a cleanup procedure if the system shuts down or loses power during an installation or if the installation process terminates abnormally. Occasionally, you are prompted to reboot (restart) the system after running the cleanup procedure.

If you get a message indicating that no products were found that could be cleaned up, you may have run the cleanup procedure when it was not needed. Try your installation again.

If you get a message indicating that you need to clean up a failed installation, contact your point of sale for assistance.

Initiating a cleanup procedure using Web-based System Manager

Follow these steps for initiating a cleanup procedure using Web-based System Manager.

1. Start the Web-based System Manager by typing `wsm` on the command line.
2. Expand the machine name.
3. Expand the **Software** container.
4. Select **Installed Software**.
5. From the **Software** menu, choose **Troubleshooting** → **Cleanup Failed or Interrupted Installation**.

Initiating a cleanup procedure using SMIT

Follow these steps for initiating a cleanup procedure using SMIT.

1. Type `smit maintain_software` on the command line.
2. Select **Clean Up After Failed or Interrupted Installation**.

Initiating a cleanup procedure from the command line

Perform this step to initiate a cleanup procedure from the command line.

Type `installp -C` on the command line.

Managing existing installp image source

The **lppmgr** command is used to manage an existing **installp** image source.

The **lppmgr** command performs the following functions on an existing **installp** image source (also known as an **lpp_source** resource in the NIM environment):

- Remove duplicate updates (**-u** flag).
- Remove duplicate base levels (**-b** flag).
- Eliminate update images that are the same level as base images of the same fileset. Such update images can create conflicts that lead to installation failure (**-u** flag).
- Remove message and locale filesets other than the language you specify (**-k** flag).
- Remove superseded filesets (**-x** flag).
- Remove non-system images from a NIM **lpp_source** resource (**-X** flag).

By default, **lppmgr** lists all images filtered by the preceding routines. The **-r** flag can be used to remove the filtered images and the **-m** flag can be used to move the images to another location.

The **lppmgr** command does not replace the **bfcreate** command, perform installations, or work with installed filesets. Before using the **-X** flag, it is recommended that you have a good understanding of NIM, system images (known as SIMAGES in NIM), and the workings of a NIM **lpp_source** resource.

To list all duplicate and conflicting updates in the **/myimages** image source directory, type:

```
# lppmgr -d /myimages -u
```

To remove all duplicate and conflicting updates in the **/myimages** image source directory, type:

```
# lppmgr -d /myimages -u -r
```

For more information about the **lppmgr** command, refer to the *AIX Version 6.1 Commands Reference*.

Using the Software Service Management menu (including SUMA)

The Software Service Management menu allows access to Service Update Management Assistant (SUMA) functions, which significantly simplify the system update process by allowing policy-based automatic downloads of technology level updates from the Web.

The Software Service Management menu allows generation of reports to manage filesets installed on a system, filesets contained in a repository, and filesets available from the IBM System p support Web site. It also provides a way for you to clean up and rename software images in a repository.

You can perform these actions using either the SMIT **service_software** fast path or by using commands directly from the command line. The following sections briefly describe how to do each action using SMIT or a command.

Using the Service Update Management Assistant (SUMA)

The Service Update Management Assistant (SUMA) helps move system administrators away from the task of manually retrieving maintenance updates from the Web.

SUMA offers flexible options that let you set up an automated interface to download fixes from a fix distribution website to your systems. Because SUMA can be configured to periodically check the availability of specific new fixes and entire maintenance levels, the time spent on such system administration tasks is cut significantly.

SUMA can be accessed through the **suma** command or through the SMIT **suma** fast path.

Using the SUMA command line interface:

The **suma** command can be used to perform these operations on a SUMA task or policy.

- Create
- Edit
- List
- Schedule
- Unschedule
- Delete

An *RqType* parameter specifies the type of download that is being requested (such as critical fixes, a specific fileset, or an APAR). A policy can be set up to retrieve the following types of fixes:

APAR Specifies a request to download an APAR (such as **IY12345**).

PTF Specifies a request to download a PTF (such as **U123456**).

ML Specifies a request to download a specific maintenance level (such as **5300-03**).

TL Specifies a request to download a specific technology level (such as **5300-04**).

SP Specifies a request to download a specific service pack (such as **5300-06-01-0744**).

Fileset

Specifies a request to download a specific fileset (such as **bos.rte.lvm**).

Security

Specifies a request to download the latest security fixes.

Critical

Specifies a request to download the latest critical fixes. These resolve highly pervasive (HIPER) problems.

Latest Specifies a request to download all of the latest fixes.

Several flag options can be used with the **suma** command to further specify your request. With these command options, you can perform the list, edit, create, schedule, unschedule, and delete operations on different tasks or policies.

For example, to create and schedule (**-s**) a task that downloads the latest critical fixes on the 15th day of every month at 2:30 a.m. (using cron format), and add a policy label through the *DisplayName* field (useful when listing policies through SMIT), type:

```
suma -s "30 2 15 * *" -a RqType=Critical \  
-a DisplayName="Critical fixes - 15th Monthly"
```

The preceding example uses task defaults, which can be displayed by the **suma -D** command.

Type the following command to create and schedule a task that downloads the entire 5300-02 Maintenance Level into the **/lppsrc/5302** directory on Monday at 11:00 p.m., while turning off filtering against installed software (*FilterSysFile*), and running an **lppmgr** clean operation after the download to remove any superseded updates, duplicates base levels, and conflicting updates:

```
suma -s "0 23 * * 1" -a Action=Clean -a RqType=ML -a RqName=5300-02 \  
-a DLTarget=/lppsrc/5302 -a FilterSysFile=/dev/null
```

Note: Prior to running a task that specifies *Action=Clean*, you can run **suma -c** to verify the SUMA global configuration settings that will be used when running **lppmgr**. Setting **REMOVE_SUPERSEDE**, **REMOVE_DUP_BASE_LEVELS**, and **REMOVE_CONFLICTING_UPDATES** to yes will result in the intended action of the preceding example.

For a more complete listing of examples that detail the functionality of the **suma** command, refer to the **suma** command.

Using the Comparison Reports menu

The Comparison Reports menu allows you to generate several comparison reports to verify that the filesets for a particular fix or preventive maintenance package are installed by comparing filesets installed on a system to another source. This source could be a fix repository, such as an **lpp_source** or a directory of fixes, or a downloaded list from the IBM System p support Web site.

If you want to verify that your **lpp_source** is up to date, you can also compare a fix repository to a downloaded list.

You can perform these actions in the SMIT **compare_report** fast path or using the **compare_report** command.

Using the Compare Installed Software to Fix Repository menu:

The Compare Installed Software to Fix Repository menu allows you to compare the filesets installed on a system to a fix repository.

The following report lists are generated:

- Filesets on the system that are back-level (**lowerlevel.rpt**)
- Filesets on the system that are at a later level (**higherlevel.rpt**)
- Filesets in the fix repository that are not installed on the system (**notinstalled.rpt**)
- Filesets installed on the system that are not in the fix repository (**no_update_found.rpt**)

The Compare Installed Software to Fix Repository option is available using the SMIT **instofix_compare** fast path or the **compare_report** command with the following options:

```
compare_report -s -i FixDir {[-l] [-h] [-m] [-n]} [-t ReportDir -Z | -v]
```

```
compare_report -b BaseList -i FixDir {[-l] [-h] [-m] [-n]} [-t ReportDir] -Z | -v
```

When using the **-l** (lower) or **-h** (higher) flags, the compare report only shows that interim fixes are installed. The higher or lower concept is not currently available.

Compare Installed Software to List of Available Updates menu:

The Compare Installed Software to List of Available Updates menu allows you to compare the filesets installed on a system to a downloaded list of available updates from the IBM System p service Web site.

The following report lists are generated:

- Filesets on the system that are back-level from the latest (**lowerthanlatest1.rpt**)
- Filesets on the system that are at a later level from the latest maintenance and technology levels (**higherthanmaint.rpt**)
- Filesets on the system that are back-level from the latest maintenance and technology levels (**lowerthanmaint.rpt**)

The Compare Installed Software to List of Available Updates option is available using the SMIT **instolist_compare** fast path or the **compare_report** command with the following options:

```
compare_report -s -r ServiceReport {[ -1] [-h]} [-t ReportDir -Z | -v]
```

```
compare_report -b BaseList -r ServiceReport {[ -1] [-h]} [-t ReportDir] -Z | -v]
```

When using the **-l** (lower) or **-h** (higher) flags, the compare report only shows that interim fixes are installed. The higher or lower concept is not currently available.

Compare Fix Repository to List of Available Updates menu:

The Compare Fix Repository to List of Available Updates menu allows you to compare the filesets in a fix repository, such as a fix directory or **lpp_source**, to a downloaded list of available updates from the IBM System p service Web site.

The report list that is generated contains information on filesets in the fix directory that are back-level from latest (**lowerthanlatest2.rpt**).

The Compare Fix Repository to List of Available Updates option is available using the SMIT **fixtolist_compare** fast path or the **compare_report** command with the following options:

```
compare_report -i FixDir -r ServiceReport [ -t ReportDir -Z | -v ]
```

Compare a list of installed software on a base system to another system:

The compare a list of installed software on a base system to another system option allows you to compare the filesets installed on a system to another system.

The **lspp -Lc** output from one system is saved to a file and compared with the **lspp -Lc** output from another system. The following report lists are generated:

- A list of base system installed software that is at a lower level (**baselower.rpt**)
- Filesets not installed on the base system, but installed on the other system (**otheronly.rpt**)
- A list of base system installed software that is at a higher level (**basehigher.rpt**)
- Filesets installed on the base system that are not installed on the other system (**baseonly.rpt**)

To compare a list of installed software on a base system to another system use the **compare_report** command with the following options:

```
compare_report -b BaseList -o OtherList {[ -1] [-h] [-m] [-n]} [-t ReportDir -Z | -v]
```

Using the Rename Software Images in Repository option

The Rename Software Images in Repository option allows you to rename updates that have FIX ID numbers for names, to more meaningful fileset names like those generated when updates are copied to hard disk for future installation. This action renames all filesets in the indicated directory with the same format.

This option is available using the SMIT **rename_software** fast path.

You can also use the **bffcreate** command to rename software images in a directory. To rename software images in a directory using the **bffcreate** command, use the **-c** flag and the **-d** flag for the directory containing the filesets. For example, to rename filesets in the **/usr/sys/inst.images** directory, type:

```
# /usr/sbin/bffcreate -cd /usr/sys/inst.images
```

You can also create a log file containing a mapping between the old names and new names, using the **-s logfile** option, as shown in the following example:

```
# /usr/sbin/bffcreate -cd /usr/sys/inst.images -s /usr/sys/inst.images/names.log
```

This example creates a **/usr/sys/inst.images/names.log** file that contains content formatted as follows:

```
old_fileset_name:new_fileset_name
```

This option is also available in SMIT Rename Software Images in Repository menu as the **LOG software name changes (location of log file)** option.

Using the Clean Up Software Images in Repository option

The Clean Up Software Images in Repository option allows you to remove unneeded or duplicate software images from a local software-image repository.

You can remove duplicate software, superseded updates, and language software:

- The Remove Duplicate software option allows you to remove duplicate base and update images from the specified directory.
- The Remove Superseded updates option allows you to remove superseded filesets from the specified directory. This action applies only to update images.
- The Remove Language software option allows you to remove language and locale filesets that are not needed on your system. This option removes all language and locale filesets from the specified directory, except the language specified in the PRESERVE language field. By default, the value of the **LANG** environment variable for the system is used to determine the language to preserve.
- The Save Removed files option allows you to save all removed files to the location specified in the **DIRECTORY for storing saved files** field. Select true in this field if you want to move the images to another location instead of removing them from the hard drive.

This option is available using the SMIT **cleanup_software** fast path.

Using InstallShield MultiPlatform

Some products that are distributed for installation on AIX are packaged and installed with InstallShield MultiPlatform (ISMP).

Unlike **installp** or RPM Package Manager (RPM) installations which only provide nonprompted or silent installations of a product, ISMP-packaged products provide both interactive and silent interfaces for installing and uninstalling a product.

Similar to products packaged and installed with **installp** and RPM, ISMP-packaged products can be installed using the AIX system management tools, including SMIT and Web-based System Manager.

These tools use the **geninstall** command to install or uninstall products that are packaged and installed with **installp**, RPM, or ISMP. As expected, the **geninstall** command can be used directly to install, list, or uninstall ISMP-packaged products.

For instructions for installing or uninstalling a specific product packaged and installed with ISMP, consult the product's documentation.

Installing products with InstallShield MultiPlatform

You install an InstallShield MultiPlatform product using SMIT, Web-based System Manager, the **geninstall** command, or the files provided by the product.

- Use the SMIT **install_software** fast path to install ISMP products without knowledge of the exact location of the product installation files. For information on installing optional software using SMIT, see “Preparing to install optional software products and service updates” on page 86. Use the F4 key on the **SOFTWARE to install** field to select the product you want to install. ISMP products are displayed in the list similar to **installp** packages or RPM packages. Select the ISMP products, and press Enter to begin the installation.

By default, ISMP product installations launched through SMIT is *silent* or *nonprompted* installations. To perform an interactive installation, use the Web-based System Manager, the **geninstall** command, or the instructions provided with the product documentation.

Although SMIT has a preview option, this option is not available for ISMP installations. If you select the preview option, a message instructs you to launch an interactive installation using Web-based System Manager or the command line, which allows you to view the preinstallation summary panel before completing the product installation.

- Use the Software Application in the Web-based System Manager to launch ISMP-packaged product installations. For information on installing optional software using the Web-based System Manager, see “Preparing to install optional software products and service updates” on page 86. When you press the **Browse** button to list products on the media, ISMP-packaged products are displayed in the list.

Note: If you select the preview option, but proceed through the entire installation wizard, the product is installed. Most ISMP products include a preinstallation summary panel that provides preview information about the installation, including space requirements and file system expansion. If you do not want to proceed with the installation after viewing this information, press the **CANCEL** button to exit the wizard.

- Use the **geninstall** command to install an ISMP-packaged product. To perform an interactive installation, specify the device or directory containing the product installation files with the **-d** flag and specify the product name. The product name is the same as the subdirectory name containing the product installation files. For example, if we have a product called MyProduct, and the product installation files are in the **/usr/sys/inst.images/ismpppc/MyProduct/** directory, use the following command for an interactive installation:

```
/usr/sbin/geninstall -d /usr/sys/inst.images J:MyProduct
```

Use the **J:** prefix to inform the **geninstall** command that the product is an ISMP package. The **geninstall** command recognizes the **ismpppc** subdirectory, just as it recognizes **RPMS/ppc** for RPM packages and **installp/ppc** for **installp** packages, so it is only necessary to pass the **/usr/sys/inst.images** base directory. You can also use the directory that contains the installation files. In this example, specify the directory as follows:

```
/usr/sbin/geninstall -d /usr/sys/inst.images/ismpppc/MyProduct J:MyProduct
```

If you want to launch a *silent* or *nonprompted* installation with **geninstall**, include the **-Z** flag:

```
/usr/sbin/geninstall -d /usr/sys/inst.images -Z J:MyProduct
```

For more information about silent installations, see “Performing a silent installation using response files” on page 100.

- You can use the installation files provided by the product developer to install an ISMP-packaged product. The product developer might provide a script or executable that can be used to launch an ISMP-packaged product installation. For more information, refer to the documentation provided with the product.

Uninstalling a InstallShield MultiPlatform product

You uninstall an ISMP product using SMIT, Web-based System Manager, the **geninstall** command, or the files provided by the product's developer.

- You can use the SMIT **remove** fast path to uninstall an ISMP-packaged product. If you use the F4 key to list the installed software for the **SOFTWARE to remove** field, the ISMP-packaged product is displayed in the list. You can also type the name of the product in the field.

By default, uninstallation processes performed in SMIT are *silent* or *nonprompted*. To perform an interactive uninstallation, use Web-based System Manager, the **geninstall** command, or the instructions provided with the product documentation.

In SMIT, the preview option is not available for the ISMP product uninstallation procedure. If you attempt to preview the uninstallation, a message instructs you to launch an interactive uninstallation using Web-based System Manager or the command line. This allows you to view the pre-uninstallation summary panel before completing the product uninstallation.

- You can use the Software Application in Web-based System Manager to uninstall ISMP-packaged products.

Note: If you select the preview option, but proceed through the entire uninstallation wizard, the product is uninstalled. Most ISMP products include a pre-uninstallation summary panel that provides preview information about the uninstallation. If you do not want to proceed with the installation after viewing this information, press the **CANCEL** button to exit the wizard.

- You can use the **geninstall** command to perform an uninstallation for an ISMP-packaged product. To perform the uninstallation interactively, specify the **-u** flag for uninstallation, and the product name. For example, to uninstall the *MyProduct* product, type the following:

```
/usr/sbin/geninstall -u J:MyProduct
```

To speed processing, use the **J:** prefix to inform the **geninstall** command that you are uninstalling an ISMP-packaged product.

To perform a *silent* or *nonprompted* uninstallation with the **geninstall** command, use the **-Z** flag, as follows:

```
/usr/sbin/geninstall -Zu J:MyProduct
```

- You can use installation files provided by the product developer to uninstall an ISMP-packaged product. The product developer might provide instructions for performing an ISMP-packaged product uninstallation. For more information, see the documentation provided with the ISMP product.

Performing a silent installation using response files

You can perform silent installations for ISMP-packaged products using response files.

A response file contains predetermined responses for an installation. By default, the **geninstall** command searches on the product media in the ISMP-product subdirectory for response files for each ISMP product. For example, the *MyProduct* ISMP product subdirectory is similar to the following:

```
/basedir/ismpppc/MyProduct/
```

The **geninstall** command searches in the ISMP-product subdirectory for each ISMP product specified in the install list or bundle for a **MyProduct.response** file. If a **MyProduct.response** file does not exist or is not found, **geninstall** proceeds with whatever defaults are configured in the installer.

The **-t ResponseFileLocation** option allows you to specify an alternate location for response files or response file templates. The *ResponseFileLocation* can either be a file or directory name. If the *ResponseFileLocation* is a directory, it must already exist. If the *ResponseFileLocation* is not an existing directory, it is assumed that a file name is specified.

To use response files with ISMP products, the following methods are available:

- Create a response file template. To create an ISMP response file template in the default location, use the **geninstall** command with the **-T** flag. The **-T** flag creates an ISMP response file template in the default location, which is the directory containing the product installation files. The resulting template can be used to create a response file for future installations of the same product with the desired options. Creation of the response file template does not result in installation of the ISMP product.

To create an ISMP response file template for the MyProduct ISMP product using the product installation files in the /usr/sys/inst.images/ismppc/MyProduct/ default directory, do the following:

```
/usr/sbin/geninstall -d /usr/sys/inst.images -T J:MyProduct
```

The MyProduct.template response file template that is generated is similar to the following:

```
#####  
#  
# InstallShield Options File Template  
#  
# Wizard name: Setup  
# Wizard source: setup.jar  
# Created on: Tue Jun 25 10:59:55 CDT 2004  
# Created by: InstallShield Options File Generator  
#  
# This file can be used to create an options file (i.e., response file) for the  
# wizard "Setup". Options files are used with "-options" on the command line to  
# modify wizard settings.  
#  
# The settings that can be specified for the wizard are listed below. To use  
# this template, follow these steps:  
#  
# 1. Enable a setting below by removing leading '###' characters from the  
# line (search for '###' to find settings you can change).  
#  
# 2. Specify a value for a setting by replacing the characters <value>.  
# Read each settings documentation for information on how to specify its  
# value.  
#  
# 3. Save the changes to the file.  
#  
# 4. To use the options file with the wizard, specify -options <filename>  
# as a command line argument to the wizard, where <filename> is the name  
# of this options file.  
#  
#####  
#####  
#  
# My Product Install Location  
#  
# The install location of the product. Specify a valid directory into which the  
# product is installed. If the directory contains spaces, enclose it in  
# double-quotes. For example, to install the product to C:\Program Files\My  
# Product, use  
#  
# -P installLocation="C:\Program Files\My Product"  
#  
### -P installLocation=<value>
```

Although the preceding is a simple example, products often have many user-configurable options that might be set in the response file. Each of these options is presented in the template with an explanation of the expected value for that option.

- Create a response file recording. To create a response file recording, use the **geninstall** command with the **-E** flag. The **-E** flag creates an ISMP response file recording in the default location, which is the directory containing the product installation files. This option requires running the ISMP installation interactively and completely. Creation of the response file recording will also result in installation of the ISMP product.

To record the MyProduct.response response file with the MyProduct ISMP product and the product installation files in the /usr/sys/inst.images/ismppc/MyProduct/ default directory, do the following:

```
/usr/sbin/geninstall -d /usr/sys/inst.images -E J:MyProduct
```

This starts the interactive installation wizard. It is necessary to run the wizard to completion to successfully create the response file recording. When completed, a message similar to the following displays:

Options record mode enabled - run the wizard to completion to create the options file response.file

The resulting file MyProduct.response response file is similar to the following:

```
#####  
#  
# InstallShield Options File  
#  
# Wizard name: Setup  
# Wizard source: setup.jar  
# Created on: Tue Jun 25 11:05:34 CDT 2002  
# Created by: InstallShield Options File Generator  
#  
# This file contains values that were specified during a recent execution of  
# Setup. It can be used to configure Setup with the options specified below when  
# the wizard is run with the "-options" command line option. Read each setting's  
# documentation for information on how to change its value.  
#  
# A common use of an options file is to run the wizard in silent mode. This lets  
# the options file author specify wizard settings without having to run the  
# wizard in graphical or console mode. To use this options file for silent mode  
# execution, use the following command line arguments when running the wizard:  
#  
# -options "record.txt" -silent  
#  
#####  
#####  
#  
# My Product Install Location  
#  
# The install location of the product. Specify a valid directory into which the  
# product is installed. If the directory contains spaces, enclose it in  
# double-quotes. For example, to install the product to C:\Program Files\My  
# Product, use  
#  
# -P installLocation="C:\Program Files\My Product"  
#  
-P installLocation="/opt/MyProduct"
```

The **-P installLocation** value has been completed according to the response given while running the wizard. In the preceding example, the **/opt/MyProduct** directory was specified as the installation location in the wizard. The response file generated by this action can be used directly to launch a silent installation with the chosen installation location.

- Use a response file for a silent installation. You can use a response file generated by the two methods mentioned previously or one provided with the product to perform a silent installation with the desired options.

To use a response file for a silent installation with the **geninstall** command, the MyProduct product, and the installation files and response file in the /usr/sys/inst.images/ismppc/MyProduct/ default directory, do the following:

```
/usr/sbin/geninstall -Zd /usr/sys/inst.images J:MyProduct
```

To use a response file for a silent installation with the **geninstall** command, MyProduct product, installation files in **/usr/sys/inst.images/ismppc/MyProduct/** directory, and the **/tmp/MyProduct/MyProduct.response** response file, do the following:

```
/usr/sbin/geninstall -Zd /usr/sys/inst.images \  
-t /tmp/MyProduct/MyProduct.response J:MyProduct
```

Using response files with NIM

If you are using NIM to install an ISMP-packaged product on one or more NIM clients, you can create and use a separate response file for each client.

Separate response files are useful when properties of the installation operation must be configured differently for each client. In order to install multiple clients, you must name each response file *CLIENT_NAME.response*. These response files must be located in the default location (the same location as the product installer files).

For example, to install the **MyProduct** ISMP-packaged product located in an **lpp_source** resource in the **/export/lpp_source/lpp_source1/ismpppc/MyProduct** directory on the **CLIENT1** and **CLIENT2** clients, do the following:

1. Create a **CLIENT1.response** and **CLIENT2.response** response file.
2. Place the response files in the **/export/lpp_source/lpp_source1/ismpppc/MyProduct** directory.
3. Create the correct responses for each client in the corresponding response file.
4. When you run the NIM **cust** operation to install the **MyProduct** ISMP-packaged product on **CLIENT1** and **CLIENT2**, the response files are used automatically and appropriately for each client.

If you want to use the same response file for all clients, name the response file *PRODUCT_NAME.response* and place in the same default location as the ISMP-packaged product (the product location in the **lpp_source** resource). For example, create a response file called **MyProduct.response** in the **/export/lpp_source/lpp_source1/ismpppc/MyProduct/** directory. If there are no client response files when you perform the NIM **cust** operation, the **MyProduct.response** file is used automatically.

Interim fix management solution

You can use the interim fix management solution to track and manage interim fix packages on a system.

An interim fix package might be an interim fix, debug code, or test code that contains commands, library archive files, or scripts that run when the interim fix package is installed.

The interim fix management solution consists of: the interim fix packager (**epkg**) command and the interim fix manager (**emgr**) command.

The **epkg** command creates interim fix packages that can be installed by the **emgr** command. The **emgr** command installs, removes, lists, and verifies system interim fixes.

Note: When the term *package* is used, **installp**'s reference is the term *fileset*.

Installing and managing interim fix packages

You can install and manage packages created with the **epkg** command.

The **epkg** command installs and manages packages created with the **epkg** command, and maintains a database with interim fix information on the system. The **emgr** command performs the following operations:

The interim fix package display:

The levels of information on the Interim fix package display are described.

The **emgr** command's **-d** flag displays the contents and topology of the efix package. The **-d** flag works with the **-v** (verbosity) flag. The default verbosity level is 1, but you can set the level to 1, 2, or 3. The syntax for interim fix package display is as follows:

```
emgr -d -e interim fixPackage | -f ListFile [-w Directory] [-v{1|2|3}]
```

For example, to get a level 1 verbosity output on the interim fix package **test.102403.epkg.Z**, type the following command.

```
# emgr -d test.102403.epkg.Z
```

The verbosity levels include the following information:

LEVEL 1

Lists one interim fix per line with the following information:

- Label for the interim fix package
- Interim fix files contained in the package
- Target location for each interim fix file

LEVEL 2

Lists the following information:

- All LEVEL 1 information
- Abstract
- Reboot requirement (yes or no)
- Prerequisite files needed
- Pre-install script
- Post-install script
- Pre-remove script
- Post-remove script
- File type for each interim fix file

LEVEL 3

Lists the following information:

- All LEVEL 2 information
- Packaging date for each interim fix file
- Virtually unique ID (VUID) for each package
- File size for each interim fix file
- Checksum for each interim fix file
- Package for each interim fix file
- Description of each interim fix file
- Contents of installation scripts and control files, if they are readable text
- Reboot scenario for each interim fix file
- Prerequisites of interim fix file on other interim fix files
- Packages that will be locked when the interim fix is installed
- Interim fixes that will be superseded when the interim fix is installed

Note: Displaying is not supported in the original release of interim fix management. You should update to the latest level of interim fix management to enable this feature. To update interim fix management, update **bos.rte.install** to the latest level.

Installing interim fix packages:

The **emgr** command installs interim fix packages that are created with the **epkg** command.

The following example shows the syntax for installing an interim fix package:

```
emgr -e interim fixPackage | -f ListFile [-w Directory] [-b] [-k] [-p] \  
[-I] [-q] [-m] [-o] [-X] [-a path]
```


The interim fix package installation operation consists of the following phases:

The installation preview phase:

These steps occur during the installation preview phase.

1. The interim fix manager initializes all commands and libraries, and extracts the interim fix metadata from the interim fix package.
2. The interim fix attributes and description are listed.
3. The **emgr** command performs a lock-checking procedure by checking the installed interim fix data if the target files that are being delivered by this interim fix package already have existing interim fixes installed. If one or more interim fix files that are delivered by this interim fix package are locked, the **emgr** command does not allow the installation or installation preview to proceed.
4. The **emgr** command performs **installp** package prerequisite verification. If the user supplied an **installp** prerequisite file, the **emgr** command checks the prerequisites at this stage. If one or more of the prerequisites is not met, the **emgr** command does not allow the installation or installation preview operation to proceed.
5. The **emgr** command performs interim fix to interim fix prerequisite verification. The **emgr** command checks the following:
 - All interim fix prerequisites for the interim fix package being checked are installed.
 - All interim fix xrequisites for the interim fix package being checked are not installed.
 - There are no previously installed interim fixes that list the interim fix being checked as an xrequisite.

Note: You can use the **epkg** command to specify the interim fix to interim fix prerequisites for an package. For more information on checking prerequisites, see “Interim fix user-specified package components” on page 116.

6. The **emgr** command checks for space requirements by checking whether the target file systems contain adequate space for the installation of the interim fix package. This includes space for unpacking the interim fix files, creating database entries, saving replaced files, installing interim fix files, creating interim fix mounts when using the **-m** flag, archiving library members, and other miscellaneous tasks. The **emgr** command also adds a small buffer to the various space calculations to account for file metadata and other factors.

If the user specifies the auto-expand flag using the **-X** flag, then the **emgr** command attempts to expand the file system to the required size. If space requirements cannot be met, the **emgr** command stops the installation. If the user specifies a preview installation using the **-p** flag, then the **emgr** command only reports the space statistics without attempting expansion

If the user specifies a preview installation using the **-p** flag, the **emgr** command does not perform the interim fix installation phase. Instead the **emgr** command skips to the summary and cleanup phase of installation.

The installation phase:

During the installation phase for installing interim fix packages, these steps occur.

1. During the interim fix installation setup step, the entire interim fix package is unpacked and the installation tools are initialized.
2. The **emgr** command checks whether the interim fix package supersedes any other currently installed interim fix files. If any of the installed interim fix files should be superseded, the **emgr** command removes them.

Note: You can use the **epkg** command to specify that an interim fix package be superseded when you install another interim fix package. For more information on superseding, see “Interim fix user-specified package components” on page 116.

3. If a **pre_install** script is specified, it is run. If the **pre_install** script returns a failure, the **emgr** command halts the installation. If the **pre_install** script succeeds, the **emgr** command proceeds with the installation and sets the interim fix state to **INSTALLING**.
4. Any files that are replaced by interim fix files in the interim fix package are saved to a secured directory. If the interim fix package does not deliver any files, this step is skipped.
From this point forward, any major failure causes the **emgr** command to run a failure-cleanup procedure, which attempts to clean up the failed installation. If this process fails, the interim fix is placed into the **BROKEN** state.
5. All interim fix files are installed to their target locations. If the installation is a mount installation operation using the **-m** flag, then the **emgr** command creates a unique mount file within the parent directory of the target file. The target file is then over-mounted by the interim fix mount point. For more information about the mount installation operation, see “Performing an interim fix mount installation operation” on page 109.
6. Package locking occurs. The interim fix package locks are processed. If the installer for which the interim fix package is created supports interim fix package locking, the **emgr** command locks the package associated with the interim fix files installed in step 4. For example, the **installp** command supports interim fix locking, so an interim fix created for an **installp** package will support interim fix package locking.

Note: In addition to implicit locking, you can use **epkg** to specify that a certain package be explicitly locked when you install another package. For more information on locking, see “Interim fix user-specified package components” on page 116.

7. If a **post_install** script is specified, it is run. If the **post_install** script returns a failure, the **emgr** command halts the installation.
8. Reboot processing occurs. If the interim fix package specifies that a reboot operation is required, the **emgr** command issues a message to the user and makes any necessary changes to the boot image. The **emgr** command does *not* reboot the system automatically.
9. At this point, all installation steps have succeeded and the **emgr** command changes the interim fix state to **STABLE** for a standard installation operation, or **MOUNTED** for a mount installation operation.

The summary and cleanup phase:

These steps occur during the summary and cleanup phase.

1. The **emgr** command displays a summary of all operations and results. If more than one interim fix package was specified with an input file using the **-f** flag, the **emgr** command provides a report for each interim fix package.
2. The **emgr** command cleans up any temporary directories and files. It also unloads any memory modules that have been loaded into memory.

Removing an interim fix package:

The interim fix removal operation removes an installed interim fix.

You can specify an individual interim fix by using one of the interim fix identification methods or specifying several individual interim fixes by using a list file. For more information about the interim fix identification methods, see “Referencing interim fixes” on page 111.

The syntax for removing an installed interim fix is as follows:

```
emgr -r -L Label | -n interim fixNumber | -u VUID | -f ListFile [-w Directory] \
[-a path] [-b] [-k] [-p] [-I] [-q] [-X]
```

The removal preview phase:

These steps occur during the removal preview phase.

1. The interim fix manager initializes all commands and libraries, and loads interim fix metadata from the interim fix database.
2. The interim fix attributes and descriptions are listed.
3. Space requirements are checked. The **emgr** command checks whether the target file systems contains adequate space to restore the saved files. This includes space-changing database entries, restoring saved files, archiving library members, and other miscellaneous tasks. The **emgr** command also adds a small buffer to the various space calculations to account for file metadata and other factors.

If the user specifies to auto-expand the file system using the **-X** flag, the **emgr** command attempts to expand the file system to the required size. If space requirements cannot be met, the **emgr** command halts the remove operation. If the user specifies a preview installation operation using the **-p** flag, then the **emgr** command only reports the space statistics without attempting to expand the file system.

If the user specifies a preview installation using the **-p** flag, the **emgr** command does not perform the interim fix removal and skips to the summary and cleanup phase.

The removal phase:

These steps occur in the removal phase.

Note: Any failure in the removal phase causes the interim fix state to change to BROKEN.

1. The **emgr** command initializes all remove utilities and changes the interim fix state to REMOVING.
2. Package unlocking occurs. All packages that are locked by the interim fix file being removed are unlocked. Because it is possible that a single package may be locked by multiple interim fixes, the **emgr** command only unlocks a package if this interim fix file is the last (or the only) interim fix file still holding a lock on the given package.
3. If a **pre_remove** script is specified, it is run. If the **pre_remove** script returns a failure, the **emgr** command halts the remove operation.
4. **emgr** checks that the interim fix being removed is not a prerequisite for another installed interim fix.
5. The interim fix is removed. If the interim fix was installed with a standard installation operation, the **emgr** command replaces the current interim fix files with the previously saved files. If the installation was a mount installation operation, the **emgr** command unmounts the interim fix files and removes them from the system.
6. If a **post_remove** script is specified, it is run. If the **post_remove** script returns a failure, the **emgr** command halts the installation.
7. Reboot processing occurs. If the interim fix package specified that a reboot is required, the **emgr** command issues a message to the user and make any necessary changes to the boot image. The **emgr** command does not reboot the system automatically.

Note: You can use **epkg** to specify the reboot scenario you want when you install another package. For more information on reboot scenarios, see “Interim fix user-specified package components” on page 116.

8. At this point, all removal steps have succeeded and the **emgr** command removes the remaining interim fix data from the database and save directories.

The summary and cleanup phase:

These steps occur during the summary and cleanup phase of removing an interim fix.

1. The **emgr** command issues a summary of all operations and results. If more than one interim fix package was specified with an input file using the **-f** flag, the **emgr** command reports for each interim fix package.
2. The **emgremgr** command cleans up any temporary directories and files. It also unloads any memory modules that have been loaded.

Listing interim fixes:

The **emgr** command lists data on installed interim fixes with various levels of verbosity.

The syntax for listing interim fixes is as follows:

```
emgr -l [-L Label | -n interim fixNumber | -u VUID ] [-v{1|2|3}] [-X] [-a path]
```

By default, the **emgr** command reports data on all installed interim fix. You can specify an individual interim fix by using one of the interim fix identification methods. For information about the interim fix identification methods, refer to “Referencing interim fixes” on page 111.

The default level of verbosity is 1. You can specify up to level 3 with the **-v** flag. The verbosity levels include the following information:

LEVEL 1

Lists one interim fix per line with the following information:

- Interim fix ID
- Interim fix state
- Install time
- Interim fix abstract

LEVEL 2

Lists the following information:

- All LEVEL 1 information
- Virtually unique ID (VUID) for each interim fix file
- Number of interim fix files
- Location for each interim fix file
- Package for each interim fix file
- Installer for each interim fix File
- Mount installation (yes or no) for each interim fix file

LEVEL 3

Lists the following information:

- All LEVEL 2 information
- Reboot requirement (yes or no)
- Prerequisite files needed
- Pre-install script
- Post-install script
- Pre-remove script
- Post-remove script
- File type for each interim fix file
- File size for each interim fix file
- Checksum for each interim fix file
- Access ownership and modes for each interim fix file
- Prerequisite information
- Interim fix description
- Archive member name for each interim fix file
- If this is a mount installation operation, then display the mount status for each interim fix file
- Reboot scenario for each interim fix file
- Interim fix to interim fix prerequisites for each interim fix file
- Packages that will be locked when the interim fix is installed
- Interim fixes that will be superseded when the interim fix is installed

Checking interim fixes:

The **emgr** command checks the status of installed interim fixes.

The syntax for interim fix checking is as follows:

```
emgr -c [-L Label | -n interim fixNumber | -u VUID | -f ListFile] [-w Directory] [-a path] \  
[-v{1|2|3}] [-X]
```

By default the **emgr** command verifies all installed interim fixes. You can specify an individual interim fix by using one of the interim fix identification methods or specify several individual interim fixes by using a list file. For information about the interim fix identification methods, refer to “Referencing interim fixes” on page 111.

The default level of verification is 1. You can specify up to level 3 with the **-v** flag. The verification levels include the following checks:

LEVEL 1

Checks the following information:

- Interim fix data and state
- If this is a mount installation operation, then check the interim fix mount status for all files

Note: If the interim fix file is unmounted, the **emgr** command changes the interim fix state to UNMOUNTED

- Interim fix checksum for all interim fix files or archive members

LEVEL 2

Checks the following information:

- All LEVEL 1 checks
- Interim fix ownership and mode for all interim fix files or archive members

LEVEL 3

Checks the following information:

- All LEVEL 2 checks
- All prerequisites
- All interim fix to interim fix prerequisites, including the following:
 - All interim fix prerequisites for the interim fix package being checked are installed.
 - All interim fix xrequisites for the interim fix package being checked are not installed.
 - There are no installed interim fixes that list the interim fix being checked as an xrequisite.

Performing an interim fix mount installation operation:

If the **-m** flag is specified during interim fix installation, the **emgr** command performs a mount installation operation of the interim fix package.

This means that the existing files that are being fixed are not removed from their present locations. Instead they are over-mounted by the interim fix files. This approach has both advantages and disadvantages. One advantage is that a system reboot unmounts all of the interim fixes. This means that any interim fix that created a serious problem is not mounted after a reboot. The disadvantages are that the administrator must monitor the mount status of interim fixes and some interim fixes may not be removed without a reboot.

The mount installation operation is not supported with interim fix packages that deliver new files.

The interim fix mount and unmount operation:

The **emgr** command mounts or unmounts interim fixes that have been installed using the mount installation operation.

The syntax for interim fix checking is as follows:

```
emgr -M | -U [-L Label | -n interim fixNumber | -u VUID | -f ListFile] [-w Directory] [-a path] [-X]
```

By default, the **emgr** command applies the mount or unmount operation to all installed interim fixes. You can specify an individual interim fix by using one of the interim fix identification methods or specify several individual interim fixes by using a list file. For more information about the interim fix identification methods, see “Referencing interim fixes” on page 111.

Using the mount operation with the **-M** flag, the **emgr** command attempts to mount all interim fix files that are unmounted. If all interim fix files are successfully mounted, and the previous interim fix state was UNMOUNTED, then the **emgr** command changes the interim fix state to MOUNTED.

Using the unmount operation with the **-U** flag, the **emgr** command attempts to unmount all interim fix files that are mounted. If at least one interim fix file is successfully unmounted, and the previous interim fix state was MOUNTED, then the **emgr** command changes the interim fix state to UNMOUNTED.

Using the interim fix display package locks operation:

The **display package locks** operation displays all packages that are locked by interim fix manager, their installer, and the locking label or labels.

The syntax for the **display package locks** operation is as follows:

```
emgr -P [Package] [-a path] [-X]
```

By default, the **emgr** command lists all locked packages. The user can specify an individual package as an argument to the **-P** flag.

Using the interim fix force removal operation:

The **force removal** operation removes interim fix data.

This operation also unlocks all interim fix packages associated with the interim fix label without removing the actual interim fix files, executing any removal scripts, or boot processing. The force removal operation can only be run on one interim fix at a time, and the interim fix label is required to identify the target interim fix. The syntax for performing a force removal operation is as follows:

```
emgr -R interim fix fixLabel [-w Directory] [-a path] [-X]
```

Note: The force removal operation must be considered as an emergency procedure. It must *only* be run if all other methods to remove the interim fix have failed. This method can create inconsistencies on the target system.

Additional interim fix information

The following are links to additional fix information.

Generating and using the MD5 checksum:

At the beginning of any operation involving **epkg** formatted images, **emgr** looks on the system for a supported command that generates an MD5 checksum. If a command is located, **emgr** executes this command and displays the resulting MD5 checksum.

You can then cross check this MD5 checksum with a secured source. If a command is not located, **emgr** takes no further action. You can force set an explicit path to a command that generates a checksum by exporting the **EMGR_MD5_CMD** shell variable. This variable should contain the absolute path to the

command. **emgr** does not verify that the user set command in the **EMGR_MD5_CMD** variable is an actual command that generates an MD5 checksum. The syntax used by **emgr** to generate the MD5 checksum is as follows:

```
$EMGR_MD5_CMD epkg image file
```

The expected output is the MD5 checksum as the first word in the output.

Note: This feature is not supported in the original release of interim fix management. You should update to the latest level of interim fix management to enable this feature. To update interim fix management, update **bos.rte.install** to the latest level.

Referencing interim fixes:

The following are methods for referencing interim fixes.

Reference by Label

Each interim fix that is installed on a given system has its a unique interim fix label. This label is called the *unique key* that binds the different database objects. To reference an interim fix by label, pass the label as an argument to the **-L** flag.

For example, to run a check operation on an interim fix with label ABC123, type the following:

```
# emgr -cL ABC123
```

Reference by Interim Fix ID

Each interim fix that is installed on a given system has a unique interim fix ID. This ID is the order number in which the interim fix is listed in the interim fix database. Using this option may be convenient if performing operations on interim fixes based on interim fix listings. The **emgr** command converts the interim fix ID into an interim fix label before performing the given operation. To reference an interim fix by ID, pass the ID as an argument to the **-n** flag.

For example, to run a check operation on the first interim fix with an ID equal to 1, type the following:

```
# emgr -cn1
```

Note: Emergency fix IDs are valid for short periods of time and change as interim fixes are removed and added. *Always* verify the current interim fix ID number by listing the interim fix using the **-l** flag.

Reference by VUID

The VUID is used to differentiate packages that have the same label. Unlike Authorized Program Analysis Reports (APARs), which are officially tracked, emergency fixes are not tracked by any organization, so it is possible to have two interim fix packages with the same label. However, the **emgr** command does not allow the installation of more than one interim fix with the same label. The **emgr** command converts the VUID into an interim fix label before performing the given operation. For example, to list an installed interim fix with VUID equal to 000775364C00020316020703, type the following:

```
# emgr -l -u 000775364C00020316020703
```

The VUID is also displayed in the preview section of the interim fix installation and removal operations, and when using the listing operation with verbosity level 2 or greater. For more information on verbosity levels, see “Listing interim fixes” on page 107

Generating interim fix list files:

You can perform operations on a set of interim fixes by specifying a list file.

For the installation operation, the list file must contain one interim fix package location per line. For the removal operation and the mount and unmount operations, the list file must have one interim fix label name per line. You can use the **-f** flag on the **emgr** command to specify a file that contains one of the following:

- A list of package locations for the installation operation (one per line)
- A list of interim fix labels for the remove, mount, unmount, and check operations (one per line)

The **emgr** command ignores any blank lines, or lines where the first non-white space character is the **#** character.

Understanding interim fix states:

The **emgr** command maintains a state for each installed interim fix.

The following installed interim fix states are maintained by the **emgr** command:

STABLE

The interim fix was installed with a standard installation, and successfully completed the last installation operation. To verify the interim fix details, run a check operation on the given **efix** or interim fixes.

MOUNTED

The interim fix was installed with a mount installation operation, and successfully completed the last installation or mount operation. A state of **MOUNTED** does not mean all interim fixes are currently mounted. For example, the interim fixes might have been manually unmounted. This state represents the **emgr** command's previous actions and determination of the mount status. To verify the interim fix details, including mount status, run a check operation on the given interim fix or interim fixes.

UNMOUNTED

The interim fix was installed with a mount installation operation and one or more interim fix files were unmounted in a previous **emgr** command operation. The state of **UNMOUNTED** does not mean that all interim fixes are currently unmounted. For example, the interim fixes might have been manually mounted or partially mounted. This state represents the **emgr** command's previous actions and determination of the mount status. To verify the interim fix details, including mount status, run a check operation on the given interim fix or interim fixes.

BROKEN

An unrecoverable error occurred during an installation or removal operation. The status of the interim fix is unreliable. You can attempt to remove this interim fix and reinstall it from the interim fix package.

INSTALLING

The interim fix is in the process of installing. Normally, this state occurs only for a brief time during interim fix installation. However, if an interim fix installation is suddenly interrupted (such as in a sudden power loss or a system crash), and the **emgr** command is unable to clean up the failed installation, an interim fix might be left in the **INSTALLING** state. You can attempt to remove this interim fix and reinstall it from the interim fix package.

REBOOT REQUIRED

The interim fix was installed successfully and requires a reboot to fully integrate into the target system. After you reboot the target system, **emgr** changes the interim fix state to **STABLE**.

Note:

1. This feature is not supported in the original release of interim fix management. You should update to the latest level of interim fix management to enable this feature. To update interim fix management, update **bos.rte.install** to the latest level.
2. **emgr** is called by **init** with the **-B** bootup flag during system start. **emgr** examines the state data for all interim fixes and changes the interim fix states as necessary. The

/etc/inittab entry `rcemgr` is created the first time **emgr** installs an interim fix file. `rcemgr` is set to not block or respawn. All `rcemgr` activities and output are logged to the **emgr** log in `/var/adm/ras/emgr.log`. Do not directly execute **emgr** with the **-B** flag.

REMOVING

The interim fix is in the process of being removed. Normally, this state occurs only for a brief time during interim fix removal. However, if an interim fix installation is suddenly interrupted (such as in a sudden power loss or a system crash), and the **emgr** command is unable to clean up the failed installation, an interim fix might be left in the REMOVING state. You can attempt to remove this interim fix and reinstall it from the interim fix package.

Logging interim fixes:

These operations are logged in the `/var/adm/ras/emgr.log` **emgr** log file.

- Installation
- Removal
- Checking
- Mounting
- Unmounting
- Force Removal

Cleaning up interim fix installation failures:

The failure-cleanup procedure is run when an interim fix installation operation fails after the installation preview (and `pre_install` script, if specified).

The failure-cleanup procedure attempts to reverse any of the changes that have already been made by the installation process and is similar to the removal phase of the interim fix removal operation. This procedure sets the **EMGR_UNDO** global environment variable to 1 and allows packaging to take different paths in the `pre_remove` and `post_remove` scripts.

Managing interim fix files when using the Trusted Computing Base:

The **emgr** command automatically detects if a system is enabled with the Trusted Computing Base (TCB).

If TCB is enabled, the **emgr** command registers all of the installed interim fixes with the interim fix database. When the interim fixes are removed, the **emgr** command restores the original TCB data. Because mount installation operations can create variations in file attributes when interim fix files are mounted and unmounted, mount installation operations are not supported on a TCB-enabled system and are blocked by the **emgr** command.

If you do not want the **emgr** command to automatically manage TCB data, export the **EMGR_IGNORE_TCB** variable and set this variable to any value that is not null. When the **EMGR_IGNORE_TCB** variable is set, the **emgr** command behaves as if the system is not TCB-enabled. If the **EMGR_IGNORE_TCB** variable is set on a TCB-enabled system, you might be required to manually manage interim fix files within TCB.

To check if TCB is enabled on your system, run the `/usr/bin/tcbck` command. If a usage statement is returned, TCB is enabled. Otherwise, a message indicating that TCB is not enabled is returned.

Using emgr to manage interim fix command paths.:

The **emgr** command calls one or more of the following UNIX® commands.

- ar
- awk

cat
chmod
chown
compress
cp
date
df
diff
du
egrep
fuser
id
ksh
ln
ls
mkdir
mount
mv
printf
ps
rm
rmdir
sed
sleep
sort
sum
tail
tar
tee
touch
umount
uname
vi
wc
zcat

The **emgr** command calls one or more of the following AIX commands:

aclget
aclput
bosboot
lspp
odmchange
odmget
slibclean
tcbck

The **emgr** command looks for the UNIX and AIX commands previously listed in the following path order:

1. /usr/emgrdata/bin
2. /usr/bin
3. /usr/sbin
4. /bin
5. /sbin
6. /usr/local/bin
7. /usr/local/sbin

The **/usr/emgrdata/bin** directory is a secured directory that is created the first time the **emgr** command is run.

If you are attempting to install or remove an interim fix for one of the commands that the **emgr** command uses, you might not be able to successfully complete the operation. To solve this problem, do the following:

1. Manually install the interim fix file into the **/usr/emgrdata/bin** directory.
2. Perform the **emgr** operation.
3. Remove the manually installed interim fix file from the **/usr/emgrdata/bin** directory.

Using this method, the interim fix is registered and tracked with interim fix manager and all other **emgr** command processing takes place.

If the interim fix file is the **/usr/bin/ksh** file and the problem it fixes prevents the **emgr** command's operations from succeeding, then do the following:

1. Back up the original **/usr/bin/ksh** file.
2. Manually install the **/usr/bin/ksh** interim fix file to **/usr/bin/ksh**.
3. Perform the **emgr** command installation or remove operation.

Creating interim fix packages

If you need to create your own interim fix and package it for distribution, use the **epkg** command to package the interim fix.

The **epkg** command can be run in two modes: *interactive* and *template-based*. The interactive method prompts the user with several questions and constructs the interim fix package based on the answers. The template-based method uses an interim fix control file that is pre-filled with default answers that are then asked in interactive mode. The interim fix package can then be installed by the **emgr** command.

By using an interim fix control file as a template, interim fix packages can be created noninteractively. The following is an example of a completed interim fix control file:

```
# interim fix control file example
ABSTRACT=This is a test of epkg.
PRE_INSTALL=/tmp/pre_install
POST_INSTALL=.
PRE_REMOVE=/tmp/pre_remove
POST_REMOVE=.
REBOOT=yes
PREREQ=.
DESCRIPTION=/tmp/description
EFIX_FILES=2

EFIX_FILE:
    EFIX_FILE_NUM=1
    SHIP_FILE=/home/test/ls
    TARGET_FILE=/usr/bin/ls
    TYPE= 1
    INSTALLER= 1
```

```
ACL= DEFAULT
AR_MEM=.
```

EFIX_FILE:

```
EFIX_FILE_NUM=2
SHIP_FILE=/home/test/mystrcat.o
TARGET_FILE=/usr/ccs/lib/libc.a
TYPE= 2
INSTALLER= 1
ACL= root:system:555
AR_MEM=strcat.o
```

Interim fix user-specified package components:

The listed interim fix control-file components are part of the overall interim fix package and are not related to specific files.

ABSTRACT

Describes the interim fix package. The abstract is limited to 38 bytes.

DESCRIPTION

Contains a detailed description of the interim fix package that is being installed.

E2E_PREREQ

Lists the interim fix label names of interim fixes that are prerequisites to the interim fix package being installed. Using this file causes **emgr** to check if the interim fix **PREREQ** label is installed. If the prerequisite is not installed, **emgr** aborts installation of the interim fix package. You can also use this file to specify an **XREQ** interim fix label. Specifying **XREQ** interim fix labels causes **emgr** to not install the interim fix package if the specified interim fix is installed. The maximum number of supported interim fix labels is 32. You can specify the interim fix labels to check for in the following ways.

- Specify the file location with the **-g** flag. For example, to specify **interim fixprereq.epkg**, type the following:

```
# epkg -g /tmp/efixprereq.epkg myefix
```
- Use the **-v** flag in interactive mode for extended options, and type the file location when prompted by **epkg**. For example, to specify **interim_fixprereq.epkg**, when prompted, type the following:
Enter the location for the supersede file or "." to skip.
-> /tmp/interim_fixprereq.epkg
- Set the **E2E_PREREQ** attribute in the interim fix control file to the local file location of the interim fix prerequisite file. For example, to specify **interim_fixprereq.epkg**, set the attribute as follows:

```
E2E_PREREQ=/tmp/interim_fixprereq.epkg
```

The format of the interim fix prerequisite file entries is as follows (where **RequisiteType** is **PREREQ** or **XREQ**):

EfixLabel RequisiteType

Comments beginning with a "#" sign and leading white space are ignored. For example:

```
oldefix1 PREREQ # Make sure oldefix1 is already installed
oldefix4 XREQ   # Make sure oldefix4 is NOT installed
```

Note: This feature is not supported in the original release of interim fix management. You should update to the latest level of interim fix management to enable this feature. To update interim fix management, update **bos.rte.install** to the latest level.

PKGLOCKS

Lists the packages that should be locked by **emgr** in addition to those that are automatically locked based on file ownership. You should specify the name of the package, the package lock

action (either *ALWAYS* or *IFINST*), and the package file type. *ALWAYS* means always attempt to lock this package, and a failure to lock the package results in interim fix installation failure. *IFINST* means attempt to lock this package only if the package is installed, and failure to lock an *installed* package results in interim fix installation failure. The maximum number of supported interim fix labels is 32. You can specify the packages to be locked in the following ways.

- Specify the file location with the **-l** flag. For example, to specify **pkglock.epkg**, type the following:

```
# epkg -l /tmp/pkglock.epkg myefix
```

- Use the **-v** flag in interactive mode for extended options, and type the file location when prompted by **epkg**. For example, to specify **pkglock.epkg**, when prompted, type the following:

```
Enter the location for the supersede file or "." to skip.  
-> /tmp/pkglock.epkg
```

- Set the **PKGLOCKS** attribute in the interim fix control file to the local file location of the package to be locked. For example, to specify **pkglock.epkg**, set the attribute as follows:

```
PKGLOCKS=/tmp/pkglock.epkg
```

The format of the interim fix package locks file entries is as follows:

```
PackageName PackageAction PackageType
```

Comments beginning with a "#" sign and leading white space are ignored. In the following example, **emgr** will always attempt to lock **bos.rte.lvm** during installation and will unlock it on removal. **emgr** will lock **bos.games** if (and only if) it is installed and will unlock it on removal (if locked).

```
bos.rte.lvm ALWAYS installp  
bos.games IFINST installp
```

Note: This feature is not supported in the original release of interim fix management. You should update to the latest level of interim fix management to enable this feature. To update interim fix management, update **bos.rte.install** to the latest level.

PRE_INSTALL

Runs after an installation preview and before any interim fix files are installed. Failure in the **pre_install** script causes the interim fix package installation to be aborted. This script is useful for doing any preinstallation checking or work. Because the **emgr** command does not call a failure-cleanup procedure for preinstallation failures, this script performs failure cleanup (related to the script) before it exits. This component is optional.

POST_INSTALL

Runs after all interim fix files have been successfully installed. A failure in the **post_install** script causes the installation to fail and causes interim fix manager to run a failure-cleanup procedure. This component is optional. For more information about the **post_install** script, refer to "Installing and managing interim fix packages" on page 103.

PRE_REMOVE

Runs after the removal preview and before any interim fix files are removed during a remove operation and in the first stage of a failure-cleanup procedure. A failure in the **pre_remove** script causes the given operation to fail. In the case of a failure-cleanup procedure, the **emgr** command sets an **EMGR_UNDO** global environment variable to 1. If necessary, the **EMGR_UNDO** variable is used to take different actions for removal as opposed to a failure-cleanup. This component is optional.

POST_REMOVE

Runs after interim fix files are removed during a remove operation and a failure-cleanup procedure. A failure in the post-remove script causes the given operation to fail. In the case of a failure-cleanup procedure, the **emgr** command sets an **EMGR_UNDO** global environment variable to 1. The **EMGR_UNDO** variable is used to take different actions for removal as opposed to a failure-cleanup (if necessary). This component is optional.

REBOOT

Indicates whether a reboot operation is required for this interim fix. You can use this variable to specify one of the following reboot scenarios.

- Reboot is not required.
- Reboot is required, and the boot image will be rebuilt.
- Reboot is required, and the boot image will not be rebuilt.

You can specify the which of these reboot scenarios you want in the following ways.

- Specify the reboot scenario with the **-r** flag. Arguments for this flag are *n* (reboot is not required), *y* (reboot required and the boot image will be rebuilt), and *o* (reboot is required, but the boot image will not be rebuilt). For example, the following command specifies that a reboot is not required:

```
# epkg -r n
```

- Use the **-v** flag in interactive mode for extended options, and select the reboot scenario you want when prompted by **epkg**. For example:

```
Select reboot policy for this efix package:
```

- 1) Reboot is NOT required.
- 2) Reboot is required. The boot image will be rebuilt.
- 3) Reboot is required. The boot image will NOT be rebuilt.

- Set the **REBOOT** and **BUILD_BOOTIMAGE** attributes in the interim fix control file to the appropriate values for the reboot scenario you want. For example, to specify that a reboot is not required, set the attributes as follows:

```
REBOOT=no  
BUILD_BOOTIMAGE=no
```

To specify that a reboot is required and the boot image will be rebuilt, set the attributes as follows:

```
REBOOT=yes  
BUILD_BOOTIMAGE=yes
```

To specify that a reboot is required and the boot image will not be rebuilt, set the attributes as follows:

```
REBOOT=yes  
BUILD_BOOTIMAGE=no
```

Note:

1. Setting **REBOOT** to *no* and **BUILD_BOOTIMAGE** to *yes* results in an error from **epkg**.
2. This feature is not supported in the original release of interim fix management. You should update to the latest level of interim fix management to enable this feature. To update interim fix management, update **bos.rte.install** to the latest level.

PREREQ

Contains **installp** prerequisites. This component is optional.

- The file has one prerequisite per line.
- The format of the prerequisite entry is as follows:

```
Fileset Min Level Max Level Type
```

Fileset

The name of the requisite **installp** fileset.

Min Level

The minimum level for the requisite fileset. The specification of NONE indicates no minimum level.

Max Level

The maximum level for the requisite fileset. The specification of NONE indicates no maximum level.

Type The following types are supported: PREREQ and IFREQ. PREREQ is the default type and requires that the requisite fileset meets all criteria. IFREQ requires that requisite fileset meet all criteria only if it is installed.

- Blank lines or lines that start with # are ignored, as shown in the following examples:

```
# Require that abc.xyz is installed at any level:
abc.xyz NONE NONE
# Require that bos.rte.lvm is installed at level 5.1.0.10 or above:
bos.rte.lvm 5.1.0.10 NONE
# Require bos.mp be between 5.1.0.0 and 5.1.0.40 if it is installed:
bos.mp 5.1.0.0 5.1.0.40 IFREQ
```

SUPERSEDE

Specifies the interim fix label name of an interim fix or interim fixes that are to be superseded when an **epkg** is installed. Using this file causes **emgr** to remove any interim fix labels that are specified in this file (if they are installed) before installing the interim fix package. Failure to remove an installed superseded interim fix aborts the installation of the interim fix package. The maximum supported number of superseded labels is 32. You can specify the superseded file in the following ways.

- Specify the file location with the **-S** flag. For example, to specify **superseded.epkg**, type the following:

```
# epkg -S /tmp/superseded.epkg myefix
```

- Use the **-v** flag in interactive mode for extended options, and type the file location when prompted by **epkg**. For example, to specify **superseded.epkg**, when prompted, type the following:

```
Enter the location for the supersede file or "." to skip.
-> /tmp/superseded.epkg
```

- Set the **SUPERSEDE** attribute in the interim fix control file to the local file location of the superseded file. For example, to specify **superseded.epkg**, set the attribute as follows:

```
SUPERSEDE=/tmp/superseded.epkg
```

The format for the list of superseded files is one interim fix label to be superseded per line. Comments beginning with a "#" sign and leading white space are ignored. For example:

```
# Requisites for efix myefix3
myefix1
myefix2
```

Note: This feature is not supported in the original release of interim fix management. You should update to the latest level of interim fix management to enable this feature. To update interim fix management, update **bos.rte.install** to the latest level.

Interim fix file components:

The following interim fix control-file components are related to specific files. The maximum number of interim fix files for each interim fix that the **epkg** and **emgr** commands support is 200.

EFIX_FILE_NUM

Number of the given file (1 - 200).

SHIP_FILE

Local file location that the **epkg** command is archiving into the interim fix package. Specify either an absolute or relative path to this file. The ship file is the interim fix that is delivered.

TARGET_FILE

Target file location where the **SHIP_FILE** is installed. This location is located on the system where

the interim fix package is installed. Specify the absolute path to this file. If this file is part of a registered package, such as an RPM or **installp** package, you must specify the tracked location.

INSTALLER

This variable represents the type of installer that owns the interim fix package. Valid integer choices are as follows:

- 1 Tracked by **installp**
- 2 Tracked by RPM
- 3 Tracked by **ISMP**
- 4 Tracked by another installer
- 5 New file that will be tracked by **installp**
- 6 New file that will be tracked by RPM
- 7 New file that will be tracked by **ISMP**
- 8 New file that will be tracked by another installer
- 9 Not tracked by any installer

TYPE This is the type of file that is being installed. The valid choices are as follows:

- 1 Standard file or executable file
- 2 Library or archive member

An example of **TYPE 1** is the `/usr/bin/ls` file or the `/usr/bin/rm` file. An example of **TYPE 2** is the `shr.o` archive member as a member of the `libc.a` library.

ACL Specifies the access attributes (mode and ownership) for a given file. If this attribute is set to **DEFAULT**, the **emgr** command maintains the current permissions of the file to be replaced. However, if the target file is a new file or the user wants to specify permissions using the **-v** flag, the **ACL** attribute can be entered with the *Owner:Group:OctalModes* syntax, similar to the following:

```
ACL= root:system:555
```

AR_MEM

Specifies the name of the archive member. This option is only valid if **TYPE=2**. In this case, **SHIP_FILE** represents the local location of the archive member that is being shipped, **TARGET_FILE** represents the target archive, and **ACL** applies to the archive member. For example, the following attributes ship the `myshr.o` local file to the `shr.o` member in the `/usr/ccs/lib/libc.a` target archive:

```
TYPE=2
SHIP_FILE=/home/myshr.o
TARGET_FILE=/usr/ccs/lib/libc.a
AR_MEM=shr.o
```

Interim fix automatic common components:

The listed components are part of the overall interim fix package and are not related to specific files.

These components are automatically determined by the **epkg** command. Typically, the user does not set the following components:

DATE Date and time that the backup was made.

INSTWORK

Amount of space (in 512 byte-blocks) required for unpacking the interim fix metadata.

UUID Virtually Unique ID. A combination of time and **cpuid**, this ID can be used to differentiate fixes that are otherwise identical.

QNEXT and QORDER

Internal trackers for interactive mode. If you are using an interim fix control file in nonprompted mode, make sure **QNEXT** and **QORDER** are not set, or set to QEND.

Interim fix automatic file components:

The listed components are related to specific files. These components are automatically determined by the **epkg** command. Typically, the user does not set these components.

CKSUM

File checksum for the given file

SIZE Size for the given file

Running the epkg command in interim fix interactive mode:

By default, the **epkg** command is run in interactive mode. The only required parameter is the interim fix label.

If you interrupt a running **epkg** command session, the interim fix control file is saved. If you start a new session with the same interim fix label, you are asked whether you want to keep working with the previous interim fix control file. You can use the **-u** flag to answer this question.

The **epkg** command maintains a record of the question order and allows the user to navigate between questions by using subcommands. Also, the **epkg** command remembers the previous answer the user provided and sets that answer as the default answer. The **epkg** subcommands are the following:

- b!** Returns to the previous question.
- s!** Shows the current interim fix control file.
- q!** Quits without saving interim fix control file (using the Ctrl-C key sequence will prompt this subcommand).
- h!** Displays help information for the current question.

The **epkg** command asks the following questions, one at a time:

1. Enter interim fix abstract [38 bytes maximum]:
** If "-s" flag is specified, go to question #3 **
 2. Does this interim fix deliver one or more files ? (yes/no):
** If "no", go to question #9 **
 3. Enter the local ship file location for interim fix file number 1:
 4. Enter target location for interim fix file number 1:
 5. Select file type for interim fix file number 1:
 - 1) Standard (file or executable)
 - 2) Library member
 6. Select the installer which tracks the file that is being fixed by interim fix file number 1:
 - 1) Currently tracked by installp.
 - 2) Currently tracked by RPM.
 - 3) Currently tracked by ISMP.
 - 4) Currently tracked by another installer.
 - 5) This is a NEW file that will be tracked by installp.
 - 6) This is a NEW file that will be tracked by RPM.
 - 7) This is a NEW file that will be tracked by ISMP.
 - 8) This is a NEW file that will be tracked by another installer.
 - 9) Not tracked by any installer.
- *** If "-m flag" and not new go to #7.1 ***

*** If new, go to #7.2 ***
*** Else, go to #8 ***

7.1 Enter the ACL for file 1 in the format of <owner>:<group>:<octal modes>. For example to make the user="root", the group="system", and the modes "444", you would enter root:system:444. Enter "." if you want to keep the default (i.e. current) permissions on the existing target file.

7.2 Enter the ACL for file 1 in the format of <owner>:<group>:<octal modes>. For example to make the user="root", the group="system", and the modes "444", you would enter root:system:444.

8. Are there more interim fix files ? (yes/no):

** If "yes", increment file and go to question #3 **
** If "no" and "-s" flag, go to #14 **
** If "no" go to question #9 **

9. Enter the local location for the pre-install script or "." to skip.

10. Enter the local location for the post-install script or "." to skip.

11. Enter the local location for the pre-remove script or "." to skip.

12. Enter the local location for the post-remove script or "." to skip.

14. Is a reboot required after installing this interim fix ? (yes/no):

15. Enter the local location for the installp prerequisite file or "." to skip.
*** This question is skipped if -p flag ***

16. Enter the local location for the interim fix description file or "." to compose it in an editor:

*** This question is skipped if "-d" flag is specified ***
*** If the description file is not specified, the user will be ***
*** put into an editor to compose it. The user can specify ***
*** which editor to use by setting the EDITOR global environment ***
*** variable. The default editor is /usr/bin/vi. ***

After all of the questions are answered, the **epkg** command verifies the interim fix control file and creates a compressed **tar** package that can be installed by using the **emgr** command.

Related information

The following are links to additional information related to optional software products and service updates.

- For information about developing software products that are installed using the **installp** command, see *Packaging Software for Installation in AIX Version 6.1 General Programming Concepts: Writing and Debugging Programs*.
- For information about creating a new backup of your system, see "Creating system backups" on page 155.
- For additional release information, see the *AIX Version 6.1 Release Notes*.

Troubleshooting your installation

Find tactics for isolating installation and configuration problems, and their solutions.

Troubleshooting an installation from a system backup

Troubleshoot common problems when installing from a system image created with the **mksysb** command.

Installing when booting a system backup fails

If a backup tape fails to boot, you can still install by using a **mksysb** image stored on the tape.

Boot the machine from the product media (Volume 1 if there is more than one volume), then install the backup from Maintenance mode. For instructions on booting, refer to “Installing the Base Operating System” on page 40. Follow the instructions to the point when the Welcome to the Base Operating System Installation and Maintenance screen displays.

Booting system backup from the product media:

Follow this procedure to boot a system backup from the product media.

Complete the following steps when the Welcome screen is displayed:

1. Choose the **Start Maintenance Mode for System Recovery** option.
2. Choose the **Install from a System Backup** option.
3. Choose the drive containing the backup tape.
The system reads the tape and begins the installation.
4. Do not remove the disk from the media drive.
The system installs the kernel and device support required on the target system from the disk.
5. Return to step 9 on page 172 in the Installing a System Backup on the Source Machine procedure and continue the instructions for installing the backup.

Note: The **Use Maps** option is not supported in Maintenance Mode. For more information on the maps options in Maintenance Mode, refer to “Installing a system backup on the source machine” on page 169.

Configuring mkysyb image on system backup tapes

Use the `swmkysyb` command to ensure that the boot image, BOS Installation/Maintenance image, and the table of contents image are created with a tape `block_size` value of 512.

Bootable **mkysyb** tapes comprise the following images:

- Boot image
- BOS Installation/Maintenance image
- Table of contents image
- System backup image

The system backup image is the actual backup of the files in the `rootvg` in all JFS-mounted file systems.

The boot image, BOS Installation/Maintenance image, and the table of contents image must be created with a tape `block_size` value of 512. The **mkysyb** command ensures that the block size is 512 when these images are created. There are no restrictions on the block size used for the fourth (system backup image) on the tape. The block size of the system, before it was temporarily set to 512, is used for the fourth image on the tape.

The value of the block size must be saved in the `/tapeblksize` file in the second image on the tape. The second and fourth images are stored in backup/restore format. Again, **mkysyb** ensures the correctness of the tapes created by using the **mkysyb** command.

If there are problems with the `bosinst.data` file, the `image.data` file, or the `tapeblksize` file, these files can be restored from the second image on the tape and checked. These files, as well as commands necessary for execution in the RAM file system (when running in maintenance mode after booting from the tape), are stored in the second image.

Restoring a file from the second image or tape:

Follow these steps to restore a file from the second image.

1. Be sure the tape block size is 512 by entering the following command: `# lsattr -E -l rmt0`.

If the block size is not correct, use the following command to set it to 512: **# chdev -l rmt0 -a block_size=512.**

2. Make sure the tape is rewound. If the tape is not rewound, enter the following command: **# tctl -f /dev/rmt0 rewind**
3. Extract the necessary files by entering: **# restore -xvq -s2 -f /dev/rmt0.1.filename**

Note: The filename should be the full path, and always preceded with a **.** (dot character), such as **./tapeblksz.**

4. Rewind the tape by entering: **# tctl -f /dev/rmt0 rewind**
5. Change the block size back to its original value, if necessary.

Troubleshooting problems with installation from mksysb backup

These troubleshooting tips apply to reported problems with installations from a **mksysb** image.

- Check that you have sufficient free blocks in the file systems to write temporary files.
- Check that each file system has at least 500 blocks free when the **mksysb** backup image is made. The system needs work space in each file system when installing from a **mksysb** backup image.

Note: Depending on the type of data or files in the file system, you might need additional blocks free. For example, if the file system has a lot of small files, an extra 4 KB is automatically allocated to allow for metadata expansion.

- Check that you are using the correct tape type for the density setting that you selected.
- Check that the tape is *not* write-protected.
- Clean the tape drive at the recommended intervals and use only approved data-grade tapes (not video tapes for 8 mm).
- Check that 7206 4-mm Digital Audio Tape (DAT) tape drives are using only DAT tapes marked with the Dataphone Digital Services (DDS) symbol. Any other DAT tapes (for example, voice grade) cannot be used.
- Check the **/smit.log** file for any errors from SMIT.
- Check that your **mksysb** backup image contains an **image.data** file. If you create the **mksysb** backup image through Web-based System Manager or SMIT, it is done automatically. If you run **mksysb** from the command line, you must either run the **mkszfile** command first, or use the **-i** flag with the **mksysb** command.

Troubleshooting migration installation

The following offers solutions for problems that can occur during a migration installation.

Troubleshooting boot logical volume errors

References for responding to errors indicating that the boot logical volume is not large enough is described.

If you receive errors indicating the boot logical volume is not large enough, see “Interpreting installation-related system and error messages” on page 130.

Troubleshooting insufficient disk space for migration

At the beginning of a migration installation, the system verifies that there will be enough space to attempt the migration. If there is not enough disk space, a message explains how much is needed.

You must now reboot the machine from the media containing your current version of AIX, and make more space available in the **rootvg** volume group. After you do this, attempt the migration again.

You can use the following options for adding additional disk space for the migration installation:

- Add another disk to the **rootvg** volume group, using either the SMIT **smit extendvg** fast path or the **extendvg** command.
- Move any user-data logical volumes from the **rootvg** volume group to another volume group. You can use either the SMIT **smit cplv** fast path or the **cplv** command to move individual logical volumes to another volume group's disk. It is a good idea to have only system logical volumes in the **rootvg**, and have user-data logical volumes in other volume groups.

After you use the **cplv** command, you must remove the original logical volumes with the **rmlv** command. If the moved logical volume contains a file system, you must modify its corresponding entries in the **/etc/filesystems** file to reflect the new logical volume name.

For more detailed information about manipulating logical volumes and volume groups, refer to Logical Volumes in *Operating system and device management*.

- Remove unneeded logical volumes (and file systems) from the **rootvg**. Run the **lsvg -l rootvg** command to see all the logical volumes in the **rootvg** volume group. The only logical volumes that must be in the **rootvg** are: hd2, hd3, hd4, hd5, hd6, hd8, and hd9var. The hd1 (**/home**) logical volume can be located in another volume group if necessary.

The hd7 (system dump) logical volume is not needed because the paging space logical volume (hd6) is used. The migration code automatically removes this logical volume if space is needed, but you can remove it ahead of time with the following commands:

```
sysdumpdev -P -p /dev/hd6
rmlv -f hd7
```

- If you cannot find extra space in your **rootvg**, you might have to do a *preservation* installation instead of a migration installation to AIX. A preservation installation saves all the "non-system" logical volumes and file systems (for example, **/home**), but removes and re-creates the following logical volumes: hd2, hd3, hd4, hd5 and hd9var.

If you do a preservation installation, you must reinstall any applications that were installed in your **rootvg** after the preservation installation has completed. You must also reconfigure devices, as well as re-create users and groups. For more information about a preservation installation, see "Installing the Base Operating System" on page 40.

After you have released enough space, reboot from your installation media, and try the migration installation again. You must have at least 8 MB of free disk space to complete the migration installation.

If there is insufficient space to complete the migration installation during the BOS installation process, a message similar to the following is displayed at the end of the installation:

```
An error occurred while migrating packages.
```

```
Some packages have not been installed.
```

```
Please see /var/adm/ras/devinst.log for details or perform an overwrite or
preservation install.
```

If space limitations prevent the migration of all software that is usually automatically migrated, the installation program attempts to install the software that is usually installed for a Preservation or Overwrite installation. If there is still not enough disk space available, the minimum set of software required to support the use of the system is installed.

If there is not enough space to migrate all of the usually migrated software, a collection of software called a Migration Bundle will be available when you install additional software later. If the minimum set of software is installed, or if the installation is not performed from a graphics console, a Graphics_Startup Bundle is created. Before installing either of these bundles, create additional disk space on the machine you want to install. For more information about installing software bundles and migrating or installing optional software products, refer to "Optional products and service updates" on page 83. "Maintaining optional software products and service updates" on page 90 describes how to remove software from the system to release disk space.

Troubleshooting alternate disk installation errors

The following are error messages you might encounter during alternate disk installation.

If you receive either of the following error messages, see “Interpreting installation-related system and error messages” on page 130.

- 0505-113 alt_disk_install: No target disk name provided.
- 0505-117 alt_disk_install: Error restoring image.data file from mksysb image.

Troubleshooting other problems with alternate disk installation

You might encounter one of these problems with alternate disk installation.

Symptom: You have run the **alt_disk_install** command or used the SMIT menus to either clone or install a **mksysb** image on an alternate disk. However, you now want to remove the definition so you can use the disk to run the **alt_disk_install** command again or use the disk for another purpose.

Action: *Do not run* the **exportvg** command. The **exportvg** examines the logical volumes on the disk (now called by their rootvg names: **hd1**, **hd2**, **hd3**, and so on) and tries to remove their corresponding entries from the **/etc/filesystems** file. This action removes the real file system stanzas from your running system and causes boot problems if you reboot with the missing stanzas.

Use the **alt_disk_install -X** command to remove the **altinst_rootvg** name from the database. This removes only the ODM information from the CuDv database, so the **lspv** command shows the disk(s) as no longer belonging to **altinst_rootvg**. It also resets your bootlist to the boot disk on which the hd5 boot logical volume resides. You can still boot from the **altinst_rootvg**, because the volume group, logical volume, and file system information remain on the disk. However, you must set your bootlist to the **altinst_rootvg** boot disk.

Troubleshooting after a BOS installation

The following are troubleshooting tips for issues that might arise following a BOS installation.

The Configuration Assistant or Installation Assistant will not display when the BOS installation program completes if your system was installed by a network installation server.

Configuration Assistant and Installation Assistant do not contain the tasks needed to configure your machine as a server. If you need to configure your system for a specific resource, refer to the documentation pertaining to that resource.

If your terminal type is not set, the first menu displayed by the ASCII Installation Assistant requires you to enter your terminal type (tty). If you enter a terminal type that is not valid, this menu redisplay until a valid type is entered.

If you enter a valid terminal type that does not match your terminal, the next screen displayed may be unreadable. In this case, press the break key sequence to return to the Set Terminal Type screen. For most terminal types, the break key sequence is Ctrl-C.

Troubleshooting a system that does not boot from the hard disk

Follow this procedure to access a system that will not boot from the hard disk.

If a **mksysb** backup tape fails to boot, read “Troubleshooting an installation from a system backup” on page 122 for instructions.

This procedure enables you to get a system prompt so that you can attempt to recover data from the system or perform corrective action that will enable the system to boot from the hard disk.

Note:

1. This procedure is intended only for experienced administrators who have knowledge of how to boot or recover data from a system that is unable to boot from the hard disk. Most administrators should not attempt this procedure but instead should follow local problem-reporting procedures.
2. This procedure is not intended for administrators who have just completed a New Installation, because the system will not contain data that needs to be recovered. If you are unable to boot from the hard disk after completing a New Installation, follow your local problem-reporting procedures.

The following steps summarize the procedure for accessing a system that will not boot.

1. Boot the system from Volume 1 of the BOS media or a bootable tape.
2. Select **Maintenance Options**.
3. Recover data or perform corrective action using the system prompt.

Preparing to access a system that does not boot

You must meet these prerequisites before attempting to access a system that will not boot from the hard disk.

Confirm the following:

- Your system cannot be booted from the hard disk.
- All hardware is installed.
- AIX Base Operating System (BOS) is installed.
- Your system unit is set to Off.

Accessing the system if unable to boot from the hard disk

Use this procedure if you are unable to boot from the hard disk.

The beginning of this procedure is similar to the one you used to install the Base Operating System. You will, however, use the maintenance screens instead of the installation screens to complete this procedure.

1. Turn on all attached external devices, such as terminals, media drives, tape drives, monitors, and external disk drives *before* turning on the system unit. Do not turn on the system unit until step 5. Turning on the external devices first is necessary so that the system unit can identify them during the startup (boot) process.
 - If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.
 - If you are not booting from a network device, go to step 3.
2. Insert Volume 1 of the installation media into the tape or media drive. Some media drives have a removable disc caddy, while others have a sliding drawer. If the media drive on your system has a sliding drawer, place the media in the drawer and push the drawer in. If the media drive on your system does not have a sliding drawer, insert the media into the disc caddy and then insert the caddy into the CD-ROM drive.

Note:

- a. You may find that on specific hardware, the tape drive door will not open while the system unit is turned off. If you have trouble opening the tape drive door during installation, use the following procedure:
 - 1) Turn the system unit on.
 - 2) Insert the BOS tape (insert Volume 1 if you received more than one volume).
 - 3) Turn the system unit off and wait 30 seconds.
- b. On some models that have a door to the tape drive, there may be a waiting period of up to three minutes before the tape drive door opens after you have pressed the button to open

the tape drive. Some models also require that the button for the tape drive door be held in the pressed position for a few seconds before the tape drive door will open.

- c. On some models, the eject button must be pressed for at least 2 seconds to eject media that is already in the disc caddy.
3. If you are not using an ASCII terminal, skip to step 5. If you are using an ASCII terminal, set the communications options as follows:
 - Line Speed (baud rate) = 9600
 - Word Length (bits per character) = 8
 - Parity = no (none)
 - Number of Stop Bits = 1
 - Interface = RS-232C (or RS-422A)
 - Line Control = IPRTS

Set the keyboard and display options as follows:

- Screen = Normal
- Row and Column = 24x80
- Scroll = jump
- Auto LF (line feed) = off
- Line Wrap = on
- Forcing Insert = line (or both)
- Tab = field
- Operating Mode = echo
- Turnaround Character = CR
- Enter = return
- Return = new line
- New Line = CR
- Send = page
- Insert Character = space

Note: If your terminal is an IBM 3151, 3161, or 3164, press the Ctrl+Setup keys to display the Setup Menu and follow the onscreen instructions to set these options. If you are using some other ASCII terminal, refer to the appropriate documentation for information about how to set these options. Some terminals have different option names and settings than those listed here.

4. Turn the system unit power switch to the On position. The system begins booting from the installation media. If your system is booting from tape, it is normal for the tape to move back and forth. After several minutes, c31 is displayed in the LED.

If you have more than one console, each terminal and directly attached display device (or console) might display a screen that directs you to press a key to identify your system console. A different key is specified for each terminal displaying this screen. If this screen is displayed, then press the specified key on the device to be used as the system console. The system console is the keyboard and display device used for installation and system administration. Press a key on only one console.

5. Type 3 to select **Start Maintenance Mode for System Recovery** from the Welcome to the Base Operating System Installation and Maintenance screen when it displays.

Note: If you customized the **bosinst.data** file in your installation media to specify a nonprompted installation, the installation and maintenance screens are not displayed. The system instead reboots from the installation media using the settings already defined in the **bosinst.data** file.

To access the installation and maintenance screens, override the nonprompted mode. You can do this when three zeros are displayed on the screen. When you observe the three zeros, type 000 (zeros) and press Enter at the terminal.

You can select **88** to display help on this or any subsequent screen.

After you have selected the **Start Maintenance Mode for System Recovery** option, the Maintenance screen displays.

6. Select option 1, **Access a Root Volume Group**, from the Maintenance screen. The Warning screen displays.
7. Read the information displayed on the Warning screen. When you are ready to continue, type 0 and press Enter. The Access a Root Volume Group screen displays.
8. Select the option for the root volume group whose logical volume information you want to display. The Access a Root Volume Group screen lists all of the volume groups (root and otherwise) on your system. After entering your selection, the Volume Group Information screen displays.

Note: Reviewing the disk and location code information on the Volume Group Information screen enables you to determine whether the volume group you selected was the root volume group. You can return to the Access a Root Volume Group screen if the choice you made was not the root volume group. If you have not chosen a root volume group, you cannot continue beyond the Volume Group Information screen.

9. Select one of the options from the Volume Group Information screen and press Enter. Each option does the following:

- Choice 1** **Access this volume group and start a shell.** Selecting this choice imports and activates the volume group and mounts the file systems for this root volume group before providing you with a shell and a system prompt.
- Choice 2** **Access this volume group and start a shell before mounting file systems.** Selecting this choice imports and activates the volume group and provides you with a shell and system prompt before mounting the file systems for this root volume group.
- Choice 99** Typing 99 returns you to the Access a Root Volume Group screen.

After you select either choice 1 or 2, a shell and system prompt display.

10. Take appropriate measures to recover data or take action (such as using the **bosboot** command) to enable the system to boot normally.

Troubleshooting a full /usr file system

Use this procedure for troubleshooting a full **/usr** file system.

To release space in a full **/usr** file system, complete one or more of the following tasks:

- Type `installp -c all` to commit all updates and release space in the **/usr** file system.
- If the system is not a Network Installation Management (NIM) system serving a Shared Product Object Tree (SPOT), enter `/usr/lib/instl/inurid -r` to remove client information for **root** file system installations. For information about NIM and SPOTs, see “Using the SPOT (Shared Product Object Tree) resource” on page 201 in the NIM Resources section.
- Remove software that you do not need. See “Maintaining optional software products and service updates” on page 90.

Viewing BOS installation logs

Information saved in BOS installation log files might help you determine the cause of installation problems.

To view BOS installation log files, type `cd /var/adm/ras` and view the files in this directory. One example is the **devinst.log**, which is a text file that can be viewed with any text editor or paged.

Viewing BOS installation logs using SMIT

You can use the SMIT fast path to view some logs in the `/var/adm/ras` directory.

To view some logs in the `/var/adm/ras` directory, you can use the following SMIT fast path:

```
smit alog_show
```

The resulting list contains all logs that are viewable with the `alog` command. Select from the list by pressing the F4 key.

Viewing BOS installation logs with the alog command

You can use the `alog` command to view some logs in the `/var/adm/ras` directory.

To view some logs in the `/var/adm/ras` directory, type:

```
alog -o -f bosinstlog
```

Interpreting installation-related system and error messages

These messages might appear during the installation of AIX.

Information about most messages is provided in the following format:

System Message	The system message is displayed in bold type.
Explanation	Describes what is likely to have caused the system message to be displayed.
System Action	Describes what the system does after the message is displayed.
User Action	Suggests a possible resolution to the problem suggested by the system message.

Note: Multiple messages can have the same explanation, system action, and user action.

0516-404 allocp: Not enough resources available to fulfill allocation. Either not enough free partitions or not enough physical volumes to keep strictness. Try again with different allocation characteristics.

0516-788: extendlv: Unable to extend logical volume

0503-008 installp: There is not enough free disk space in file system /usr (506935 more 512 byte blocks are required.) An attempt to extend this file system was unsuccessful. Make more space available, then retry this operation.

Explanation	There is not enough space to complete the installation.
System Action	The installation cannot begin until the problem is resolved.
User Action	You have several options: <ul style="list-style-type: none">• Select fewer filesets than the number originally selected for installation.OR• Extend the root volume group to another disk. Type: <code>extendvg rootvg hdisk Number</code>, where <i>Number</i> is the number of the specified disk.OR• Remove user-defined file systems to release space in the rootvg file system.OR• Follow the instructions in “Troubleshooting a full /usr file system” on page 129.

BOS Install: After saving all the data from the previous system into /tmp, it was discovered that there will not be enough free space in /tmp to make the boot image. Please reboot in normal mode

and increase the size of `/tmp` or reduce the number of files to save as listed in the `/etc/preserve.list` file.

Explanation	During a preservation installation, files listed in the <code>/etc/preserve.list</code> file were copied to the <code>/tmp</code> file. After doing so, there was not enough room in <code>/tmp</code> to create the boot image.
System Action	Installation cannot continue.
User Action	Reboot in normal mode and increase the size of <code>/tmp</code> or reduce the number of files to be saved.

BOS Install: You chose to create logical volumes mapped exactly as they were on the previous disks, but there are no map files specified in the `image.data` file.

Explanation	On system backup restore, <code>EXACT_FIT = yes</code> was specified in the <code>image.data</code> file, but no map files were specified in the <code>image.data</code> file.
System Action	Nonprompted mode is terminated. The user is prompted.
User Action	Run the <code>mkszfile</code> command with the <code>-m</code> option before creating the system backup tape. OR Do not specify <code>EXACT_FIT = yes</code> in the <code>image.data</code> file.

The boot logical volume (`hd5`) must be at least 12 MB. The system you are installing has a boot logical volume smaller than this, and the system does not have enough free contiguous physical partitions on `diskname` to increase the size of the boot logical volume. Please reboot in normal mode and correct this problem, or restart the installation and choose an overwrite install. Use the `lspv -M diskname` command to see the current allocation map of the disk.

OR

Error: No space available to create a larger boot logical volume. In order to proceed with this installation the size of the boot logical volume (`hd5`) must be increased to 12 MB. At this time there are not *N* contiguous physical partitions available on the boot disk (`diskname`) for recreating the larger boot logical volume. You must free up this space by removing or relocating one or more logical volumes or file systems from `diskname`. Use `lspv -M diskname` to see its current partition allocation map.

Explanation	The boot logical volume (<code>blv</code>), logical volume <code>hd5</code> , must be greater than 12 megabytes. If your system had disks less than 4 gigabytes in size in the root volume group, your boot logical volume may only be 4 megabytes. You might experience this failure during preservation or migration installations. Overwrite installations create the boot logical volume with a minimum size of 12 megabytes. If free partitions contiguous to <code>hd5</code> are available or if another location on the disk contains <code>hd5</code> is identified, the installation process increases the size of <code>hd5</code> and continues. Only the disk that currently contains the boot logical volume is checked for additional partitions in order to increase the size of the boot logical volume. Other disks in the rootvg are not checked.
System Action	You will be prompted to reboot in normal mode from the existing rootvg and increase the boot logical volume, or restart the installation and choose an overwrite install.

User Action	<p>Only a system administrator with root authority should attempt to increase the boot logical volume. To increase the boot logical volume, follow the process described below:</p> <p>If you received this error, then your partition size is less than 8 megabytes, and you must increase the number of partitions in hd5 (boot logical volume). You can check your partition size as follows:</p> <ol style="list-style-type: none">1. Type the following: <code># lsvg rootvg</code>2. Look for the field: PP SIZE:3. Obtain the current number of partitions in hd5, as follows: <code># lslv hd5</code>4. Look for the field: LPs :5. Your boot logical volume must contain enough partitions such that:<ul style="list-style-type: none">• PP SIZE multiplied by LPs is greater than or equal to 8.• The partitions for the boot logical volume must be contiguous. <p>If there were free partitions available next to hd5 or at some other location on the disk that contains hd5, the installation process would have increased the size of hd5, and continued.</p> <p>To view the current allocation map (free and used partitions) of a disk, use the command: <code># lspv -M diskname</code></p>
--------------------	--

User Action, continued

If there are not enough contiguous free partitions, you must increase the size of the boot logical volume (hd5) using one of the options described below, and rerun the installation. The options for increasing the boot logical volume size are as follows:

- If a user-created logical volume or file system follows hd5 on the disk (check the allocation map), and has free partitions, you can back up, remove, re-create, and restore the logical volume.
- If there is another disk in the rootvg, that has enough contiguous free partitions, then you could move hd5 to the other disk with the following steps:
 1. Verify that the disk you plan to move hd5 to is bootable by using the command:

```
bootinfo -B diskname
```

 - If 1 is returned, the disk is bootable.
 - If 0 is returned, the disk is not bootable.
 2. Find the free contiguous partitions you need on the other disk by viewing the allocation map with the command:

```
lspv -M diskname
```
 3. Create a map file to use when re-creating hd5. For example, if you want to re-create hd5 on hdisk2, on partitions 88 and 89, use the command:

```
echo "hdisk2:88-89" > your_MAP_file
```
 4. Remove the existing hd5:

```
rmlv -f hd5
```
 5. Create the new hd5:

```
mklv -y hd5 -t boot -m your_MAP_file rootvg 2
```

The 2 represents the number of partitions and can vary as needed.

Note: If the **mklv** command moves hd5 to a new location, you must run the following command:

```
echo ":C:C:C" | /usr/lpp/bosinst/blvset -d /dev/hdiskN
```

Where *C* is the message, locale, and keyboard (respectively) and *hdiskN* is the disk that contains hd5.

6. Run the **mkboot** command to clear the boot record from the disk that previously contained hd5 (boot logical volume). For example, if hd5 was previously on hdisk0, use the command:

```
mkboot -d /dev/hdisk0 -c
```
7. Use the **bosboot** command to re-create the boot image and boot record on the new disk. For example, if hd5 was re-created on hdisk2, use the command:

```
bosboot -a -d /dev/hdisk2
```

User Action, continued	<ol style="list-style-type: none"> 1. Change the bootlist of your system to boot from the new disk. To see the current bootlist, use the command: <pre>bootlist -m normal -o</pre> OR If your previous hd5 was on hdisk0, the output might be: <pre>hdisk0</pre> To change the bootlist to use hdisk2, use the command: <pre>bootlist -m normal hdisk2</pre> If there were additional items in your bootlist, add them after hdisk2, with spaces separating each item. 2. If there were no errors, reboot your system. 3. If you encountered this error when installing a mksysb on a system other than the system it was created on (cloning), then you might be able to use a customized image.data file to increase the size of hd5. The vg_data stanza contains the size of the physical partitions in the PPSIZE field. Use this information to determine how many partitions are needed for hd5. The lv_data stanza for hd5 contains the fields for the number of logical partitions (LPS), the number of physical partitions (PP), and the minimum number of logical partitions required for the logical volume (LV_MIN_LPS). These fields must be set to the number of partitions needed. See "Creating and using a supplementary bosinst.data diskette" on page 82 for information on putting an image.data file on diskette and a bosinst.data file. If the source machine had no free partitions, and the target machine has the same disk size, then you might need to install using the shrink option, as well as the customized image.data file.
-------------------------------	--

BOS Install: Could not create boot image.

Explanation	The bosboot command failed.
System Action	The boot image was not created.
User Action	Check the /var/adm/ras/bosinst.log file for errors (alog -o -f bosinst.log pg). This log is updated by appending, so make sure you check the last entry.

The bosinst.data file does not specify any bootable disks.

Explanation	The bosinst.data file does not specify any bootable disks.
System Action	Nonprompted mode is terminated. The user is prompted.
User Action	When the system prompts, select bootable disks to install on. OR Add a bootable disk to the bosinst.data file target_disk_data stanzas.

The bosinst.data file specified doing a migration install, but there is no existing root volume group.

Explanation	A BOS installation method of migration was specified in the bosinst.data file, but the existing volume group is at a lower level.
System Action	This error only occurs during a nonprompted BOS installation. The installation menus are displayed.
User Action	Respond to the menu prompts to complete the installation.

The **bosinst.data** file specified doing either a migration or a preservation install, but there is no existing root volume group.

Explanation	A BOS installation method of migrate or preserve was specified in the bosinst.data file, but no root volume group was found.
System Action	This error only occurs during a nonprompted BOS installation. The installation menus are displayed.
User Action	Respond to the menu prompts to complete the installation.

The data file did not specify enough disk space to contain the operating system.

Explanation	Nonprompted mode was specified, and there were not enough disks specified in the bosinst.data file to hold the operating system.
System Action	Nonprompted mode is terminated. The user is prompted.
User Action	When the system prompts, select disks to install on. OR Add more target_disk_data stanzas to bosinst.data file.

Duplicate **lv_data** stanzas specified in the **image.data** file. The installation cannot continue because data may be lost.

Explanation	An lv_data stanza was duplicated in the image.data file.
System Action	Installation cannot continue.
User Action	Correct the problem and try the installation again.

Duplicate **fs_data** stanzas specified in the **image.data** file. The installation cannot continue because data may be lost.

Explanation	An fs_data stanza was duplicated in the image.data file.
System Action	Installation cannot continue.
User Action	Correct the problem and try the installation again.

The following disks failed the preliminary diagnostic tests: <disk name>

bosset: No hard disks can be accessed.

Explanation	The listed disks failed pretest.
System Action	The system initiated a diagnostic pretest on the specified disk.
User Action	Run full diagnostics on the specified disks.

Disks specified in **bosinst.data** do not define a root volume group.

Explanation	Nonprompted mode was specified. The install method was set to preserve or migrate , and the disks specified in bosinst.data do not define a root volume group.
System Action	Nonprompted mode is terminated. The user is prompted.

User Action	When the system prompts, select a root volume group to install on. OR Specify disks in the bosinst.data file that define a root volume group.
--------------------	--

Encountered an unrecoverable error.

Explanation	The menus subsystem encountered an unrecoverable error.
System Action	The menu is restarted.
User Action	None

The image.data file contains no vg_data stanza for rootvg. The installation cannot continue.

Explanation	The image.data file is incomplete.
System Action	Installation cannot continue.
User Action	Use the default image.data file supplied with product media.

image.data has invalid logical volume data. Cannot continue.

Explanation	The system could not parse the logical volume data stanzas in the image.data file.
System Action	Installation cannot continue.
User Action	Use the default image.data file supplied with product media.

image.data has invalid file system data. Cannot continue.

Explanation	The system detected invalid file system data stanzas in the image.data file.
System Action	Installation cannot continue.
User Action	Use the default image.data file supplied with product media.

0516-366 putlvodm: Volume group rootvg is locked. Try again.

0516-788: extendlv: Unable to extend logical volume.

Explanation	You interrupted the installation of your optional software.
System Action	When an installation is interrupted, the system sometimes locks the root volume group.
User Action	Unlock the root volume group. Then attempt the installation procedure again. To unlock a root volume group: 1. Log in with root authority. 2. Type <code>chvg -u rootvg</code> 3. Type <code>smit_install</code> and attempt to install your optional software products again.

installp: An error occurred during bosboot processing.

Please correct the problem and rerun.

0301-52 bosboot: not enough file space to create: /tmp/disk.image.

OR

0301-152 bosboot: not enough file space to create: /tmp/unix.

Explanation	The bosboot command was unable to finish processing because of insufficient space in /tmp .
System Action	The bosboot process is interrupted. The error message, the amount of disk space required, and the available disk space are displayed. The disk space displayed indicates the number of 1024 KB blocks required.
User Action	<p>Release space in the /tmp file system or extend the /tmp file system. Continue or restart the installation process.</p> <p>To resize the /tmp file system and complete the installation, do the following:</p> <ol style="list-style-type: none">1. Note the error message preceding this one. Either the message bosboot verification starting or bosboot process starting will precede this message.2. Change directories to /tmp. List the files and determine which files can be deleted. If there is sufficient space available, go to step 6. If you need to expand the /tmp file system, continue with this procedure.3. Type <code>smit chfs</code>4. Select the /tmp file system from the displayed list.5. Add the additional block space required. The smit chfs command requires disk space to be defined in 512 KB blocks. Double the required disk space displayed in the system message.6. If the message <code>installp: An error occurred during bosboot processing</code> was displayed after the message bosboot verification starting, rerun the installation procedure. OR If the message <code>installp: An error occurred during bosboot processing</code> was displayed after the message bosboot process starting, enter <code>installp -C</code>.7. Continue the installation process.

installp: An error occurred during bosboot processing.

Please correct the problem and rerun.

301-155 bosboot: Invalid or no boot device specified.

Explanation	A device specified with the bosboot -d command is not valid. The bosboot command was unable to finish processing because it could not locate the required boot device. The installp command calls the bosboot command with /dev/ipldevice . If this error does occur, it is probably because /dev/ipldevice does not exist. /dev/ipldevice is a link to the boot disk.
System Action	The bosboot process is interrupted.

User Action	<p>Determine if the link to the boot device is missing or incorrect, correct the error and complete the installation process.</p> <p>To identify the boot device and complete the installation:</p> <ol style="list-style-type: none"> To identify the boot disk, enter <code>lslv -m hd5</code>. The boot disk name displays. Create a link between the boot device indicated and the <code>/dev/ipldevice</code> file. Enter: <code>ln /dev/boot_device_name /dev/ipldevice</code> (An example of <code>boot_device_name</code> is <code>rhdisk0</code>.) If the message <code>installp: An error occurred during bosboot processing was displayed after the message bosboot verification starting</code>, rerun the installation procedure. <p>OR</p> <p>If the message <code>installp: An error occurred during bosboot processing was displayed after the message bosboot process starting</code>, enter <code>installp -C</code>. Continue the installation process.</p>
--------------------	---

Missing image.data file. The tape does not contain a valid install image.

Explanation	The system could not find an image.data file.
System Action	Installation cannot continue.
User Action	The most likely cause of this error is the tape is bad. Try a different tape.

0512-0016 mksysb: Attempt to create a bootable tape failed: bosboot -d /dev/device -a failed with return code xxx.

OR

0512-0016 mksysb: Attempt to create a bootable tape failed: mkinsttape /dev/device failed with return code xxx.

Explanation	<p>The xxx return code indicates the error:</p> <p>5 OR 1 Not enough space in one or more of three file systems:</p> <ul style="list-style-type: none"> <code>/</code> must have at least 500 1KB blocks. <code>/tmp</code> must have at least 7400 1KB blocks. <code>/usr</code> must have at least 4000 1KB blocks. <p>11 Defective tape.</p> <p>42 OR 45 Either the <code>/usr/lib/boot/unix</code> file is corrupted (may be 0 length) or the link to <code>/unix</code> is missing.</p> <p>48 Cannot write to the tape drive or cannot read <code>/dev/blv</code>. This is probably caused by an incorrect density setting for the tape drive. It could also be caused by either a hardware problem with the tape drive or by dirty heads on the drive.</p>
System Action	The mksysb command failed to make a bootable tape.

User Action	<p>The return code xxx indicates the action required:</p> <p>5 OR 1 Check the <code>/</code>, <code>/tmp</code>, and <code>/usr</code> file systems and create more space as required.</p> <p>11 Replace the defective tape.</p> <p>42 OR 45 Either restore the <code>/usr/lib/boot/unix</code> file from the original tape or create the missing link.</p> <p>48 Check the tape drive settings and clean the heads.</p>
--------------------	--

There are no disks available on this system.

Explanation	No hard disks are configured on the system. Consequently, the only functioning menu option is the maintenance option.
System Action	Installation cannot begin until the problem is resolved.
User Action	<p>You have several options:</p> <ul style="list-style-type: none"> • Select Maintenance (option 3) from the Welcome to Base Operating System Install Menu, and select the Limited Function Maintenance Shell. Verify that no disks were configured by entering the following command: <pre>lsdev -Cc disk</pre> <p>To determine if there were configuration errors, enter the command: <pre>cfgmgr -v 2>1 tee /tmp/cfgmgr.out</pre> <p>You can use the cat command to view the <code>/tmp/cfgmgr.out</code> file, and look specifically for errors in configuration of disks. The file can be copied to diskette media using either the dd or pax commands, and moved to a running system for ease of viewing.</p> <p>OR</p> • Turn off the system and check the following on systems with SCSI devices: <ul style="list-style-type: none"> – Check all SCSI devices to ensure that all SCSI addresses are unique. – Make sure the SCSI cards are properly terminated. – If external SCSI devices are in use, make sure that the SCSI chain is terminated and that the devices are turned on. – Check the SCSI cabling and connections. – Reboot and attempt the installation again. <p>OR</p> • Turn off the system and check the following on systems with IDE devices: <ul style="list-style-type: none"> – Check all IDE devices to ensure that all IDE master and slave settings are unique per controller. If only one IDE device is connected to a controller, it must be set to master. If an ATA device (disk) and an ATAPI device (CD-ROM or tape) are connected to the same controller, the ATA device must be set to the master device and the ATAPI device must be set as the slave device. – Check the IDE cabling and connections. – Reboot and attempt the installation again. <p>OR</p> • Boot from the diagnostics and check the hard disks.</p> <p>OR</p> • Follow your local problem-reporting procedures.

There are no disks on this system which can be booted.

Explanation	The system could not find any bootable disks on the system.
System Action	Installation cannot continue.

User Action	Some third-party disks are not bootable. If a disk should be bootable but is not, run diagnostics.
--------------------	--

You chose to install only onto disks in the existing root volume group and those not in any volume group. There are not enough of those disks to contain the mkysb image.

Explanation	The EXISTING_SYSTEM_OVERWRITE field in bosinst.data was set to yes , and prompt was set to no , and there were not enough disks on the system that contained the root volume group or contained no volume group.
System Action	Nonprompted mode is terminated. The user is prompted.
User Action	Use target_disk_data stanzas to specify the disks to install on, set SHRINK to yes in the image.data file, or at the BOS Install prompt set the EXISTING_SYSTEM_OVERWRITE in the bosinst.data file to any . This allows any disks to be used for the installation. <p style="text-align: center;">Attention: If EXISTING_SYSTEM_OVERWRITE is set to any, user volume groups might be overwritten.</p> <p style="text-align: center;">OR</p> When the system prompts, select disks on which to install or select to shrink the file systems.

You chose to install only onto disks which are not contained in a volume group, but there are not enough of those disks to contain the mkysb image.

Explanation	The EXISTING_SYSTEM_OVERWRITE field in bosinst.data was set to no , and prompt was set to no , and there were not enough disks on the system that contained a volume group.
System Action	Nonprompted mode is terminated. The user is prompted.
User Action	If you want the system to select the disk to install on, use the target_disk_data stanzas to specify the target disks and set the appropriate setting for EXISTING_SYSTEM_OVERWRITE , leave EXISTING_SYSTEM_OVERWRITE blank in the bosinst.data file, or set SHRINK to yes in the image.data file and retry the installation. <p style="text-align: center;">OR</p> When the system prompts, select disks on which to install.

0505-113 alt_disk_install: No target disk name provided.

Explanation	This message is displayed in the following situations: <ul style="list-style-type: none"> • You did not enter a target disk. • The disk that was specified as the target disk has a volume group already associated with it. Running the lspv command should show the word None by disks that do not have a volume group associated with them, which is what the alt_disk_install command checks. • The target disk (or disks) specified are not bootable. The alt_disk_install command runs bootinfo -B disk_name on each disk specified in the target disk list. If any one bootinfo -B command returns a 0, then the disk is not bootable, and it cannot be used as a target disk for the alt_disk_install operation.
--------------------	--

0505-117 alt_disk_install: Error restoring image.data file from mksysb image.

Explanation	<p>This message is displayed when you are trying to install a mksysb image from tape.</p> <p>The alt_disk_install command first checks the second image on the tape for a .tapeblksz file, which contains the block size in which the mksysb image was created. The mksysb command creates this file and puts it in the second image on the tape. The first three images of a mksysb tape are always created at a 512 byte block size. The mksysb image (the fourth image on the tape) can be created at another block size.</p> <p>If the alt_disk_install command cannot restore the .tapeblksz file from the second image, the block size will remain what it was when the alt_disk_install command was started. It will attempt to restore the .image.data file from the mksysb image. If this block size does not match the block size in which the mksysb image was created, the restore fails, and the alt_disk_install command produces this error.</p>
--------------------	---

The size of a disk is too large for the running kernel.

Explanation	This message is displayed when the BOS menus load to indicate that the size of one of the selected disks for installation is larger than 1 TB (1048576 MB).
System Action	Non-prompted mode is terminated. The user is prompted.
User Action	When prompted, select a smaller disk. OR Restart the installation with AIX media (product or mksysb image) that supports booting the 64 bit kernel.

Could not determine kernel type.

Explanation	This message is displayed when the installation program cannot determine the kernel type at the time of the installation.
System Action	The installation will be paused for troubleshooting.
User Action	Contact your service representative for troubleshooting.

Could not determine the largest disk size.

Explanation	This message is displayed when the installation program cannot determine the largest disk size on the system.
System Action	The installation will be paused for troubleshooting.
User Action	Verify that the data in the target_disk_data stanzas in the bosinst.data file are correct and follow the guidelines for stanza validation as specified in the bosinst.template.README file.

The size of the Logical Volume (logical volume name) is larger than the size supported by the running kernel.

Explanation	This message is displayed when the installation program detects that one of the Logical Volumes being created is larger than 1 TB (1048576 MB) and the running kernel is not the 64 bit kernel.
System Action	The installation will be paused for troubleshooting.
User Action	Restart the installation with AIX media (product or mksysb image) that supports booting the 64 bit kernel to prevent data loss or errors.

The size of one of the Logical Volumes in the rootvg disk or disks is larger than the size supported by the running kernel.

Explanation	This message is displayed when the installation program detects that one of the Logical Volumes on the root volume group about to be imported is larger than 1 TB (1048576 MB) and the running kernel is not the 64 bit kernel.
System Action	The installation will be paused for troubleshooting.
User Action	Restart the installation with AIX media (product or mksysb image) that supports booting the 64 bit kernel to prevent data loss or errors.

Installing content for the man command

The documentation for AIX commands, files and libraries in **man** command format for English are contained on both the *AIX operating system* CDs or DVD and on the *AIX Documentation* CDs or DVD. Translated versions of this documentation are contained only on the *AIX Documentation* the CDs or DVD.

Note: These filesets are not translated into all languages.

The fileset names for the AIX commands, files and libraries in **man** command format are titled as follows:

- **infocenter.man.XX_XX.commands**
- **infocenter.man.XX_XX.files**
- **infocenter.man.XX_XX.libs**

Where XX_XX is the language indicator for that fileset (for example, EN_US). While performing installs from either the *AIX operating system* CDs or DVD or the *AIX Documentation* CDs or DVD, select filesets such as those in the list above for the languages in which you wish to view **man** command documentation.

Configuring AIX

Complete all configuration tasks that apply to your newly installed system. Two configuration tools are available to assist you.

Depending on which type of console you are using, one of the following usually begins automatically after installation:

- Configuration Assistant for graphics consoles
- Installation Assistant for ASCII consoles

Note:

- If your system was installed by a network installation server, the Configuration Assistant or Installation Assistant does not display when the BOS installation program completes.
If your system was installed using a system backup image, or if your BOS installation was customized, or if you selected migration installation from AIX, the Configuration Assistant or Installation Assistant might not display when the BOS installation program completes.
- The Configuration Assistant and the Installation Assistant do not contain the tasks needed to configure your machine as a server. If you need to configure your system for a specific resource, refer to the documentation pertaining to that resource.
- If your terminal type is not set, the first menu displayed by the ASCII Installation Assistant requires you to enter your terminal type (TTY). If you enter a terminal type that is not valid, this menu redisplay until a valid type is entered.
If you enter a valid terminal type that does not match your terminal, the next screen displayed might be unreadable. In this case, press the break key sequence to return to the Set Terminal Type screen. For most terminal types, the break key sequence is Ctr1-C.

Configuring AIX with the Configuration Assistant

On a system with a graphical interface, the newly installed BOS reboots and the Configuration Assistant guides you through the configuration tasks.

If there are outstanding software license agreements that must be accepted before you can continue to use the machine, the Configuration Assistant prompts you to view and accept these agreements.

The Configuration Assistant guides you through the following configuration tasks:

- Set or verify system date and time.
- Set password for administrator (root user).
- Configure network communications (TCP/IP).

Note: To configure your machine as an NFS server, refer to *Configuring an NFS server in Networks and communication management*.

- Configure the Web server for Web-based System Manager remote management.
- Manage Software.
- Exit the Configuration Assistant.

The Manage Software option allows you to perform software management tasks immediately after a BOS installation. The following options are available:

- List installed software
- Install additional software
- List software licenses with license text

If you select **List installed software**, the following options are available:

- List automatically installed Software – Displays a list of all installed packages
- List optionally installed software – Displays a list of all optional software that was selected to be installed during BOS installation

If you select **Install additional software**, the following options are available:

- Install by bundles – Allows you to select from a list of software bundles to install additional software, such as the Mozilla Software Bundle or a User-Defined Software Bundle
- Selective install – Allows you to select a specific package or set of packages to install

The graphical interface for the Configuration Assistant provides step-by-step instructions for completing each configuration task. The tasks are presented to you in a logical sequence. Complete all configuration tasks before you use your system.

When you exit the Configuration Assistant, the guide asks you whether you want to start Configuration Assistant again the next time you restart the operating system. After exiting the Configuration Assistant, users can begin logging in to and using AIX.

To access the Configuration Assistant later, type `configassist` on the command line.

Configuring AIX with the Installation Assistant

On a system with an ASCII interface, the newly installed BOS reboots, and the Installation Assistant guides you through the configuration tasks.

You must have root user authority to use the Installation Assistant. To access the Installation Assistant later, type `install_assist` on the command line. You can also access it from a graphics system through the SMIT **smit assist** fast path.

If there are outstanding software license agreements that must be accepted before you can continue to use the machine, the Installation Assistant prompts you to view and accept these agreements.

The Installation Assistant guides you through the following configuration tasks:

- Set the system date and time for your time zone.
- Set a root user account password to restrict access to system resources.
- Configure network communications.
- Install software applications.
- Using SMIT (information only).
- Tasks Completed - Exit to Login.

The Install software applications option allows you to perform software management tasks immediately after a BOS installation. The following options are available:

- Install and Update Software
- Add License Passwords for Applications
- Show Installed License Agreements

If you select **Install and Update Software**, the following menu displays:

```
Install and Update Software
Move cursor to desired item and press Enter.
Install Software
Update Installed Software to Latest Level (Update All)
Install Software Bundle
Update Software by Fix (APAR)
Install and Update from ALL Available Software
```

You can also access this SMIT menu by using the **install_update** fast path.

Related information

The following are links to information related to Configuring AIX.

If you are installing from CD or DVD-ROM, or would like more information about installing optional software, refer to “Preparing to install optional software products and service updates” on page 86.

Migrating AIX

During a migration, the installation process determines which optional software products are installed on the existing version of the operating system. Components from previous releases that have been replaced by new software in AIX Version 6.1 are installed at the AIX Version 6.1 level.

Migration is the default installation method to move from AIX 5.1 and later to AIX Version 6.1.

Note: If you only want to install the next recommended maintenance or technology level of the operating system, use the SMIT **update_all** fast path or the **install_all_updates** command to update the filesets currently installed. For more information about updating to the next recommended maintenance or technology level of AIX, see “Optional products and service updates” on page 83.

Migration attempts to preserve all user configuration, while moving the operating system to a new level of software. The following steps are taken to achieve this objective:

- Save configuration files
- Prepare and remove old files

- Restore new files
- Remove unsupported or unnecessary filesets
- Migrate configuration data wherever possible
- Prepare VPD for install
- Update additional filesets

When performing a migration, the following occurs:

- All files in the **/usr/lib/drivers**, **/usr/lib/microcode**, **/usr/lib/methods** and **/dev** directories are removed from the system, so software support for device drivers must be reinstalled. Non-device software products and applications remain on the system, and work correctly if they are among those files described in “Ensuring binary compatibility between AIX 6.1 and earlier versions.”
- The following software products are removed from the system:
 - AIXwindows Interface Composer
 - Remote Customer Services
 - AIXwindows Development Environment
 - Display PostScript® functionality from AIXwindows Run-Time Environment Extensions
 - Performance Tools functionality from Extended Commands
 - OpenGL and graPHIGS
 - Xstation Manager®

In most cases, user-configuration files from the previous version of a product are saved when the new version is installed during a migration installation.

Ensuring binary compatibility between AIX 6.1 and earlier versions

After a migration installation, you might notice filesets on the system in the **OBSOLETE** state. Obsolete filesets were installed by earlier versions of the operating system, but they remain on the current system because the migration only replaced some, but not all, of the files they contain. These filesets remain necessary for systems running mixed levels of the operating system.

During a migration installation, the following filesets are automatically included:

- Base operating system commands
- Base operating system libraries
- Base operating system curses/termcap
- Base operating system networking
- Base operating system directories/files (symlinks)
- Messages
- X11R3
- X11R4
- X11 fonts

All AIX operating system applications intended for use with the POWER™ family, POWER2™, and POWER-based models run compatibly on AIX 6.1 without recompilation for those same models. The only exceptions to this statement are applications using the following:

- Unsupported self-loadable kernel extensions
- Certain High-Function Terminal (HFT) control interfaces
- X11R3 input device interfaces
- CIO LAN device driver interface
- SCSI device configuration methods (IHVs)

- nlist subroutine interface
- DCE threads
- Applications compiled using POWER2 or POWER-based compiler options, but executed on models other than POWER2 or POWER-based models.

Note: Any program that must run in all environments (POWER family, POWER2, and POWER-based models 601 and higher) must be compiled using the common mode of the compiler. Programs compiled to exploit POWER2 technology must be run on POWER2 processors. Existing code need not be recompiled to run.

A system using an earlier AIX version can operate as a server system for client machines using AIX 6.1 with the following exceptions:

- Network installation of AIX 6.1 clients
- Service SNA or X.25 to AIX 6.1 clients
- Service HCON to AIX 6.1 clients
- Service CGE extensions of PEX and PEX-PHIGS
- Use of AIX 6.1 client installation formats

Font servers might be required on the AIX 6.1 clients to reliably handle AIXwindows between server and client.

A system using AIX 6.1 might operate as a server system for client machines using an earlier version of AIX as long as the necessary compatibility options are installed. All statements about binary compatibility apply in this case. AIX 6.1 applications might not execute reliably on earlier versions of AIX systems using remote network mounts from an AIX 6.1 file system.

BOS pre- and post-migration checks

The **pre_migration** and **post_migration** commands perform various system checks to ensure a successful migration installation. Both commands are shipped in the **bos.rte** fileset.

In case the **pre_migration** command does not exist on a level of AIX that you want to check before performing a migration installation, the **pre_migration** command is also located in the **usr/lpp/bos** directory of the media file system. Copy the **pre_migration** command from the **usr/lpp/bos** directory of the new AIX media version you are about to perform the migration.

The output from the **pre_migration** command is saved to the system in the **/home/pre_migration date** directory.

The **pre_migration** command performs the following actions:

- List the device filesets being removed.
- List all other filesets being removed.
- List the saved base configuration files that will not be merged.
- List configuration files that will be merged.
- Verify fileset version consistency.
- Create a list of all filesets installed, to be used by the **post_migration** command.
- Check the size and location of the boot logical volume.
- Check the major number for rootvg is 10.
- Check for the missing DB directory for the **bos.net.ipsec.keymgt** fileset.
- Determine if Kerberos is being used.
- Check disk and memory sizes.
- Check the firmware level for IBM System p5™ 7025/7026 systems.

Note: The required version of the firmware can be obtained from the following Web site:

<http://techsupport.services.ibm.com/server/mdownload>

Refer to the history section of the firmware level for the statement of AIX Version 6.1 support.

- If migrating from an earlier version of AIX, verify that the correct updates are applied.
- Verify system platform.

Note: If the platform is not supported for AIX 6.1, a minimal pre-migration check is performed since the system may be used for a mksysb migration.

- Print a recommendation that a system backup be made before the migration.

The output from the **post_migration** command is saved in the **/home/post_migration** *date* directory.

The **post_migration** command performs the following actions:

- Verify fileset version consistency.
- Check the installation list from before the migration, and inform the user of any filesets that might still need migrating.
- Compare saved and merged configuration scripts and save the differences.

Migrating to AIX 6.1

Follow this procedure to migrate to AIX 6.1.

Note:

1. The boot logical volume requires 20 MB of contiguous disk space. During migrations, the **inuextendblv** command runs to ensure there are contiguous partitions for hd5. If contiguous partitions are not present, the **inuextendblv** command attempts to create them. If the partitions are not present and the **inuextendblv** command fails to create them, the migration is stopped.
2. The settings in your bootlist are not migrated. After a migration, the bootlist is set to the primary boot device.

Attention: This procedure requires shutting down and reinstalling the base operating system. Whenever you reinstall any operating system, schedule your downtime when it least impacts your workload to protect yourself from a possible loss of data or functionality. Before you perform a migration installation, ensure that you have reliable backups of your data and any customized applications or volume groups. For instructions on how to create a system backup, refer to “Creating system backups” on page 155.

Prerequisites

Before starting the migration, complete the following prerequisites:

- All requisite hardware, including any external devices (such as tape, CD, or DVD-ROM drives), must be physically connected. If you need further information, refer to the hardware documentation that accompanied your system.
- Before migrating your BOS to AIX 6.1, ensure that the root user has a primary authentication method of **SYSTEM**. You can check this condition by typing the following command:

```
# lsuser -a auth1 root
```

Change the value, if needed, by typing the following command:

```
# chuser auth1=SYSTEM root
```

- Before you begin the installation, other users who have access to your system must be logged off.
- Verify that your applications runs on AIX 6.1. Also, verify that your applications are binary-compatible with AIX 6.1. If your system is an application server, verify that there are no licensing issues. Refer to your application documentation or provider to verify on which levels of AIX your applications are

supported and licensed. You can also check the *AIX application availability guide* at the following Web address: <http://www.ibm.com/servers/aix/products/ibmsw/list/>

- Verify that your hardware microcode is up-to-date.
- All requisite hardware, including any external devices (such as tape, CD, or DVD-ROM drives), must be physically connected and powered on. If you need further information, refer to the hardware documentation that accompanied your system.
- Use the **errpt** command to generate an error report from entries in the system error log. To display a complete detailed report, type the following:

```
# errpt -a
```

- There must be adequate disk space and memory available. AIX 6.1 requires 256–512 MB of memory and 2.2 GB of physical disk space. For additional release information, see the *AIX 6.1 Release Notes*.
- Run the pre-migration script.
- Make a backup copy of your system software and data. For instructions on how to create a system backup, refer to “Creating system backups” on page 155.

Note: As of AIX 6.1, the 32-bit kernel has been deprecated. Therefore, 64-bit hardware is required to run AIX 6.1 (POWER4™, POWER5™, or POWER6™ systems only). Architecture models that use 604e processors are not 64-bit capable and will not run AIX 6.1. These RS/6000® models include:

- 7025 F50 Series
- 7026 H50 Series
- 9076 H50 Series
- 7043 150 Series
- 7046 B50 Series

To verify the processor capability, run the following command:

```
/usr/sbin/prtconf -c
```

The command returns CPU Type: 32-bit or CPU Type: 64-bit depending on the system capability. If your system does not have the **prtconf** command, you can use the **bootinfo -y** command. For more information, see the *AIX 6.1 Release Notes*.

Preparing your system for BOS installation

Follow this procedure for preparing to migrate to the AIX 6.1 BOS.

Prepare for migrating to the AIX 6.1 BOS by doing the following:

1. Insert the *AIX Volume 1* disk into the media device.
2. Shut down your system. If your machine is currently running, power it off now by following these steps:
 - a. Log in as the root user.
 - b. Type the following command: **# shutdown -F**
 - c. If your system does not automatically power off, place the power switch in the Off (0) position.

Attention: You *must not* turn on the system unit until instructed to do so in “Booting from your installation media” on page 149.

3. Turn on all attached external devices. These include the following:
 - Terminals
 - CD or DVD-ROM drives
 - Tape drives
 - Monitors
 - External disk drives

Turning on the external devices first is necessary so the system unit can identify each peripheral device during the startup (boot) process.

Booting from your installation media

Follow this procedure to migrate your current version of the operating system to AIX 6.1.

If you are using an ASCII console that was not defined in your previous system, complete “Step 3. Setting up an ASCII terminal” on page 57 before proceeding.

The following steps migrate your current version of the operating system to AIX 6.1:

1. Turn the system unit power switch from Off (0) to On (|).
2. When the system beeps twice, press F5 on the keyboard (or 5 on an ASCII terminal). If you have a graphics display, you see the keyboard icon on the screen when the beeps occur. If you have an ASCII terminal (also called a tty terminal), you see the word keyboard when the beeps occur.

Note: If your system does not boot using the F5 key (or the 5 key on an ASCII terminal), refer to your hardware documentation for information about how to boot your system from an AIX product CD.

The system begins booting from the installation media.

3. If your system has an LED display, the three-digit LED should display c31.
If you have more than one console, each might display a window that directs you to press a key to identify your system console. A different key is specified for each console displaying this window. If this window displays, press the specified key *only* on the device to be used as the system console. (The system console is the keyboard and display device used for installation and system administration.) Press a key on one console *only*.
A window displays, asking you to select a language to be used for installation instructions.
4. Select the language you prefer to use for installation instructions.
5. When the Welcome to Base Operating System Installation and Maintenance window displays, either begin the migration immediately by typing 1 to select **Start Install Now with Default Settings**, or verify the installation and system settings by typing 2 to select **Change/Show Installation Settings and Install**. If you want to change any settings, follow the procedure in “Step 5. Verifying or changing the installation settings” on page 59.

Note:

- You should not have to change settings simply to select the migration installation method. If a previous version of the operating system exists, the installation method defaults to migration.
 - The available installation methods vary, depending on the version of the operating system that is currently installed (before migration). For information about the BOS installation methods, refer to “Installing the Base Operating System” on page 40. For information about the installation options available for a migration installations, refer to “BOS installation options” on page 43.
6. Verify the selections in the Migration Installation Summary window and press Enter.
 7. Confirm the migration installation process in the Migration Confirmation window, and press Enter to begin the migration installation.

Finishing the BOS migration

After prompting for confirmation, the installation process begins. The Installing Base Operating System window displays.

As the installation progresses, the numbers increment in the fields that show percentage complete and elapsed time to indicate the installation status. After the base run-time environment is installed, status information displays about other software that is being installed. After the BOS installation is complete, the system automatically reboots.

After the system has restarted, you are prompted to configure your installation of the BOS. Go to “Configuring AIX” on page 142 for information on the configuration process.

Note: If there is not enough space to migrate all of the usually migrated software, a collection of software called a Migration Bundle is available when you install additional software later. You must create additional disk space on the machine on which you want to install, and then you can run **smit update_all** to complete the installation, during which the Migration Bundle is installed.

If you are not doing the installation from a graphics console, a Graphics_Startup bundle is created. Refer to “Preparing to install optional software products and service updates” on page 86 for more information about installing software bundles and for information on migrating or installing optional software products. “Maintaining optional software products and service updates” on page 90 describes how to remove software from the system to release disk space.

Run the post-migration script and verify the output files.

Checking modifications to configuration files

The **geninstall** command provides an easy way to see what modifications have been made to the configuration files listed in **/etc/check_config.files**.

When these files have been changed during a **geninstall** installation or update operation, the differences between the old and new files is recorded in the **/var/adm/ras/config.diff** file. If **/etc/check_config.files** requests that the old file be saved, the old file can be found in the **/var/adm/config** directory. The **/etc/check_config.files** file can be edited and used to specify whether old configuration files that have been changed should be saved (indicated by s) or deleted (indicated by d), and has the following format:

```
d /etc/inittab
```

mksysb migration

A **mksysb** migration allows you to restore the **mksysb** from an old system to a system that supports AIX 6.1 and then migrate the **mksysb**.

Traditional migration moves the operating system of a supported hardware configuration to a newer level. A **mksysb** migration installation is the recommended method of installation to move unsupported hardware configurations running AIX 4.3 and later to new supported hardware running AIX 6.1.

A **mksysb** migration is not intended for systems that you can migrate with a traditional migration. This method allows you to bypass the hardware limitation by restoring the **mksysb** on the new hardware configuration and migrate it without running AIX 4.3. The resulting system will be running the new level of AIX.

Requirements for using a customized bosinst.data file with a mksysb migration

A customized **bosinst.data** file is required to perform a **mksysb** migration installation.

Your customized **bosinst.data** file must meet the following requirements to be used with a **mksysb** migration:

- The file must be provided using the supplementary diskette method or using the client file method (NIM). For additional information about creating this file, see “Customizing your installation” on page 80. The supplementary CD or DVD method is not supported for a **mksysb** migration.
- The file must contain a new variable called **MKSYSB_MIGRATION_DEVICE**. This variable specifies the name of the device that contains the **mksysb**. For information about the supported values for this variable, see “bosinst.data control_flow stanza descriptions” on page 46.
- The following variables in the **CONTROL_FLOW** stanza must be set as follows:
 - **PROMPT** must be set to *no*.
 - **INSTALL_METHOD** must be set to *migrate*.
 - **EXISTING_SYSTEM_OVERWRITE** must be set to *yes*.

- RECOVER_DEVICES must be set to *no*. A **mksysb** migration attempts to recover the sys0 attributed for the source system as specified in the **mksysb** ODM, but no other device-specific data is recovered from the source system.

Any user-supplied values for these variable are ignored.

- The file should list the disks to be installed in the TARGET_DISK_DATA stanza to ensure that only those disks are used. A **mksysb** migration is a combination of an overwrite installation and a migration installation. The overwrite portion destroys all of the data on the target disks. The TARGET_DISK_DATA stanza must have enough information to clearly single out a disk. If you supply an empty TARGET_DISK_DATA stanza, the default disk for the platform is used, if available. The following examples show possible values for the TARGET_DISK_DATA stanza:

Example 1. Disk names only (two disks)

```
target_disk_data:
    PVID =
    PHYSICAL_LOCATION =
    CONNECTION =
    LOCATION =
    SIZE_MB =
    HDISKNAME = hdisk0

target_disk_data:
    PVID =
    PHYSICAL_LOCATION =
    CONNECTION =
    LOCATION =
    SIZE_MB =
    HDISKNAME = hdisk1
```

Example 2. Physical location specified (1 disk)

```
target_disk_data:
    PVID =
    PHYSICAL_LOCATION = U0.1-P2/Z1-A8
    CONNECTION =
    LOCATION =
    SIZE_MB =
    HDISKNAME =
```

Example 3. By physical volume ID (PVID)(2 disks)

```
target_disk_data:
    PVID = 0007245fc49bfe3e
    PHYSICAL_LOCATION =
    CONNECTION =
    LOCATION =
    SIZE_MB =
    HDISKNAME =

target_disk_data:
    PVID = 00000000a472476f
    PHYSICAL_LOCATION =
    CONNECTION =
    LOCATION =
    SIZE_MB =
    HDISKNAME =
```

Performing a mksysb migration with CD or DVD installation

You can perform a **mksysb** migration with a CD or DVD installation of AIX 6.1.

Prerequisites

- All requisite hardware, including any external devices (such as tape, CD, or DVD-ROM drives), must be physically connected. For more information about connecting external devices, see the hardware documentation that accompanied your system.
- Before you begin the installation, other users who have access to your system must be logged off.

- Verify that your applications run on AIX 6.1. Also, verify that your applications are binary-compatible with AIX 6.1. If your system is an application server, verify that there are no licensing issues. Refer to your application documentation or provider to verify on which levels of AIX your applications are supported and licensed. You can also check the *AIX application availability guide* at the following Web address: <http://www.ibm.com/servers/aix/products/ibmsw/list/>
- Verify that your hardware microcode is up-to-date.
- There must be adequate disk space and memory available. AIX 6.1 requires 256–512 MB of memory and 2.2 GB of physical disk space. For additional release information, see the *AIX 6.1 Release Notes*.
- Make a backup copy of your system software and data. For instructions on how to create a system backup, refer to “Creating system backups” on page 155. This backup is used during the **mksysb** migration installation to restore your system files prior to migration.
- If the source system is available, run the pre-migration script on it. Ignore any messages that pertain to the hardware configuration of the source system because the migration takes place on the target system. Correct any other problems as recommended by the script.

Step 1. Prepare your system for installation

Prepare for migrating to the AIX 6.1 BOS by completing the following steps:

1. Insert the *AIX Volume 1* disk into the media device.
2. Shut down the target system. If your machine is currently running, power it off by following these steps:
 - a. Log in as the root user.
 - b. Type `shutdown -F`.
 - c. If your system does not automatically power off, place the power switch in the Off (0) position.

Attention: You must not turn on the system unit until instructed to do so.

3. Turn on all attached external devices. External devices include the following:
 - Terminals
 - CD-ROM drives
 - DVD-ROM drives
 - Tape drives
 - Monitors
 - External disk drives

Turning on the external devices first is necessary so that the system unit can identify each peripheral device during the startup (boot) process.
4. If your `MKSYSB_MIGRATION_DEVICE` is a tape, insert the tape for the **mksysb** in the tape drive. If your `MKSYSB_MIGRATION_DEVICE` is a CD or DVD, and there is an additional CD or DVD drive on the system (other than the one being used to boot AIX), insert the **mksysb** CD or DVD in the drive to avoid being prompted to swap medias.
5. Insert your customized **bosinst.data** supplemental diskette in the diskette drive. If the system does not have a diskette drive, use the network installation method for **mksysb** migration.

Step 2. Boot from your installation media

The following steps migrate your current version of the operating system to AIX 6.1. If you are using an ASCII console that was not defined in your previous system, you must define it. For more information about defining ASCII consoles, see “Step 3. Setting up an ASCII terminal” on page 57.

1. Turn the system unit power switch from Off (0) to On (I).
2. When the system beeps twice, press F5 on the keyboard (or 5 on an ASCII terminal). If you have a graphics display, you will see the keyboard icon on the screen when the beeps occur. If you have an ASCII terminal (also called a tty terminal), you will see the word “keyboard” when the beeps occur.

Note: If your system does not boot using the F5 key (or the 5 key on an ASCII terminal), refer to your hardware documentation for information about how to boot your system from an AIX product media.

The system begins booting from the installation media. The **mksysb** migration installation proceeds as an unattended installation (non-prompted) unless the `MKSYSB_MIGRATION_DEVICE` is the same CD or DVD drive as the one being used to boot and install the system. In this case, the user is prompted to switch the product media for the **mksysb** CD or DVD to restore the **image.data** and the **/etc/filesystems** file. After this happens the user is prompted to reinsert the product media and the installation continues. When it is time to restore the **mksysb** image, the same procedure repeats.

The BOS menus do not currently support **mksysb** migration, so they cannot be loaded. In a traditional migration, if there are errors that can be fixed by prompting the user for information through the menus, the BOS menus are loaded. If such errors or problems are encountered during **mksysb** migration, the installation asserts and an error stating that the migration cannot continue displays. Depending on the error that caused the assertion, information specific to the error might be displayed. If the installation asserts, the LED shows "088".

Step 3. Finish the BOS migration

After the installation process begins, the Installing Base Operating System screen displays.

As the installation progresses, the numbers in the percentage complete field and the elapsed time field increment to indicate the installation status. After the **mksysb** is restored, the base run-time environment is installed, status information about other software that is being installed displays. After the BOS installation is complete, the system automatically reboots.

After the system has restarted, you are prompted to configure your installation of the BOS. For more information on configuring the BOS, see "Configuring AIX" on page 142.

Note:

If there is not enough space to migrate all of the usually migrated software, a collection of software called a migration bundle is available when you install additional software later. You must create additional disk space on the machine where you want to install the migration bundle, and then you can run **smitty update_all** to complete the installation where the migration bundle is installed.

If you are not doing the installation from a graphics console, a **Graphics_Startup** bundle is created. For more information on this, see "Optional products and service updates" on page 83. For information on how to remove software from the system to release disk space, see "Maintaining optional software products and service updates" on page 90.

If the pre-migration script ran on the source system, run the post-migration script and verify the output files.

Performing a mksysb migration with NIM installation

You can perform a **mksysb** migration with a NIM installation of AIX 6.1.

Prerequisites

- All requisite hardware, including any external devices (such as tape, CD, or DVD-ROM drives), must be physically connected. For more information about connecting external devices, see the hardware documentation that accompanied your system.
- Before you begin the installation, other users who have access to your system must be logged off.
- Verify that your applications run on AIX 6.1. Also, verify that your applications are binary-compatible with AIX 6.1. If your system is an application server, verify that there are no licensing issues. Refer to your

application documentation or provider to verify on which levels of AIX your applications are supported and licensed. You can also check the *AIX application availability guide* at the following Web address: <http://www.ibm.com/servers/aix/products/ibmsw/list/>

- Verify that your hardware microcode is up-to-date.
- There must be adequate disk space and memory available. AIX 6.1 requires 256–512 MB of memory and 2.2 GB of physical disk space. For additional release information, see the *AIX 6.1 Release Notes*.
- Make a backup copy of your system software and data. For instructions on how to create a system backup, refer to “Creating system backups” on page 155. This backup is used during the **mksysb** migration installation to restore your system files prior to migration.
- If the source system is available, run the pre-migration script on it. Ignore any messages that pertain to the hardware configuration of the source system because the migration takes place on the target system. Correct any other problems as recommended by the script.

Step 1. Prepare your system for installation

To prepare your system, verify that the following conditions are met:

- The target system must be a defined client to the NIM master.
- The required customized **bosinst.data** file described in the prerequisites is a NIM **bosinst.data** resource or supplied using the supplemental diskette method.

To instruct the NIM master to start an installation of the client run the following command:

```
# nim -o bos_inst -a source=rte -a spot=spot name -a lpp_source=lpp source name  
-a bosinst_data=bosinst_data resource name -a mksysb=mksysb name client_name
```

The **SPOT** file and **lpp_source** file should be at the AIX 6.1 level.

Alternatively, the **mksysb** can be allocated to the client first using a separate **alloc** operation. Then use command line or **smitty nim** to perform a **bos_inst** operation on the client. If the **mksysb** is allocated to the client prior to the **bos_inst** operation, the specification of the **mksysb** is not required.

Step 2. Boot from your installation media

The following steps migrate your current version of the operating system to AIX 6.1. If you are using an ASCII console that was not defined in your previous system, you must define the console. For more information about defining ASCII consoles, see “Step 3. Setting up an ASCII terminal” on page 57.

1. After the network boot image is transferred, the system begins booting using the network resources.
2. The **mksysb** migration installation proceeds as an unattended installation (non-prompted).

The BOS menus do not currently support **mksysb** migration, so they cannot be loaded. In a traditional migration, if there are errors that can be fixed by prompting the user for information through the menus, the BOS menus are loaded. If such errors or problems are encountered during **mksysb** migration, the installation asserts and an error stating that the migration cannot continue displays. Depending on the error that caused the assertion, information specific to the error might be displayed. If the installation asserts, the LED shows “088”.

Step 3. Finish the BOS migration

After the installation process begins, the Installing Base Operating System screen displays.

As the installation progresses, the numbers in the percentage complete field and the elapsed time field increment to indicate the installation status. After the **mksysb** is restored, the base run-time environment is installed, status information about other software that is being installed displays. After the BOS installation is complete, the system automatically reboots.

After the system has restarted, you are prompted to configure your installation of the BOS. For more information on configuring the BOS, see “Configuring AIX” on page 142.

Note:

If there is not enough space to migrate all of the usually migrated software, a collection of software called a migration bundle is available when you install additional software later. You must create additional disk space on the machine where you want to install the migration bundle, and then you can run **smit update_all** to complete the installation where the migration bundle is installed.

If you are not doing the installation from a graphics console, a **Graphics_Startup** bundle is created. For more information on this, see “Optional products and service updates” on page 83. For information on how to remove software from the system to release disk space, see “Maintaining optional software products and service updates” on page 90.

If the pre-migration script ran on the source system, run the post-migration script and verify the output files.

Related information

The following are links to information related to migrating AIX.

- For additional release information, see the *AIX 6.1 Release Notes*.
- For late-breaking information, which might include information on the configuration process and installed software, refer to readme files.
- For information about installing optional software, refer to “Preparing to install optional software products and service updates” on page 86.

Creating and installing system backups

Use the following information to create and install system backups.

Notes:

1. References to CD also apply to DVD.
2. AIX provides the **cdromd** CD and DVD automount facility, which is included in the **bos.cdmount** fileset. To determine if the **cdromd** daemon is enabled on your system, run the following command:

```
# lssrc -s cdromd
```

The **cdromd** daemon can interfere with scripts, applications, or instructions that attempt to mount the CD or DVD device without first checking to see if the device is already enabled. A resource or device busy error occurs in such a condition. Use the **cdumount** or **cdeject** command to unmount the device. Then mount the device as specified in the program or instructions. Alternatively, use the **cdcheck -m** or **mount** command to determine the current mount point of the device. For further information, see the **cdromd** command documentation in *AIX Version 6.1 Commands Reference, Volume 1*.

The installation code allows for this automatic mounting. If **cdromd** is enabled and the **mkcd** command is run, the CD-R or DVD-RAM is ejected after the image is completed. If you do not want to have the media ejected, then the **cdromd** daemon should be put in the inoperative state with the following command:

```
# stopsrc -s cdromd
```

Creating system backups

You can create and verify a bootable backup copy, or *mksysb image*, of your root volume group. You can also make separate backup copies of user volume groups.

The *root volume group* is a hard disk or group of disks that contains:

- Startup files
- Base Operating System (BOS)
- System configuration information
- Optional software products

A *user volume group*, also called the *nonroot volume group*, typically contains data files and application software.

A system backup does the following:

- Contains a working copy of your system. In the event your system data becomes corrupted, you can use this information to restore your system to working order.
- Allows you to transfer installed and configured software from one system to others. You can use the Web-based System Manager or SMIT to make a backup image of the root volume group or user volume groups.

A backup transfers the following configurations from the source system to the target system:

- **rootvg** volume group information
- Paging space information
- Logical volume information
- Placement of logical partitions (if creating map files has been selected in the Web-based System Manager or SMIT).

Note: The use of map files is not recommended if you plan to reinstall the backup to target systems other than the source system, or the disk configuration of the source system is to be changed before reinstalling the backup.

Using the Web-based System Manager or the SMIT backup menu lets you preserve configuration information, thus avoiding some of the configuring tasks normally required after restoring a system backup.

A backup preserves the configuration if the following are true:

- The target system has the same hardware configuration as the source system.

AND

- The target disk has enough space to hold the backup image.

The Web-based System Manager and SMIT both use the **mksysb** command to create a backup image, stored either on CD, DVD, tape, or in a file. If you choose CD, DVD, or tape, the backup program by default writes a *boot image*, which makes the medium suitable for installing. For more information, see “Creating a system backup to CD-R, DVD-R, or DVD-RAM” on page 159.

If you have problems with installations from a **mksysb** image, see Troubleshooting problems with installation from mksysb backup.

Installing all device and kernel support before the backup is created

Create a system backup that contains all devices and kernel types.

All devices and kernels are installed by default when performing a base operating system installation. This allows you to create a system backup that contains all devices and kernel types. Because the system backup contains all the devices and kernel support, the system backup can be used to install another system without the need for the AIX product media. This option is available in the Install Options menu in the BOS installation menus. If you change the default (**yes**) to **no**, only the devices and kernel type for your system configuration will be installed.

This value is read from the **ALL_DEVICES_KERNELS** field in the `/var/adm/ras/bosinst.data` file on the product media that you used to boot the system.

After the system is installed, you can check if all the devices and kernel types have been installed on the system as follows:

```
# grep ALL_DEVICES_KERNELS bosinst.data
```

Output similar to the following displays:

```
ALL_DEVICES_KERNELS = yes
```

For more information about the **bosinst.data** file, refer to “Customizing your installation” on page 80.

Preparing to create system backups

Meet these prerequisites before creating system backups.

Before creating system backups, complete the following prerequisites:

- Be sure you are logged in as root user.
- Consider altering passwords and network addresses if you use a backup to make master copies of a source system. Copying passwords from the source to a target system can create security problems. Also, if network addresses are copied to a target system, duplicate addresses can disrupt network communications.
- Mount all file systems you want to back up. The **mksysb** command backs up mounted JFS (journaled file systems) and JFS2 (enhanced journaled file systems) in the **rootvg**. Refer to the **mount** command for details.

Note: The **mksysb** command does not back up file systems mounted across an NFS network.

- Unmount any local directories that are mounted over another local directory.

This backup procedure backs up files twice if a local directory is mounted over another local directory in the same file system. For example, if you mount **/tmp** over **/usr/tmp**, the files in the **/tmp** directory are then backed up twice. This duplication might exceed the number of files a file system can hold, which can cause a future installation of the backup image to fail.

- Use the **/etc/exclude.rootvg** file to list files you do not want backed up.
- Make at least 40 MB of free disk space available in the **/tmp** directory. The **mksysb** command requires this working space for the duration of the backup.

Use the **df** command, which reports in units of 512-byte blocks, to determine the free space in the **/tmp** directory. Use the **chfs** command to change the size of the file system, if necessary.

For example, the following command adds 40 MB of disk space to the **/tmp** directory of a system with 4 MB partitions:

```
chfs -a size=+80000 /tmp
```

- All hardware must already be installed, including external devices, such as tape and media drives.
- The **bos.sysmgt.sysbr** fileset in the BOS System Management Tools and Applications software package must be installed. The **bos.sysmgt.sysbr** fileset is automatically installed. To determine if the **bos.sysmgt.sysbr** fileset is installed on your system, type:

```
ls|pp -l bos.sysmgt.sysbr
```

If your system has the **bos.sysmgt.sysbr** fileset installed, continue with one of the following procedures:

- “Creating a root volume group backup to tape or file” on page 158
- “Creating a system backup to CD-R, DVD-R, or DVD-RAM” on page 159
- “Backing-up a user volume group” on page 164

If the **lspp** command does not list the **bos.sysmgt.sysbr** fileset, install it before continuing with the backup procedure. Refer to “Optional products and service updates” on page 83 for instructions, or enter the following command:

```
installp -agqXd device bos.sysmgt.sysbr
```

where *device* is the location of the software; for example, `/dev/cd0` for CD-ROM drive.

Creating a root volume group backup to tape or file

Follow this procedure for creating a root volume group backup to tape or file.

You can use either the Web-based System Manager or SMIT to create a system backup to be stored to tape or in a file.

For instructions on how to back up to CD or DVD, see “Creating a system backup to CD-R, DVD-R, or DVD-RAM” on page 159.

To create a root volume group backup:

- Use the Web-based System Manager **Backup and Restore** application and select **Back up the system**.

OR

- Use the following SMIT procedure:

1. Enter the **smit mksysb** fast path.

2. In the Back Up the System menu, make the following selections:

- Select which medium you want to use in the **Backup DEVICE or File** field. If you want to create a bootable backup, the medium must be tape or CD/DVD. See “Creating a system backup to CD-R, DVD-R, or DVD-RAM” on page 159 for more information. Then, select the appropriate option below:

TAPE Press the F4 key to list available devices and highlight the device name.

FILE Enter a full path and file name in the entry field.

- If you want to create map files, select **yes** in the **Create Map Files?** field.

Map files match the physical partitions on a drive to its logical partitions. When installing from a backup image, the BOS installation program uses map files to position the logical volumes on the target drive in the same partitions they were on in the source system. If you do not create map files, the installation program relies on the logical volume manager (LVM) to determine placement for the logical volumes. For more information, see *Using map files for precise allocation in Operating system and device management*.

Note: If you plan to reinstall the backup to target systems other than the source system, or if the disk configuration of the source system might change before reinstalling the backup, do not create map files.

- To exclude certain files from the backup, select **yes** in the **Exclude Files** field, then create an **/etc/exclude.rootvg** file with an ASCII editor, and enter the file names that you do not want included in your system backup image. You can use patterns for the file names that conform to the pattern matching conventions of the **grep** command. For example, to exclude all the contents of the directory called `scratch`, put the following line in the exclude file:

```
/scratch/
```

For another example, exclude the contents of the directory called **/tmp** and avoid excluding any other directories that have **/tmp** in the pathname by adding the following line to the exclude file:

```
^./tmp/
```

Note: All files are backed up relative to the current working directory. This directory is represented by a `.` (dot character). To exclude any file or directory for which it is important to have the search match the string at the beginning of the line, use a `^` (caret character)

as the first character in the search string, followed by a . (dot character), and then followed by the file name or directory to be excluded.

If the file name or directory being excluded is a substring of another file name or directory, use ^. (caret character followed by dot character) to indicate that the search should begin at the beginning of the line and/or use \$ (dollar sign character) to indicate that the search should end at the end of the line.

- To list each file as it is backed up, select **yes** in the **List files as they are backed up?** field. Otherwise, you see a percentage-completed progress message while the backup is created.
 - If you modified the **image.data** file and do not want a new one created, select **no** for **Generate new /image.data file?**. (The **image.data** file contains information about the sizes of all the file systems and logical volumes in your rootvg.)
 - If you are creating a bootable tape and you want to expand the system **/tmp** file system (if required by the backup program), select **yes** for **EXPAND /tmp if needed?**.
 - If the tape drive you are using provides packing (or compression), set the **Disable software packing of backup?** field to **yes**.
 - If you chose tape as the backup medium, either leave the default in the **Number of BLOCKS to write in a single output** field or enter a different number.
 - If you chose file as the backup medium, press Enter. If you chose tape as the backup medium, insert the first blank backup tape into the drive and press Enter.
3. The COMMAND STATUS screen displays, showing status messages while the system makes the backup image.

If you chose tape as the backup medium, the system might prompt you to insert the next tape during the backup by displaying a message similar to the following:

Mount next Volume on /dev/rmt0 and press Enter.

If this message displays, remove the tape and label it, including the BOS version number. Then insert another tape and press Enter.

When the backup process finishes, the **COMMAND:** field changes to **OK**.

4. When the backup completes, press F10 to exit SMIT.
5. If you selected tape as the backup medium, remove the last tape and label it. Write-protect the backup tapes.
6. Record any backed-up root and user passwords. Remember that these passwords become active if you use the backup to either restore this system or install another system.

You have created the backup of your root volume group (rootvg). If you created bootable tapes, you can use these tapes to start your system if for some reason you cannot boot from hard disks.

Creating a system backup to CD-R, DVD-R, or DVD-RAM

Creating a backup on CD-R, DVD-R, or DVD-RAM media is similar to making a backup tape for your personal use, but with some noticeable differences.

For DVD media, the following formats for creating backups are available:

- ISO9660 CD format, which is available for DVD-R/DVD-RAM media.
- Universal Disk Format (UDF), which is available for DVD-RAM media. For information about creating a backup to DVD-RAM using UDF, see “Creating system backups using DVD-RAM media and Universal Disk Format” on page 162.

Note: For information about CD-R, DVD-R, or DVD-RAM drives and CD-R, DVD-R, or DVD-RAM creation software, refer to the following readme file:

/usr/lpp/bos.sysmgt/mkcd.README.txt

Both Web-based System Manager and SMIT use the **mkcd** command, which calls the **mksysb** or **savevg** command, if needed.

For system backups, the CDs or DVDs can be created as:

- Non-bootable CDs or DVDs
- Bootable CDs or DVDs

A bootable system backup contains a boot image and all the device and kernel packages necessary to install a system. A backup CD or DVD can be used to install (clone) a large number of machines, which is convenient when each machine in the system environment needs to have the same image installed.

Note: It is possible that a backup CD or DVD would not boot all machines of the same type because not every machine has the same hardware configuration. Depending on what packages were made available during the creation of the backup, the backup might not have all the necessary packages to boot an individual system. Most required packages for systems are present on the BOS AIX media.

Web-based System Manager and SMIT interfaces are available for the **mkcd** command. Online help can guide you through the required steps.

Meeting hardware and software requirements for system backups:

These are the hardware and software requirements for system backup to CD-R, DVD-R, or DVD-RAM.

The **mkcd** command requires that you already have the software installed to create a CD or DVD file system in Rock Ridge format and to *burn* or write the CD or DVD. The GNU versions of the **cdrecord** and **mkisofs** commands are installed with a BOS installation. Hardware and software that have been tested with this command include the following:

Software	Hardware
GNU and Free Software Foundation, Inc. readcd command version 1.9 mkisofs command version 1.13	DVD-RAM

Preparing to run the mkcd command:

To run the **mkcd** command, you need extra working space.

A separate file system or directory is required for each of the following:

- Storing a **mksysb** or **savevg** image
- Storing the CD or DVD file system contents
- Storing the CD or DVD images before they are recorded

The **mkcd** command creates the following file systems if they are not already present or if alternative file systems or directories have not been specified:

/mkcd/mksysb_image

Space requirement depends on the size of the **mksysb** image that is to be created. The **mkcd** command attempts to calculate this space and verify that adequate space is available before starting to create the **mksysb** image.

Note: When the **mkcd** command calculates the space requirements needed for the **/mkcd/mksysb_image** directory, it also adds the space used by the excluded files (**/etc/exclude.rootvg**). It is therefore possible that the **mkcd** command might not be able to create the **/mkcd/mksysb_image** directory.

/mkcd/cd_fs

Requires 645 megabytes (up to 4.38 GB for DVD)

/mkcd/cd_images

Requires at least 645 megabytes (up to 4.38 GB for DVD) of space. If the **-R** or **-S** flags are used to specify not removing the images and there are multiple volumes required, more space must be provided.

The space used in these file systems is only temporary (unless the **-R** or **-S** flag is specified to save the images). If the **mkcd** command creates the file systems, it also removes them. Each file system or directory might require over 645 megabytes (up to 4.38 GB for DVD).

If your machine does not have sufficient space, you can use NFS to mount some space from another server system; however, the file systems must be writable. You can create a **/mkcd** file system that is very large (1.5 GB for CD or 9 GB for DVDs). The **/mkcd** file system can then be mounted onto the clients when they want to create a backup CD or DVD for their systems. When creating very large backups (larger than 2 GB) with the **mkcd** command, the file system must be large-file enabled and the **ulimit** values must be set to `unlimited`.

The **mkcd** command with the **-L** flag allows the creation of DVD-sized ISO9660 images. The **mkcd** command with the **-U** flag allows the creation of UDF DVD images. You can also use the **mkdvd** command to create DVD-sized ISO9660 images.

Creating a root volume group backup on CD or DVD with the ISO9660 format:

Follow this procedure to create a root volume group backup on CD or DVD with the ISO9660 format.

You can use Web-based System Manager or SMIT to create a root volume group backup on CD or DVD with the ISO9660 format, as follows:

- Use the Web-based System Manager **Backup and Restore** application and select **System backup wizard method**. This method lets you create bootable or non-bootable backups on CD-R, DVD-R, or DVD-RAM media.
OR
- To create a backup to CD, use the **smit mkcd** fast path.
- To create a backup to DVD, use the **smit mkdvd** fast path and select **ISO9660 (CD format)**.

The following procedure shows you how to use SMIT to create a system backup to CD. (The SMIT procedure for creating a system backup to an ISO9660 DVD is similar to the CD procedure.)

1. Type the **smit mkcd** fast path. The system asks whether you are using an existing **mksysb** image.
2. Type the name of the CD-R device. (This can be left blank if the **Create the CD now?** field is set to `no`.)
3. If you are creating a **mksysb** image, select **yes** or **no** for the **mksysb** creation options, **Create map files?** and **Exclude files?**. Verify the selections, or change as appropriate.

The **mkcd** command always calls the **mksysb** command with the flags to extend **/tmp**.

You can specify an existing **image.data** file or supply a user-defined **image.data** file. See step 16 on page 162.

4. Enter the file system in which to store the **mksysb** image. This can be a file system that you created in the **rootvg**, in another volume group, or in NFS-mounted file systems with read-write access. If this field is left blank, the **mkcd** command creates the file system, if the file system does not exist, and removes it when the command completes.

5. Enter the file systems in which to store the CD or DVD file structure and final CD or DVD images. These can be file systems you created in the rootvg, in another volume group, or in NFS-mounted file systems. If these fields are left blank, the **mkcd** command creates these file systems, and removes them when the command completes, unless you specify differently in later steps in this procedure.
6. If you did not enter any information in the file systems' fields, you can select to have the **mkcd** command either create these file systems in the **rootvg**, or in another volume group. If the default of **rootvg** is chosen and a **mksysb** image is being created, the **mkcd** command adds the file systems to the exclude file and calls the **mksysb** command with the **-e** exclude files option.
7. In the **Do you want the CD or DVD to be bootable?** field, select **yes** to have a boot image created on the CD or DVD. If you select **no**, you must boot from a product CD at the same *version.release.maintenance* level, and then select to install the system backup from the system backup CD.
8. If you change the **Remove final images after creating CD?** field to no, the file system for the CD images (that you specified earlier in this procedure) remains after the CD has been recorded.
9. If you change the **Create the CD now?** field to no, the file system for the CD images (that you specified earlier in this procedure) remains. The settings that you selected in this procedure remain valid, but the CD is not created at this time.
10. If you intend to use an Install bundle file, type the full path name to the bundle file. The **mkcd** command copies the file into the CD file system. You must have the bundle file already specified in the **BUNDLES** field, either in the **bosinst.data** file of the **mksysb** image or in a user-specified **bosinst.data** file. When this option is used to have the bundle file placed on the CD, the location in the **BUNDLES** field of the **bosinst.data** file must be as follows:


```
../usr/sys/inst.data/user_bundles/bundle_file_name
```
11. To place additional packages on the CD or DVD, enter the name of the file that contains the packages list in the **File with list of packages to copy to CD** field. The format of this file is one package name per line.

If you are planning to install one or more bundles after the **mksysb** image is restored, follow the directions in the previous step to specify the bundle file. You can then use this option to have packages listed in the bundle available on the CD. If this option is used, you must also specify the location of installation images in the next step.
12. Enter the location of installation images that are to be copied to the CD file system (if any) in the **Location of packages to copy to CD** field. This field is required if additional packages are to be placed on the CD (see the previous step). The location can be a directory or CD device.
13. You can specify the full path name to a customization script in the **Customization script** field. If given, the **mkcd** command copies the script to the CD file system. You must have the **CUSTOMIZATION_FILE** field already set in the **bosinst.data** file in the **mksysb** image or else use a user-specified **bosinst.data** file with the **CUSTOMIZATION_FILE** field set. The **mkcd** command copies this file to the **RAM** file system. Therefore, the path in the **CUSTOMIZATION_FILE** field must be as follows:


```
../filename
```
14. You can use your own **bosinst.data** file, rather than the one in the **mksysb** image, by typing the full path name of your **bosinst.data** file in the **User supplied bosinst.data file** field.
15. To turn on debugging for the **mkcd** command, set **Debug output?** to yes. The debug output goes to the **smit.log**.
16. You can use your own **image.data** file, rather than the **image.data** file in the **mksysb** image, by typing the full path name of your **image.data** file for the **User supplied image.data file** field.

Creating system backups using DVD-RAM media and Universal Disk Format:

Universal Disk Format (UDF) allows you to manipulate files directly on the DVD-RAM media.

The system backup image is an archived file composed of many files that cannot be manipulated. However, the installation packages and any files that are not contained in the backup image, can be

directly manipulated on the DVD-RAM. After the DVD is mounted the files can be changed by using an editor or new files can be copied to the DVD using the various copy and restore commands such as the **cp**, **mv**, **restore** commands.

With UDF and DVD-RAM, system space is only needed for the backup image. A high-level description of the UDF backup process is as follows:

1. Create a backup of a volume group to a file (archive) on a hard disk containing enough space to hold the backup image.
2. Populate UDF with files needed to boot and install a system.
3. Copy backup to DVD-RAM media.

The **mkcd** or the **mkdvd** command with the **-U** flag is used to create a UDF file system on the DVD-RAM.

UDF allows for the possibility of changing files directly on the DVD-RAM media, such as a **bosinst.data** file and **image.data** or **vgname.data** file. Without UDF for example, to add a user-defined **bosinst.data** file to a backup image, you must restore the backup image to a location, add the file, and then back up the files again.

Or, you had to create a supplemental diskette containing the changed **bosinst.data** file, and use the supplemental diskette in conjunction with the backup. However, some system configurations might not provide diskette drives, making this procedure more difficult.

Creating a root volume group backup on DVD-RAM with Universal Disk Format:

Use this procedure to creating a root volume group backup on DVD-RAM with Universal Disk Format (UDF).

To create a root volume group backup on DVD-RAM with UDF, do the following:

- Use the Web-based System Manager **Backup and Restore** application and select **System backup wizard method**. This method lets you create bootable or non-bootable backups on DVD-RAM media.
OR
- Use SMIT to create a backup to DVD-RAM with UDF, as follows:
 1. Enter the **smit mkdvd** fast path. The system asks whether you are using an existing **mksysb** image.
 2. Select **UDF (Universal Disk Format)**.
 3. Enter the name of the DVD-RAM device.
 4. If you are creating a **mksysb** image, select **yes** or **no** for the **mksysb** creation options. The options are as follows:

- **Create map files?**

- **Exclude files?**

The **mkcd** command always calls the **mksysb** command with the flags to extend **/tmp**.

You can specify an existing **image.data** file or supply a user-defined **image.data**. See step 14 on page 164.

5. Enter the file system or directory in which to store the **mksysb** image. This can be a file system you created in the **rootvg**, in another volume group, or in NFS mounted file systems with read-write access. If left blank, the **mkcd** command creates the file system and removes it when the command completes.
6. If you did not enter information in the file system field, you can select to have the **mkcd** command either create these file systems in the **rootvg**, or in another volume group. If the default of **rootvg** is chosen and a **mksysb** image is being created, the **mkcd** command adds the file systems to the exclude file and calls the **mksysb** command with the exclude files option **-e**.

7. Do you want the DVD to be bootable? If you select **no**, you must boot from a product CD at the same *version.release.maintenance* level, and then select to install the system backup from the system backup DVD.
8. If you intend to use an Install bundle file, enter the full path name to the bundle file. The **mkcd** command copies the file into the DVD file system. You must have the bundle file already specified in the **BUNDLES** field, either in the **bosinst.data** file of the **mksysb** image or in a user-specified **bosinst.data** file. When this option is used to have the bundle file placed on the DVD, the location in the **BUNDLES** field of the **bosinst.data** file must be as follows:

```
../usr/sys/inst.data/user_bundles/bundle_file_name
```

9. Additional packages can be placed on the CD by entering the name of the file that contains the packages list in the **File with list of packages to copy to DVD** field. The format of this file is one package name per line.

If you are planning to install one or more bundles after the **mksysb** image is restored, follow the directions in the previous step to specify the bundle file. You can then use this option to have packages listed in the bundle available on the DVD. If this option is used, you must also specify the location of installation images in the next step.

10. Enter the location of installation images that are to be copied to the CD file system (if any) in the **Location of packages to copy to DVD** field. This field is required if additional packages are to be placed on the DVD (see the previous step). The location can be a directory or DVD device.
11. You can specify the full path name to a customization script in the **Customization script** field. If given, the **mkcd** command copies the script to the CD file system. You must have the **CUSTOMIZATION_FILE** field already set in the **bosinst.data** file in the **mksysb** image or use a user-specified **bosinst.data** file with the **CUSTOMIZATION_FILE** field set. The **mkcd** command copies this file to the **RAM** file system. Therefore, the path in the **CUSTOMIZATION_FILE** field must be as follows:

```
../filename
```

12. You can use your own **bosinst.data** file, rather than the one in the **mksysb** image, by entering the full path name of your **bosinst.data** file in the **User supplied bosinst.data file** field.
13. To enable debugging for the **mkcd** command, set **Debug output?** to **yes**. The debug output goes to the **smit.log**.
14. You can use your own **image.data** file, rather than the **image.data** file in the **mksysb** image, by entering the full path name of your **image.data** file for the **User supplied image.data file** field.

Backing-up a user volume group

The **savevg** command provides the ability to create a user-volume group backup to a CD, DVD, tape, or file.

The **savevg** command finds and backs up all files belonging to a specified volume group. The volume group must be varied-on, and the file systems must be mounted.

This user backup contains a copy of a non-rootvg volume group, and is useful for volume groups that contain user data.

The **savevg** command uses a data file created by the **mkvgdata** command. The data file created is as follows:

```
/tmp/vgdata/vgname/vgname.data
```

The **vgname.data** file contains information about a user volume group. The **savevg** command uses this file to create a backup image that can be used by the **restvg** command to re-create the user volume group.

The **savevg** command with the **-r** flag is used to back up only a user-volume group's logical volume structure information. The data needed to list backup properties is also backed up. The **-r** flag runs the **mkvgdata** command for the volume group specified to create a **vgname.data** file. The **-r** flag backs up

only the **vgname.data** file, any map files, and the **backup.data** file. The backup image that is created is used with the **restvg -r** command option to create only the volume group, logical volumes, and file system information contained in the file, without restoring any data. For example, to back up only the *paul* user volume group's structure information to the **/vg_backup/paul_vg_data** file, type the following:

```
savevg -r -f /vg_backup/paul_vg_data paul
```

You can also use the **mkcd** command to create a user volume group backup to CD or DVD. The **mkcd** command saves one volume group at a time to a CD or DVD.

The **mkcd** command with the **-L** flag allows the creation of ISO9660 DVD sized images. The **mkcd** or the **mkdvd** command with the **-U** flag allows the creation of UDF DVD images.

If your **rootvg** image and **savevg** image are small enough to fit on one CD or DVD, you can save them both by using the **-I** (stacklist) and **-z** (customization_script) flags. The **-I** flag gives a list of images to copy to the CD or DVD. The **-z** flag lets you create a script to restore **savevg** backups. For example, if you make a copy of a non-rootvg volume group ahead of time, and then write a script that calls the **restvg** command, your non-rootvg volume group would be restored to **hdisk2** at the end of the installation of **rootvg**, as shown by the following command:

```
restvg -d /SP0T/installp/ppc/savevg_image hdisk2
```

This procedure is recommended *only* if you know you want to restore the non-rootvg volume group every time you install. Otherwise, you might just want to store it on the CD/DVD, then use **restvg** to restore it after reboot. The **restvg** command can restore from CD or DVD if the name of the image is *savevg_image*. If you save the non-rootvg backup on a CD or DVD with a different file name, you can insert that CD or DVD and use the full path to the file name as the device for the **restvg** command.

Use either Web-based System Manager or SMIT to back up user volume groups to CD or DVD.

Backing-up a user volume group using Web-based System Manager:

You can use the wizard for creating a non-bootable CD or DVD that contains only a volume group backup image of a user volume group.

Use Web-based System Manager and select **System backup wizard method**.

Creating a user volume group backup using SMIT:

With this procedure, you can use SMIT to create a backup image of a user volume group.

1. To back up a user volume group to tape or file using SMIT, type `smit savevg` on the command line. Back up a user volume group to CD by typing `smit savevgcd` on the command line. Back up a user volume group to DVD by typing `smit savevgdvd` on the command line.
2. When the Save a Volume Group screen displays, use the steps for backing up the root volume group as a guide for backing up user volume groups. There is one exception to this procedure. If you want to exclude files in a user volume group from the backup image, create a file named **/etc/exclude.volume_group_name**, where *volume_group_name* is the name of the volume group you want to backup.
3. If you exclude files, edit the **/etc/exclude.volume_group_name** file and enter the patterns of file names that you do not want included in your backup image. The patterns in this file are input to the pattern-matching conventions of the **grep** command to determine which files are excluded from the backup.

Using the user volume group backup options

After you have a system backup or a user volume group backup, you may want to verify the backup or list information about the backup image.

You can use this information for the operations you can perform on a backup image. The commands used to perform these operations are the **lsmksysb** command for system backups, and the **lssavevg** command for user volume groups. Using the **lsmksysb** command or the **lssavevg** command, you can perform the operations described in the following topics:

Previewing information about a volume group backup:

The preview option allows you to view volume group information, the date and time the backup was made, and the level of AIX.

You can use the **lsmksysb** command or the **lssavevg** command with the **-l** option to preview a backup image. For example, to preview a system backup file called **/tmp/mybackup**, type the following:

```
# lsmksysb -l -f /tmp/mybackup
```

Output similar to the following displays:

```
VOLUME GROUP:      rootvg
BACKUP DATE/TIME:  Mon Jul 29 22:03:27 CDT 2002
UNAME INFO:        AIX va08 2 5 000974AF4C00
BACKUP OSLEVEL:    5.2.0.0
none
MAINTENANCE LEVEL: none
BACKUP SIZE (MB):  1408
SHRINK SIZE (MB):  1242
```

```
rootvg:
LV NAME           TYPE      LPs  PPs  PVs  LV STATE      MOUNT POINT
hd5               boot     1    1    1    closed/syncd  N/A
hd6               paging   16   16   1    open/syncd    N/A
hd8               jfs2log 1    1    1    open/syncd    N/A
hd4               jfs2     1    1    1    open/syncd    /
hd2               jfs2     21   21   1    open/syncd    /usr
hd9var            jfs2     1    1    1    open/syncd    /var
hd3               jfs2     1    1    1    open/syncd    /tmp
hd1               jfs2     1    1    1    open/syncd    /home
hd10opt           jfs2     1    1    1    open/syncd    /opt
fs1v00            jfs2     31   31   1    open/syncd    /export/nim
fs1v01            jfs2     1    1    1    open/syncd    /tftpboot
```

To preview a backup image in the SMIT, use the **lsbackupinfo** fast path.

Verifying system backup (tape only):

You can list the contents of a **mksysb** image on tape.

To list the contents of a **mksysb** image on tape, you can use either Web-based System Manager (type **wsm** on the command line, then choose the Backup and Restore application) or SMIT (type **smit lsmksysb** on the command line). The listing verifies most of the information on the tape, but does not verify that the backup media can be booted for installations. The only way to verify that the boot image on a **mksysb** tape functions properly is by booting from the media.

Viewing the backup log for volume group and system backups:

You can view the backup log that is created each time a volume group is backed up. The log file contains information on previous volume group and system backups.

You can use the **lsmksysb** command or the **lssavevg** command with the **-B** option to view the backup log file. Type:

```
# lsmksysb -B
```

Output similar to the following displays:

```
#Device;Command;Date;Shrink Size;Full Size;Maintenance Level
/export/mksysb/generic_sysb;"mksysb -X -e /export/mksysb/generic_sysb";M
on Jul 29 22:11:17 CDT 2002;1242;1408;
/export/mksysb/generic_sysb;"mksysb -X -e /export/mksysb/generic_sys
b";Tue Jul 30 16:38:31 CDT 2002;2458;2720;
```

To view the backup log in the SMIT, select **View the Backup Log** in the System Backup Manager menu.

Viewing filesets installed in a system backup:

You can view the filesets installed in a system backup using the **lsmkysb** command with the **-L** option.

For example, to view the filesets installed in a system backup, type the following:

```
# lsmkysb -L -f generic_sysb
```

Output similar to the following displays:

Fileset	Level	State	Description

Path: /usr/lib/objrepos			
IMNSearch.bld.DBCS Modules	2.4.0.0	COMMITTED	NetQuestion DBCS Buildtime
.			
.			
.			
bos.terminfo.wyse.data	5.3.0.0	COMMITTED	Wyse Terminal Definitions
bos.txt.spell.data	5.3.0.0	COMMITTED	Writer's Tools Data
bos.txt.tfs.data	5.3.0.0	COMMITTED	Text Formatting Services Data

To view the filesets installed in a system backup in SMIT, use the **lsppbackup** fast path.

Installing system backups

You can install the Base Operating System (BOS) using a system backup image, also called a *mksysb image*.

You can use a system backup to restore a corrupted operating system. But installing a system from a backup can also reduce (or even eliminate) repetitive installation and configuration tasks. For example, you can use a backup to transfer optional software installed on the *source* system (the machine from which you created the backup copy), in addition to the basic operating system. Also, the backup image can transfer many user configuration settings to the *target* system (a different machine on which you are installing the system backup).

You can install a system from a backup image that is stored on tape, CD, or DVD, or in a file. If you want to install a backup stored in a directory on your network installation server, refer to "Using a mksysb image to install the base operating system on a NIM Client" on page 238.

The procedures to install from backup operate either in prompted or nonprompted mode, depending on conditions set in the **/bosinst.data** file and on compatibility between the backup image and the installed machine. See "Customizing your installation" on page 80 for information on how to modify the **bosinst.data** file to preset installation parameters when you create a system backup.

When installing the backup image, the system checks whether the target system has enough disk space to create all the logical volumes stored on the backup. If there is enough space, the entire backup is recovered. Otherwise, the installation halts and the system prompts you to choose additional destination hard disks.

File systems are created on the target system at the same size as they were on the source system, unless the backup image was created with **SHRINK** set to **yes** in the **image.data** file, or you selected **yes** in the BOS Install menus. An exception is the **/tmp** directory, which can be increased to allocate enough space for the **bosboot** command. For more information about setting variables, see the **image.data** file in *AIX Version 6.1 Files Reference*.

When you install a system backup on the source machine, the installation program restores the Object Data Manager (ODM) on that machine. Restoring the ODM allows devices to keep the same number they had on the original system. For example, if you install two ethernet cards in your source machine, first en0 in slot 3 and then en1 in slot 1, the cards are not renumbered if they are detected in reverse order when you install a system backup. When you clone a system backup, the installation program rebuilds the ODM on the target system after installing the image, so devices are renumbered. In both cases, the **rootvg** and all logical volumes have different IDs.

If you reinstall a system backup on the source machine, and the target system does not have exactly the same hardware configuration as the source system, the program might modify device attributes in the following target system files:

- All files in the **/etc/objrepos** directory beginning with "Cu"
- All files in the **/dev** directory

The settings in the bootlist are not restored. After a system backup restore, the bootlist is reset to the primary boot device.

Shared volume groups have AUTO ON set to no. Only user volume groups that have AUTO ON set to **yes** are imported. The reason for this is that shared volume groups might lock out other systems' access to the volume group because of installation queries on the shared volume group at the time of a **mksysb** restore operation.

If you have problems with installations from a **mksysb** image, see Troubleshooting problems with installation from **mksysb** backup.

Cloning a system backup

You can install a system backup on a target machine to propagate a consistent operating system, optional software, and configuration settings.

With a **mksysb** image, you can clone one system image onto multiple target systems. However, the target systems might not contain the same hardware devices or adapters, or require the same kernel as the source system. All devices and kernels are automatically installed during a BOS installation. As a result, when you create a system backup, the **mksysb** image contains all the device and kernel support. For example, you can create a system backup from *System_A* and install *System_A*'s **mksysb** image onto *System_B* without having to use product media to boot *System_B*. For more information on installing all devices and kernels, see "Installing all device and kernel support before the backup is created" on page 156.

If you are performing a clone installation, device information will not be restored to the target system by default. During a clone installation, the BOS installation process verifies that the **mksysb** image is from the system you are trying to install. If the target system and the **mksysb** image are different, the device information is not recovered. This behavior is determined by the **RECOVER_DEVICES** variable in the **bosinst.data** file. This variable can be set to Default, yes, or no. The following list shows the resulting behaviors for each value:

Default

No recovery of devices

yes Attempted rebuild of ODM

no No recovery of devices

Note: You can override the default value of **RECOVER_DEVICES** by selecting **yes** or **no** in the Backup Restore menu or by editing the value of the attribute in the **bosinst.data** file.

If the source system does not have the correct passwords and network information, you can make modifications on the target system now. Also, some products (such as graPHIGS) ship device-specific files. If your graphics adapter is different on the target system, verify that the device-specific filesets for graphics-related LPPs are installed.

Installing a system backup on the source machine

You can use Web-based System Manager or command line to restore an operating system onto the same machine from which you created the backup.

For either interface, the following conditions must be met before beginning the procedure:

- All hardware must already be installed, including external devices, such as tape and CD/DVD-ROM drives.
- Obtain your system backup image from one of the following sources:

CD or DVD BOS CDs, created in one of the following ways:

- Using the Web-based System Manager **Backup and Restore** application. Select **System backup to writable CD**.
- Using the SMIT Back Up This System to CD menu.
- From the command line, using the **mkcd** or **mkdvd** command.

Tape BOS tapes, created in one of the following ways:

- Using the Web-based System Manager **Backup and Restore** application. Select **Back up the system**.
- Using the SMIT Back Up the System to Tape/File menu.
- From the command line, using the **mksysb -i Target** command.

Note: If devices were removed from or replaced on the system after the backup was created, their information will be restored when you install a backup. The system shows these devices in a defined state because the ODM from the system at the time of backup is restored instead of rebuilt.

Network The path to your backup image file. For information about installing a backup across a network, refer to Using a mksysb image to install the base operating system on a NIM Client.

Note: Before you begin, select the tape or CD/DVD-ROM drive as the primary boot device. For additional information, refer to the section in your hardware documentation that discusses system management services.

Due to enhancements in the **mksysb** command, you can control how devices are recovered when you install a system backup on the source machine. This behavior is determined by the **RECOVER_DEVICES** variable in the **bosinst.data** file. This variable can be set to default, yes, or no. The following list shows the resulting behaviors for each value:

default

ODM is restored

yes

ODM is restored

no

No recovery of devices

Note: You can override the default value of **RECOVER_DEVICES** by selecting **yes** or **no** in the Backup Restore menu or by editing the value of the attribute in the **bosinst.data** file.

To use Web-based System Manager:

1. Start the Web-based System Manager by typing **wsm** on the command line as root user.

2. Expand **Software** in the Navigation Area, select **Overview and Tasks**, then select **Reinstall Operating System**.
3. Choose the installation device:
 - Network
If you choose this option, your machine must either be a configured NIM client, or have access to a NIM environment. If your machine is not a NIM client, the Reinstall Base Operating System wizard leads you through the process. For more information on setting up a NIM environment, see Using installation images to install the base operating system on a NIM client.
 - Tape or CD/DVD-ROM
4. Choose **Install a system backup image (mksysb)** as the installation type.
5. Follow the wizard prompts to complete the procedure.

To use the command line:

1. You can use the **bootlist** command to display or change the primary boot device.
To display the primary boot device:

```
bootlist -m normal -o
```


To change the primary boot device:

```
bootlist -m normal rmt0
bootlist -m normal cd0
```
2. Power off your machine by following these steps:
 - a. Log in as the root user.
 - b. Enter the following command:

```
shutdown -F
```
 - c. If your system does not automatically power off, place the power switch in the Off (0) position.

Attention: Do *not* turn on the system unit until Step 6 on page 171.

3. Turn on all attached external devices. These include:
 - Terminals
 - CD or DVD drives
 - Tape drives
 - Monitors
 - External disk drivesTurning on the external devices first is necessary so that the system unit can identify them during the startup (boot) process.
4. Insert the installation media into the tape or CD or DVD drive.
You might find that on certain tape drive units, the tape drive door does not open while the system is turned off. If you have this problem, use the following procedure:
 - a. Turn on the system unit.
 - b. Insert the boot installation tape (insert Volume 1 if you received more than one volume).
 - c. Turn off the system unit and wait for 30 seconds.
5. If you are not using an ASCII terminal, skip to Step 6. If you are using an ASCII terminal, use the following criteria to set the communications, keyboard, and display options.

Note: If your terminal is an IBM 3151, 3161, or 3164, press the Ctrl+Setup keys to display the Setup Menu and follow the on-screen instructions to set these options. If you are using some other ASCII terminal, refer to the appropriate documents for information about how to set these options. Some terminals have different option names and settings than those listed here.

Communication Options	
Option	Setting
Line Speed (baud rate)	9600
Word Length (bits per character)	8
Parity	no (none)
Number of Stop Bits	1
Interface	RS-232C (or RS-422A)
Line Control	IPRTS

Keyboard and Display Options	
Option	Setting
Screen	normal
Row and Column	24x80
Scroll	jump
Auto LF (line feed)	off
Line Wrap	on
Forcing Insert	line (or both)
Tab	field
Operating Mode	echo
Turnaround Character	CR
Enter	return
Return	new line
New Line	CR
Send	page
Insert Character	space

- Turn the system unit power switch from Off (0) to On (|). The system begins booting from the backup media. If your system is booting from tape, it is normal for the tape to move back and forth. If your system has an LED display, the three-digit LED should display c31.

Note: You can boot from production media (tape or CD) if your backup media fails to boot. The initial Welcome screen includes an option to enter a maintenance mode in which you can continue the installation from your backup media. Refer to Troubleshooting an installation from a system backup for more information.

If you have more than one console, each terminal and directly attached display device (or console) might display a screen that directs you to press a key to identify your system console. A different key is specified for each terminal displaying this screen. If this screen is displayed, then press the specified key *only* on the device to be used as the system console. (The system console is the keyboard and display device used for installation and system administration.) Press a key on only one console.

Note: If the **bosinst.data** file lists a valid display device for the **CONSOLE** variable, you do not manually choose a system console. Read Customizing your installation for more information about the **bosinst.data** file.

- The type of installation that begins is determined by the settings of the **PROMPT** field in the control_flow stanza of the **bosinst.data** file. Use the following criteria to determine the type of installation you will be using:

PROMPT = no Nonprompted Installation. This installation method is used if the backup image is configured to install automatically, without having to respond to the installation program. Go to step 8.

PROMPT = yes Prompted Installation. This installation method is used if you need to use menu prompts to install the backup image. Also, use this installation method if a nonprompted installation halts and the Welcome to Base Operating System Installation and Maintenance screen displays. Go to step 9.

8. A successful nonprompted installation requires no further instructions because the installation is automatic.

Note: If the backup image holds source system-configuration information that is incompatible with the target system, the nonprompted installation stops and a prompted installation begins.

The Installing Base Operating System screen displays before the installation starts. The nonprompted installation pauses for approximately five seconds before beginning. After this time, the non-prompted installation continues to completion.

However, if you decide to interrupt the automatic installation and start a prompted session, type 000 (three zeros) at the terminal and follow the remaining steps in this procedure.

9. The Welcome to the Base Operating System Installation and Maintenance screen displays.

Note: You can view Help information at each screen of this installation process by typing 88.

Choose the **Change/Show Installation Settings and Install** option.

10. The System Backup Installation and Settings displays. This screen shows current settings for the system. An ellipsis follows the disk listed in the first line if there is more than one disk selected.

11. Either accept the settings or change them. For more information on using map files, see Creating system backups.

To accept the settings and begin the installation, skip to step 16.

To change the settings, continue with step 12.

12. Type 1 in the System Backup Installation and Settings screen to specify disks where you want to install the backup image. The Change Disk(s) Where You Want to Install screen displays. This screen lists all available disks on which you can install the system backup image. Three greater-than signs (>>>) mark each selected disk.

Type the number and press Enter for each disk you choose. Type the number of a selected disk to deselect it. You can select more than one disk.

Note: You can also specify a supplemental disk by typing 66 and pressing the Enter key for the **Disks not known to Base Operating System Installation** option. This option opens a new menu that prompts for a device support media for the supplemental disk. BOS installation configures the system for the disk and then returns to the Change Disk(s) Where You Want to Install screen.

13. After you have finished selecting disks, press the Enter key.

The screen that displays after you press the Enter key is dependent on the availability of map files for *all* of the selected disks. The criteria for this is as follows:

- If one or more selected disks have no maps, BOS installation returns directly to the System Backup Installation and Settings screen. Skip to step 15.
- If all selected disks have maps, the Change Use Maps Status screen displays, where you choose whether to use maps for installation. Continue with step 14.

To preserve the placement of logical volumes during a future restoration of the backup, you can create map files before backing up a system. Map files, stored in the **/tmp/vgdata/rootvg** directory, match the physical partitions on a drive to its logical partitions. Create map files either with the SMIT Backup the System menu, using Web-based System Manager, or using the **-m** option when you run the **mksysb** command.

For more information about map files, see Using Map Files for Precise Allocation in *Operating system and device management*.

14. Type either 1 or 2 in the Change Use Maps Status screen to specify whether the installation program is to use maps.

When you complete this choice, BOS installation returns to the System Backup Installation and Settings screen.

15. Decide whether BOS installation is to shrink file systems on the disks where you install the system. When you choose this option, the logical volumes and file systems within a volume group are re-created to the minimum size required to contain the data. This reduces wasted free space in a file system.

File systems on your backup image might be larger than required for the installed files. Press the 2 key to toggle the **Shrink File Systems** option between **Yes** and **No** in the System Backup Installation and Settings screen. The default setting is **No**.

Note: Shrinking the file system disables the use of maps.

16. Type 0 to accept the settings in the System Backup Installation and Settings screen.

The Installing Base Operating System screen displays the rate of completion and duration.

If you specified a supplemental disk in step 12, an untitled screen temporarily replaces the Installing Base Operating System screen. When this screen displays, it prompts you to place the device-support media in the drive and press the Enter key. BOS installation reconfigures the supplemental disk, then returns to the Installing Base Operating System screen.

The system reboots automatically when the installation completes.

Software product packaging

The following is additional software product packaging information.

Installing variously formatted software packages

You can use this information to install software packages received in different formats.

You can install RPM Package Manager (RPM) and **InstallShield MultiPlatform (ISMP)** formatted packages in addition to **installp** formatted packages. Use the Web-based System Manager, SMIT, or the **geninstall** command to install and uninstall these types of packages. The **geninstall** command can detect the format type of a specified package and run the appropriate installation command.

The AIX product media contains **installp** packages and RPM packages that are installed during a base operating system (BOS) installation. The **installp** packages are located in the following path:

```
/mount_point/installp/ppc
```

The RPM packages are located in the following path:

```
/mount_point/RPMS/ppc
```

If you have media that contains **ISMP** packages for AIX, the **ISMP** packages are located in the following path:

```
/mount_point/ISMP/ppc
```

If you are using the **geninstall** command to install RPM or **ISMP** packages, use the prefix type to indicate to the **geninstall** command the type of package that you are installing. The package prefix types are the following:

I: **installp** format

R: **RPM** format

J: ISMP format

E: interim fix format

For example, to install the **cdrecord** RPM package and the **bos.games installp** package, type the following:

```
# geninstall -d/dev/cd0 R:cdrecord I:bos.games
```

The **geninstall** command detects that the **cdrecord** package is an RPM package type and runs the **rpm** command to install the **cdrecord** package. The **geninstall** command then detects that **bos.games** is an **installp** package type and runs the **installp** command to install the **bos.games** package. The process for uninstallation is similar to the installation process.

In Web-based System Manager and SMIT, if you are selecting the packages from a software list, you need not specify the prefix type.

Fileset installation packages

The installation packaging of each fileset in a product can be divided into three parts.

These parts include the *usr*, *root*, and *share* parts. Although this can add further complexity to the understanding of the packaging, this parceling of a software product is necessary for the product to be used by diskless and dataless clients in AIX.

Because they are parceled, a product can be installed on one machine (called the *server*) and then be used remotely by other machines on a network (called the *clients*).

Note: The *usr* and *root* parts of a product are packaged in the same installable package.

usr part

The *usr* part of a software product contains the part of the product that can be shared by machines that have the same hardware architecture. Most of the software that is part of a product usually falls into this category.

In a standard system, the *usr* parts of products are stored in the **/usr** file tree. For example, the **ls** command would be in the **/usr/bin/ls** file.

root part

Every product has a *usr* part. The *root* part of a software product contains the part of the product that cannot be shared. The *root* part of a product is optional because many products may not have any files that need to be specific to each individual machine.

In a client/server environment, these are the files for which there must be a unique copy for each client of a server. Most of the *root* software is associated with the configuration of the machine or product.

In a standard system, the *root* parts of a product are stored in the root (*/*) file tree. The **/etc/objrepos** directory contains the *root* part of an installable software product's vital product data (VPD).

share part

The *share* part of a software product contains the part of the product that can be shared among machines, even if they have different hardware architectures, which can include nonexecutable text or data files. For example, the *share* part of a product might contain documentation written in ASCII text or data files containing special fonts.

The *share* part of a product is optional because many products might not have any files that can be shared among different hardware platforms. The *share* part of a product is always packaged in a separately installable package.

In a standard system, the *share* parts of products are usually stored in the **/usr/share** file tree. For example, a dictionary database might be stored in the **/usr/share/dict/words** file.

Creating software packages

The **mkinstallp** command allows users to create their own software packages for AIX.

Packages created with the **mkinstallp** command are in **installp** format and are installed or removed with the **mkinstallp** command.

Files to be packaged by the **mkinstallp** command must be in a directory structure such that the location of the file relative to the root build directory is the same as the destination of the file after installation. For example, if the */usr/bin/somecommand* command is to be installed by a **mkinstallp** package, the *somecommand* parameter must be in the *buildroot/usr/bin* directory when the **mkinstallp** command is invoked.

When the contents of a package are in the correct directory structure, the **mkinstallp** command prompts for basic package data through the command line. This data includes the package name, requisites, descriptions of files to be packaged, and more. The **mkinstallp** command then generates a template file based on responses given by the user. To prevent command line prompting when using a template file, create and edit the template file directly and use the **mkinstallp** command with the **-T** flag.

For example, to package the */usr/bin/foo* command using the */tmp/packages* directory as the build root, make sure the following directory structure exists by typing the following at the command line:

```
mkdir /tmp/packages
touch /tmp/packages/usr/bin/foo
```

Then type the following:

```
mkinstallp -d /tmp/packages
```

For more examples, refer to the */usr/lpp/bos/README.MKINSTALLP* file.

The **mkinstallp** command is included with the **bos.adt.insttools** fileset.

Packaging software bundles

The Web-based System Manager and the SMIT Install application look for bundles in */usr/sys/inst.data/sys_bundles* and in */usr/sys/inst.data/user_bundles*.

The **sys_bundles** location is typically reserved for system-defined bundles (those which come with AIX). Users can create their own bundle files in the **user_bundles** directory.

The bundle definition file name must end in **.bnd**, because the AIX installation interfaces that process bundles recognize only bundle files that end in **.bnd**. Use any editor to create bundle files, which can contain comments and fileset names. Lines beginning with the pound sign (#) are recognized as comments and are ignored by the bundle processing code. When you have completed your list of filesets, save the file and make sure the file has the appropriate read permission. Invoking a bundle installation interface displays your bundle without the **.bnd** extension.

The following are examples of the predefined bundles:

- *Server Bundle*. A collection of software packages for machines running AIX in a multiuser standalone or networked environment. This bundle emphasizes functionality over disk utilization.
- *Graphics Bundle*. A collection of software packages that provides support of graphical environments. Graphical support may be automatically installed on some systems during BOS installation.
- *Migration Bundle*. This bundle is created when there was not enough disk space available to complete a migration installation during the BOS installation process. The bundle consists of a collection of software packages that must be installed to complete your migration. You must install this bundle to complete the migration installation. Install the bundle using the **smit update_all** fast path.

You may also need to install the *Graphics Bundle*.

Some system bundles might refer to installation images that are spread across multiple media. If you see errors indicating that filesets could not be found on the media you are using, insert the media containing the missing filesets and retry the bundle installation.

The system bundles are located in the `/usr/sys/inst.data/sys_bundles` directory. To list the system bundles, type the following:

```
ls /usr/sys/inst.data/sys_bundles/*.bnd
```

You can also use the SMIT `list_bundle` fast path to list the system bundles.

The `geninstall` and `gencopy` commands handle multiple software sources to be specified when a bundle file is used. This is accomplished by grouping software images together under `#MEDIA=` headings in the bundle file. Any images listed under such a heading must reside on the specified media. Media can be specified as the name of a CD (such as *Base Install Media Volume 1* or *AIX Linux Toolbox CD*) or as a local directory (such as the `/usr/sys/inst.images` directory).

The `#MEDIA=` heading is used to designate the location of the file sets or packages in the bundle. For example, the *BaseAndLinuxCD Bundle* might contain the following information:

```
# BaseAndLinuxCDBundle contains packages on volume 1 of base media and on the AIX
# Linux Toolbox CD

#MEDIA=Base Install Media Volume 1
I:bos.adt.prof

#MEDIA=AIX Linux Toolbox CD
R:mtools
R:vim-common
```

When the `geninstall` and `gencopy` commands prompt for the additional media, they use the words provided in the `#MEDIA=` line. In the previous examples, the `geninstall` and the `gencopy` commands display a message informing you that the `bos.adt.prof installp` package is located on *Base Install Media Volume 1*, and the `mtools` and `vim-common` RPM packages are located on the *AIX Linux Toolbox CD*.

The `#MEDIA=` heading can also be used to indicate a directory. For example, the *CD_Directory Bundle* might contain the following information:

```
# CD_DirectoryBundle contains packages on volume 1 of base install media
# and in /usr/sys/inst.images

#MEDIA=/usr/sys/inst.images
I:bos.games

#MEDIA=Base Install Media Volume 1
I:bos.adt.prof
R:cdrecord-1.9-4
```

This informs the `geninstall` and the `gencopy` commands that the `bos.games installp` package is located in the ³ directory, and that the `bos.adt.prof installp` package and the `cdrecord-1.9-4` RPM package are located on *Base Install Media Volume 1*.

The `geninstall` and `gencopy` commands understand the `"%L"` wildcard in a bundle file. This wildcard is replaced at runtime with the value of the appropriate locale environment variable; `LC_ALL` is checked first, then `LC_MESSAGES`, and then `LANG`. This allows you to create a single bundle file corresponding to multiple installation configurations.

3. /usr/sys/inst.images

As an example, assume you provide the ABC product, which requires the **abc.rte** and **abc.com** filesets, as well as a message catalog fileset and a documentation fileset. You then provide the message and documentation filesets in English, French, and German, as follows:

```
abc.cat.en_US
abc.cat.fr_FR
abc.cat.de_DE
```

```
abc.doc.en_US
abc.doc.fr_FR
abc.doc.de_DE
```

The following bundle file would cause the appropriate combination of filesets to be installed, according to the locale variables on the target system:

```
I:abc.rte
I:abc.com
I:abc.cat.%L
I:abc.doc.%L
```

Note: If expanding the %L wildcard does not yield a fileset name corresponding to a fileset available on the installation media, then the UTF-8 version of the current locale will be tried, then **en_US**, and then **EN_US**.

You can determine whether or not the contents of a bundle are installed on your system with the **lsipp -Lb** command. For example, to determine whether the components of the `Alt_Disk_Install` bundle, which is located in the `/usr/sys/inst.data/sys_bundles` directory, are installed, run the following command:

```
lsipp -Lb Alt_Disk_Install.bnd
```

You might see output that looks similar to the following:

```
Fileset                Level   State  Type  Description
-----
bos.alt_disk_install.boot_images  6.1.00  C     F     Alternate Disk Installation Disk Boot Image
bos.alt_disk_install.rte         6.1.00  C     F     Alternate disk Installation Runtime

State codes:
A -- Applied.
B -- Broken.
C -- Committed.
E -- EFI X Locked.
O -- Obsolete. (partially migrated to newer version)
? -- Inconsistent State...Run lppchk -v.

Type codes:
F -- Installp Fileset
P -- Product
C -- Component
T -- Feature
R -- RPM Package
```

Installing with Network Installation Management

AIX Network Installation Management (NIM) allows you to manage the installation of the Base Operating System (BOS) and optional software on one or more machines.

You can install a group of machines with a common configuration or customize an installation for the specific needs of a given machine. The number of machines you can install simultaneously depends on the throughput of your network, the disk access throughput of the installation servers, and the platform type of your servers.

The NIM environment includes client and server machines. A *server* provides resources (for example, files and programs required for installation) to another machine. A machine that is dependent on a server to

provide resources is known as a *client*. Any machine that receives NIM resources is a client, although the same machine can also be a server in the overall network environment.

Most installation tasks in the NIM environment are performed from one server, called the *master*. A set of installation tasks can also be performed from NIM clients. Once the network installation setup is complete, users of standalone clients can, from the client, install software that is available on NIM servers.

NIM objects

The machines you want to manage in the NIM environment, their resources, and the networks through which the machines communicate are all represented as *objects* within a central database that resides on the master.

Network objects and their attributes reflect the physical characteristics of the network environment. This information does not affect the running of a physical network but is used internally by NIM for configuration information.

Each object in the NIM environment has a unique name that you specify when the object is defined. The NIM name is independent of any of the physical characteristics of the object it identifies and is only used for NIM operations. The benefit of unique names is that an operation can be performed using the NIM name without having to specify which physical attribute should be used. NIM determines which object attributes to use. For example, to easily identify NIM clients, the host name of the system can be used as the NIM object name, but these names are independent of each other. When an operation is performed on a machine, the NIM name is used, and all other data for the machine (including the host name) is retrieved from the NIM database.

NIM machines

The types of machines that can be managed in the NIM environment are *standalone*, *diskless*, and *dataless* clients. This section describes the differences between the machines, the attributes required to define the machines, and the operations that can be performed on them.

The NIM environment is composed of two basic machine roles: *master* and *client*. The NIM master manages the installation of the rest of the machines in the NIM environment. The master is the only machine that can remotely run NIM commands on the clients. All other machines participating in the NIM environment are clients to the master, including machines that may also serve resources.

Operating NIM on client machines

There are unique operations to initialize the different client configurations. NIM checks that the operation is a valid operation for a specific client configuration.

The following table shows the operations that can be performed on the different client configuration types.

NIM Operation	Machine Configuration		
	Standalone	Diskless	Dataless
bos_inst	x		
dkls_init		x	
dtls_init			x
diag	x	x	x
cust	x		
fix_query	x		
lppchk	x		
maint	x		
maint_boot	x		

NIM Operation	Machine Configuration		
	Standalone	Diskless	Dataless
reset	x	x	x
check	x	x	x
showlog	x	x	x
reboot	x	x	x

Defining NIM clients

You can use the NIM **define** operation to define standalone, diskless, and dataless clients.

The command line syntax is as follows:

```
nim -o define -t MachineType -a Attribute=Value ... MachineName
```

where the following attributes are required:

- t *MachineType* Specifies the type of machine being defined. Valid values are **standalone**, **diskless**, and **dataless**.
- a if=*Value* ... Stores network interface information for a NIM client, and requires a sequence number when specified. The value for this attribute consists of three required values and a fourth, optional value:
 - Value 1* Specifies the name of the NIM network to which this interface connects. If the name of the NIM network is unknown, then the **find_net** keyword can be used to match the client's IP address to a defined NIM network. If the **find_net** keyword is used, but NIM does not find a matching network, the optional **net_definition** attribute should be used to define the network, as well.
 - Value 2* Specifies the host name associated with this interface.
 - Value 3* Specifies the network adapter hardware address of this interface. A value of **0** can be specified unless broadcasting is used for network boot of the client.
 - Value 4* Specifies the logical device name of the network adapter used for this interface. If this value is not specified, NIM uses a default based on the type of network interface defined. This field is required when the client is defined on a heterogeneous network.

This attribute requires a sequence number for NIM to distinguish between multiple network interfaces. Because machines can be multihomed, NIM allows more than one **if** attribute per machine.

The following attributes are optional:

- a ring_speed=*Value* Specifies the ring speed of the client's token-ring adapter. This value is required if the client's NIM network is token-ring. This attribute requires a sequence number for NIM to distinguish between ring speeds for multiple interfaces on the machine.
- a cable_type=*Value* Specifies the cable type of the client's ethernet adapter. This value is required if the client's NIM network is Ethernet. This attribute requires a sequence number for NIM to distinguish between cable types for multiple interfaces on the machine.
- a netboot_kernel=*Value* Specifies the kernel type of the client. Valid values are **up** for uniprocessor machines and **mp** for multiprocessor machines. The default value is **up**.
- a iplrom_emu=*Value* Specifies the device that contains the IPL ROM emulation software. IPL ROM emulation is required for machines that do not have bootp-enabled IPL ROM.

-a net_definition=Value ... Defines a NIM network to be associated with the client being defined. The value for this attribute consists of required values and optional values:

Value 1 = NetworkType (required)
Specified values are **tok**, **ent**, **fddi**, and **generic**.

Value 2 = SubnetMask (required)
Specifies the dotted decimal mask for the network.

Value 3 = ClientGateway (optional)
Specifies the IP address or host name of the default gateway used by the machine being defined to communicate with the NIM master.

Value 4 = MasterGateway (optional)
Specifies the IP address or host name of the default gateway used by the NIM master to communicate with clients on other subnets.

Value 5 = NetworkName (optional)
Specifies a name to be given to the NIM definition created for the network. (Otherwise, a unique default value is assigned.)

When specifying the **net_definition** attribute to create or change a machine definition, the **find_net** keyword must be specified as the first component of the **if** attribute for the machine. The **net_definition** attribute may also be specified when defining additional NIM interfaces (**if** attributes) for machine definitions.

-a cpuid=Value Specifies the CPU ID of the machine being defined. This attribute can be used for client verification during NIM operations. To display the CPU ID on a running machine, use the **uname -m** command. This field is optional and will be automatically set the first time a client communicates with the NIM master.

-a master_port=Value Specifies the port number used by the NIM master for socket communication with the clients. The default master port number is **1058**.

-a registration_port=Value Specifies the port number used by clients to register themselves with the NIM master. The default registration port number is **1059**.

-a group=Value Specifies a machine group to which the client should be added. The group will be defined if it does not exist.

-a comments=Value Provides comments about the client being defined.

-a verbose=Value Displays information for debugging. Use **verbose=5** to show maximum detail.

-a net_settings=Value1 Value2 Specifies the speed and duplex settings to use for the client's ethernet adapter during a network install, and requires a sequence number when specified. When initiating an install and reboot of a client, NIM will set these parameters in the bootlist.

Value1= auto, 10, 100, or 1000
The default is value is *100*.

Value2 = auto, half, or full
The default value is *full*.

For example:

```
nim -o change -a net_settings1="10 half" jellyfish
```

-a connect=Value Specifies the communicating service used by the NIM client for remote execution of NIM commands. Value options are **shell** (for RSH) and **nimsh**. The default setting is **connect=shell**.

Booting and operating standalone NIM clients

Standalone NIM clients can be booted and operated from local resources.

Standalone clients mount all file systems from local disks and have a local boot image. Standalone clients are not dependent upon network servers for operation.

Booting a standalone client from the network:

Although an installed standalone client is capable of booting from the local disk, it may be necessary to perform a network boot of the client for certain NIM operations.

Clients must boot over the network in order for NIM to perform a BOS installation (**bos_inst**) of the client or to boot into maintenance mode (**maint_boot**) and diagnostics (**diag**). If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.

Managing software on standalone clients:

The AIX Base Operating System can be installed directly on standalone clients using the NIM **bos_inst** operation.

Additional software and updates can be installed and managed on standalone clients using the NIM **cust** and **maint** operations. For more information about these and other operations, see “NIM operations” on page 205.

Defining diskless and dataless clients

Diskless and dataless clients are machines that are not capable of booting and running without the assistance of servers on a network.

As their names imply, diskless clients have no hard disk, and dataless clients have disks that are unable to hold all the data that may be required for operation. Diskless machines must mount paging space and all file systems from remote servers. Dataless machines can only use a local disk for paging space and the **/tmp** and **/home** file systems. Neither diskless nor dataless clients have a local boot image, and they must boot from servers on the network.

Defining a machine as diskless or dataless has the following advantages:

- **Cost savings**

No hard disk is required for diskless clients. Only a small hard disk is needed for dataless clients.

- **Manage software configurations on machines**

On diskless and dataless clients, the file system containing the BOS is mounted from a server. All client systems that mount the same file system for BOS run from identical software.

- **Manage storage of user data**

User data for diskless and dataless clients are stored on remote servers. A system administrator can manage storage allocation and data backups for the client machines by managing the data on the server, rather than on each machine separately.

Resources for diskless and dataless clients:

The file systems that are mounted by the diskless and dataless client machines are treated as resources in the NIM environment. Like other resources, they exist on a server in the NIM environment, and they are NFS-exported to the clients that use them.

The following resources are managed by NIM to support diskless and dataless clients:

boot	Defined as a network boot image for NIM clients. The boot resource is managed automatically by NIM and is never explicitly allocated or deallocated by users.
-------------	--

SPOT	<p>Defined as a directory structure that contains the AIX run-time files common to all machines. These files are referred to as the usr parts of the fileset. The SPOT resource is mounted as the /usr file system on diskless and dataless clients.</p> <p>Contains the root parts of filesets. The root part of a fileset is the set of files that may be used to configure the software for a particular machine. These root files are stored in special directories in the SPOT, and they are used to populate the root directories of diskless and dataless clients during initialization.</p> <p>The network boot images used to boot clients are constructed from software installed in the SPOT.</p>
root	<p>A SPOT resource is required for both diskless and dataless clients.</p> <p>Defined as a parent directory for client "/" (root) directories. The client root directory in the root resource is mounted as the "/" (root) file system on the client.</p> <p>When the resources for a client are initialized, the client root directory is populated with configuration files. These configuration files are copied from the SPOT resource that has been allocated to the same machine.</p>
dump	<p>A root resource is required for both diskless and dataless clients.</p> <p>Defined as a parent directory for client dump files. The client dump file in the dump resource is mounted as the dump device for the client.</p>
paging	<p>A dump resource is required for both diskless and dataless clients.</p> <p>Defined as a parent directory for client paging files. The client paging file in the paging resource is mounted as the paging device for the client.</p>
home	<p>A paging resource is required for diskless clients and optional for dataless clients.</p> <p>Defined as a parent directory for client /home directories. The client directory in the home resource is mounted as the /home file system on the client.</p>
shared_home	<p>A home resource is optional for both diskless and dataless clients.</p> <p>Defined as a /home directory shared by clients. All clients that use a shared_home resource will mount the same directory as the /home file system.</p>
tmp	<p>A shared_home resource is optional for both diskless and dataless clients.</p> <p>Defined as a parent directory for client /tmp directories. The client directory in the tmp resource is mounted as the /tmp file system on the client.</p>
resolv_conf	<p>A tmp resource is optional for both diskless and dataless clients.</p> <p>Contains nameserver IP addresses and a network domain name.</p> <p>Unlike the other resources used by diskless/dataless clients, the resolv_conf resource does not remain mounted by the client. Instead, it is copied to the /etc/resolv.conf file in the client's root directory.</p> <p>A resolv_conf resource is optional for both diskless and dataless clients.</p>

Initializing diskless and dataless clients:

Diskless and dataless clients are not installed in the same way as standalone machines. Instead, they are initialized. Initialization of diskless and dataless clients involves several phases of operation.

Resource Allocation The resources required to support a diskless/dataless client must be allocated to the client before or during the initialization operation.

If the resource is a parent directory of client directories, the allocation will create an empty subdirectory for the client. The client subdirectory is then NFS-exported to the client. The client subdirectories are not populated until the initialization is actually performed.

Client Initialization

The **dkls_init** and **dtls_init** operations are used in NIM to initialize the resources for client use.

Among the operations performed during client initialization are the following:

- The boot image is made available to the client for performing a network boot.
- The root files, which are used for machine-specific customization, are copied into the client's subdirectory in the **root** resource. The files that are copied into the client root directories come from the **SPOT** resource that has been allocated to the client.
- The **/tftpboot/Client.info** file is created on the boot server (which is the **SPOT** server). This file contains information that will be needed by the client during the start-up configuration processing to successfully configure as a diskless or dataless client.

The following are some of the variables defined in the *Client.info* file:

```
export NIM_CONFIGURATION=diskless
export RC_CONFIG=rc.dd_boot
export ROOT=Host:Client_Root_Directory
export DUMP=Host:Client_Dump_Directory
export SPOT=Host:SPOT_Location
```

The paging location is set in the client's root directory in the **/etc/swapspace**s file.

Network Boot of the Client

The client machine is booted over the network using standard **bootp** procedures for the machine type. The client obtains the boot image and begins running a mini-kernel in a file system in RAM.

The client tftp's the *Client.info* file from the **/tftpboot** directory on the **SPOT** server. The information in the *Client.info* file is used to properly configure the client as a diskless or dataless machine.

The remote file systems are mounted from the resource servers.

If the client is a dataless client, and no **paging**, **tmp**, **home**, or **shared_home** resource is allocated, then the client will create the missing file system on the local hard disk.

Managing software on diskless and dataless clients:

The **/usr** and **root** file systems of diskless and dataless clients are resources that have been mounted from a server. Therefore, in order to install or uninstall software on a diskless or dataless client, the processing must actually occur on the resources that the clients use.

The **SPOT** contains the directory structure for an installed **/usr** file system. It also contains subdirectories for the "root" parts of installed filesets. Because the **SPOT** contains both **usr** and **root** files, software maintenance must be performed on the **SPOT** in order to update the software that is running on the clients. Such actions must be performed using the NIM **cust** and **maint** operations. For more information about the **cust** and **maint** operations, see "NIM operations" on page 205.

If the **SPOT** is currently allocated for client use, NIM will prevent software customization operations from being performed on it. This is to safeguard the **SPOT** from changes that may adversely affect running client machines. However, this restriction can be overridden by specifying the **force** option when performing the operation.

When NIM is used to install software in a **SPOT**, the following operations are performed to manage the software for diskless and dataless clients:

1. The **/usr** files are installed in the **SPOT**. These files are automatically seen by all the clients that mount the **SPOT** as their **/usr** file systems.
2. The root files are installed in special subdirectories in the **SPOT**.

3. After all the filesets have been installed in the **SPOT**, the **root** files are copied to the **root** directories of any diskless or dataless clients that have been initialized with the **SPOT**.

When NIM is used to uninstall software in a **SPOT**, the following operations are performed to manage the software for diskless and dataless clients:

1. The **/usr** files are removed from the **SPOT**. This also automatically "removes" the files from the client systems.
2. The **root** files of the software are removed from the client **root** directories.

NIM also provides a **sync_roots** operation to perform consistency verification and correction to ensure the client **root** directories match the **root** parts stored in the **SPOT**.

Establishing NIM networks

When the NIM master is configured, the network associated with the master is automatically defined in the NIM environment. It is necessary only to define additional NIM networks if clients reside on other local area networks or subnets.

In order to perform certain NIM operations, the NIM master must be able to supply information necessary to configure client network interfaces. The NIM master must also be able to verify that client machines can access all the resources required to support operations. To avoid the overhead of repeatedly specifying network information for each individual client, NIM networks are used to represent the networks in a NIM environment. When NIM clients are defined, the associated network for the client must be specified. During NIM operations, the NIM master is able to use information from the client's network definition when necessary.

Supported NIM network types

You can use these network types to support NIM.

- Ethernet
- Standard Ethernet
- IEEE 802.3 Ethernet
- Token-Ring
- FDDI
- ATM
- Generic

Network boot support is provided for Ethernet, Token-Ring, and FDDI. Unlike other network adapters, ATM adapters cannot be used to boot a machine. Therefore, installing a machine over an ATM network requires special processing. See "Using NIM with ATM networks" on page 243. The Generic network type is used to represent all other network types where network boot support is not available. For clients on Generic networks, NIM operations that require a network boot, such as **bos_inst** and **diag**, are not supported. However, nonbooting operations, such as **cust** and **maint**, are allowed. Diskless and dataless clients cannot be associated with Generic networks, because they inherently rely on network boot capability.

Defining NIM networks

Networks are defined in the NIM environment using the NIM **define** operation.

The command line syntax is as follows:

```
nim -o define -t NetworkType -a Attribute=Value ... MachineName
```

where the following attributes are required:

-a net_addr=Value Specifies the IP address of the network being defined. If the network address is not known, see "Determining a network's IP address" on page 185.

-a snm=*Value* Specifies the subnet mask for the network.
-t *NetworkType* Specifies the type of network being defined. Valid values are **atm**, **tok**, **ent**, **fddi**, and **generic**.

The following attributes are optional:

-a comments=*Value* Provides comments about this network.
-a ieee_ent=*Value* Specifies IEEE 802.3 Ethernet configuration. This is only valid for networks that are defined with the **ent** type or those that have an **other_net_type** attribute set to **ent**.
-a other_net_type=*Value* Specifies another network type that applies to this logical network. Each NIM network is used to represent one logical network that exists in the NIM environment. When the network is defined, the type of network interface used in the network must be supplied. Usually, a network is composed of only one type. However, a bridge can be used to connect different network types together to form one logical network. In that situation, NIM needs to know what the other network interface types are, and this attribute is used to specify that information. For more information on how to use the **other_net_type** attribute, see “Defining a heterogeneous network” on page 186.
-a routing=*Value ...* Stores NIM routing information for a network. This attribute requires a sequence number when specified. When a new NIM route is specified, the **routing** attribute consists of three values:
Value 1 Specifies the NIM name of the destination network for this route.
Value 2 Specifies the host name of the gateway to use in order to communicate with the destination network.
Value 3 Specifies the host name of the gateway used by the destination network to get back to this network.
This attribute can be used to add a default route or static route. To add a default route, specify **default** for *Value 1*. Then, specify the default gateway for the network in *Value 2*. Leave *Value 3* blank.
For more information on adding and changing routes, see “Defining NIM routes” on page 186, “Establishing a default NIM route between networks” on page 272, and “Establishing a static NIM route between networks” on page 273.
-a verbose=*Value* Displays information for debugging. Use **verbose=5** to show maximum detail.

It is also possible to define NIM networks automatically when client machines are defined. To do this, use the **find_net** and **net_definition** attributes when defining the client. For more information, see “NIM machines” on page 178.

Determining a network’s IP address

NIM determines a network’s IP address by performing a bitwise “AND” on the binary representations of the network’s subnet mask and the address of any machine’s IP address on the same network.

For example:

```
subnet mask = 255.255.254.0
client address = 129.35.58.207
```

In binary:

```
subnet mask = 11111111.11111111.11111110.00000000
client address = 10000001.00100011.00111010.11001111
```

network address = 10000001.00100011.00111010.00000000

In decimal:

network address = 129.35.58.0

Defining NIM routes

NIM uses routing information internally to ensure that a client on one network can communicate with a server on another network. It defines the gateway to use to go from one network to the other network.

NIM provides the ability to define default or static routes. Default NIM routes provide the following advantages over static routes:

- They more closely model the network configuration of common network environments.
- They permit resources that are distributed throughout a NIM environment to be more easily accessed by any client in the NIM environment.

To determine the gateway used by machines on a given network, run **netstat -rn** on a running machine on the network to see if a default gateway is listed. You can also issue **traceroute Host_Name** from a running machine on the network in question, where *Host_Name* is the name of the master's primary network interface if determining the gateway for a client, or the name of a target client if determining the gateway used by the master. The first gateway listed is the gateway used by machines on the specified network.

Note that NIM routes are not required if the only networks defined in a NIM environment are associated with interfaces (**if** attributes) defined on the NIM master and if all resources will be defined on the master. If resources are served by machines other than the master to clients that do not reside on the same network as the server, NIM routes are required between those networks even if all networks are attached to interfaces belonging to the master. In this case, the master must act as a gateway (with IP-forwarding switched on), and the host name of the interface on the master should be used as a gateway.

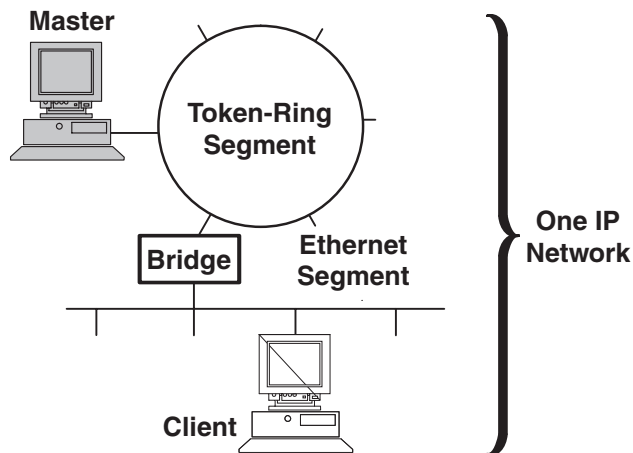
Networks with default routes may be created automatically when NIM machines are being defined.

Communications between networks go through several gateways. However, it is important to remember that when defining NIM routes for networks, the only gateways of interest are the first ones used by the networks to reach their destinations. Intermediate gateways between the originating and destination networks are irrelevant for NIM routing purposes.

Defining a heterogeneous network

The NIM feature enables NIM to model networks consisting of different data-link protocol segments.

Networks consisting of different data-link protocol segments use bridges to connect two segments that have different data link protocols. A network consisting of a Token-Ring and an Ethernet segment can be connected to form a single logical network, as shown in the following figure.



Heterogeneous Network

Figure 1. Heterogeneous Network. This illustration shows a single IP network in which the master server uses its token-ring connection and a bridge to communicate with its client on an Ethernet segment.

Because a single NIM network object is used to represent one network, the **other_net_type** attribute is reserved for a different type of interface that can exist in a network. The **other_net_type** attribute can be added to the definition of a network object. When present in a network definition, the **other_net_type** attribute tells NIM that this logical network uses a bridge to connect the other network type to the network type that was specified when the object was defined.

When you define a machine object to be connected to a network object, NIM checks to see if the network has any **other_net_type** attributes. If so, NIM requires that the fourth field, which is usually optional, in the **if** attribute, be specified. This field specifies the logical name of the client's network adapter. The following example defines a network object that has a bridge joining a Token-Ring and an Ethernet segment:

```
nim -o define -t tok -a net_addr=129.35.129.0 \
  -a snm=255.255.240.0 -a other_net_type1=ent b905net

lsnim -l b905net

class          = network
type           = tok
net_addr       = 129.35.128.0
snm            = 255.255.240.0
other_net_type1 = ent
Nstate         = ready for use
prev_state     = information is missing from this object's def>
```

The **other_net_type** attribute requires a sequence number because a network could be composed of all three types of interfaces linked by bridges.

When you define a client's interface that is physically connected to an Ethernet segment joined with a Token-Ring network using a bridge (with master being on the Token-Ring side), you must supply the fourth field:

```
nim -o define -t standalone -a if1='find_net mymac 08005ac9430c \
ent' -a cable_type1=bnc mymac
```

Adding another network type to a NIM network

You can add a network type to a NIM network using Web-based System Manager, SMIT, or the command line.

Adding another network type to a NIM network using Web-based System Manager:

Follow this procedure for adding another network type to a NIM network using Web-based System Manager.

1. In the NIM Network container, double-click on a network. The General page of the properties notebook opens.
2. Use the General page to add a type of network to the network.

Adding another network type to a NIM network using SMIT:

Follow this procedure for adding another type of network to a NIM network using SMIT.

1. To add another network type, enter the **smit nim_chnet** fast path.
2. Select the network to change.
3. Specify the additional network type to be supported.

Adding another network type to a NIM network from the command line:

Follow this procedure for adding another network type to a NIM network from the command line.

To define a NIM network, enter:

```
nim -o change -a other_net_typeSequenceNumber=NetworkType NetworkName
```

For example, to change a Token-Ring network called network1 to also support Ethernet and FDDI, enter:

```
nim -o change -a other_net_type1=ent -a other_net_type2=fddi network1
```

NIM resources

All operations on clients in the NIM environment require one or more resources.

NIM resource objects represent files and directories that are used to support some type of NIM operation. Because NIM resources are ordinary file system objects in the AIX operating system, most of them are provided to clients with standard Network File System (NFS) software. This means that many resources must reside locally on the servers providing these resources, because NFS can only export file system objects that are stored on local media in the machines from which they are exported.

A large number of resources (files and directories) are needed to support NIM software installation and maintenance operations. Resources can be added through the Web-based System Manager **New Resources** wizard.

To obtain detailed information about any resource, enter the following from the NIM master:

```
lsnim -Pa ResourceType
```

The Web-based System Manager and SMIT interfaces are designed to hide much of the detail required for the command line interface. Therefore, these sections only document the resource task procedures for the command line. The following information applies to the other interfaces as well, but discussion of those interfaces is deferred to the online contextual help available for those applications.

Using the adapter_def resource

The **adapter_def** resource represents a directory that contains secondary adapter configuration files that are used during **bos_inst** and **cust** operations.

The **adapter_def** resource directory is populated with secondary-adapter configuration files by the **nimadapters** command.

Defining an adapter_def resource:

You can use the following syntax and attributes for defining an **adapter_def** resource.

The command line syntax for defining an **adapter_def** resource is:

```
nim -o define -t adapter_def -a Attribute=Value ... adapter_defName
```

The following attributes are required for the **adapter_def** resource:

- a location=Value** Specifies the full path name of the **adapter_def** resource directory.
- a server=Value** Specifies the name of the machine where the **adapter_def** resource directory resides. Only the master can serve an **adapter_def** resource.

The following attributes are optional for the **adapter_def** resource:

- a comments=Value** Describes the resource.
- a group=Value** Specifies the name of a resource group to which this resource should be added.
- a verbose=Value** Displays information for debugging. To show maximum detail, specify a value of 5.
- a nfs_vers=Value** Specifies the NFS protocol version required for NFS access.
- a nfs_sec=Value** Specifies the security method required for NFS access.

Secondary adapter support is available for AIX. Before you enable a secondary adapter, you must verify the AIX version the client is on. The secondary adapters will fail to configure because NIM is unable to find the **/usr/lpp/bos.sysmgmt/nim/methods/c_cfgadptrs** client method. The following example shows the outcome if you attempt to enable this support on your NIM master.

```
nim -o cust -a adapter_def=adapter_def1 rspc10
trigger.austin.xyz.com. 0042-001 nim: processing error encountered on "master":
0042-001 m_cust: processing error encountered on "rspc10":
0042-175 c_script: An unexpected result was returned by the
"trigger.austin.xyz.com:/export/nim/scripts/rspc10.script" command:
/tmp/_nim_dir_4714/script[10]: /usr/lpp/bos.sysmgmt/nim/methods/c_cfgadptrs: not found.
```

Using the boot resource

The **boot** resource is an internally managed NIM resource used to indicate that a boot image has been allocated to a client.

The **boot** resource is automatically allocated to clients to support NIM operations requiring a network boot. The **boot** resource will automatically be deallocated when the operation finishes.

Using the bosinst_data resource

With a **bosinst_data** resource, data can be specified in a NIM resource prior to the installation.

A **bosinst_data** resource represents a file that contains information for the BOS installation program. Normally, the BOS installation program looks for this information in the **/bosinst.data** file in the BOS installation image. If this file does not exist or if it does not contain all the information that the BOS installation program requires, the program prompts for information by using a console that is local to the target. Information must then be specified manually for the BOS installation to proceed. With a **bosinst_data** resource, the data can be specified in a NIM resource prior to the installation to prevent the need for prompting at the console.

A sample **bosinst.data** file (*SPOT_Offset /usr/lpp/bosinst/bosinst.template*) is located on the **SPOT** resource server. Also, see “Performing a nonprompted BOS installation” on page 241 for a sample **bosinst_data** file.

For instructions on how to create and use a **bosinst_data** file, see “Performing a nonprompted BOS installation” on page 241.

Defining a bosinst_data resource:

You can use the following command-line syntax and attributes for defining a **bosinst_data** resource.

The command line syntax for defining a **bosinst_data** resource is:

```
nim -o define -t bosinst_data -a Attribute=Value ... bosinst_dataName
```

The following attributes are required for the **bosinst_data** resource:

- a location=Value** Specifies the full path name of the **bosinst_data** resource file.
- a server=Value** Specifies the name of the machine where the **bosinst_data** resource file resides.

The following attributes are optional for the **bosinst_data** resource:

- a comments=Value** Describes the resource.
- a group=Value** Specifies the name of a resource group to which this resource should be added.
- a verbose=Value** Displays information for debugging. To show maximum detail, specify a value of **5**.
- a source=Value** Specifies an existing **bosinst_data** resource to be replicated when defining a new resource. The file pointed to by the source resource will be copied to the new location.
- a nfs_vers=Value** Specifies the NFS protocol version required for NFS access.
- a nfs_sec=Value** Specifies the security method required for NFS access.

Using the dump resource

A **dump** resource represents a directory in which client dump directories are maintained.

When a **dump** resource is allocated to a client, NIM creates a subdirectory for the client's exclusive use. This allocated subdirectory is initialized by the **dkls_init** or **dtls_init** operation, which creates an empty file in this subdirectory. After initialization, the client uses this file to store any **dump** images it creates.

Note: If you subsequently deallocate this resource, NIM removes the **dump** file and the subdirectory that NIM created for the client's use.

Defining a dump resource:

You can use the following command-line syntax and attributes for defining a **dump** resource.

The command line syntax for defining a **dump** resource is:

```
nim -o define -t dump -a Attribute=Value ... DumpName
```

The following attributes are required for the **dump** resource:

- a location=Value** Specifies the full path name of the parent directory for the client **dump** files.
- a server=Value** Specifies the name of the machine where the directory for the **dump** resource will be created.

The following attributes are optional for the **dump** resource:

- a comments=Value** Describes the resource.
- a group=Value** Specifies the name of a resource group to which this resource should be added.
- a verbose=Value** Displays information for debugging. To show maximum detail, specify a value of **5**.

Using the exclude_files resource

This resource may be used when a **mksysb** resource is being created from a running NIM client.

An **exclude_files** resource represents a file that contains a list of files and directories that should be excluded when creating a system backup image.

Defining an exclude_files resource:

You can use the following command-line syntax and attributes for defining an **exclude_files** resource.

The command line syntax for defining an **exclude_files** resource is:

```
nim -o define -t exclude_files -a Attribute=Value ... exclude_filesName
```

The following attributes are required for the **exclude_files** resource:

- | | |
|--------------------------|---|
| -a location=Value | Specifies the full path name of the file containing the list of files and directories to exclude from the mksysb . |
| -a server=Value | Specifies the name of the machine where the file for the exclude_files resource resides. |

The following attributes are optional for the **exclude_files** resource:

- | | |
|--------------------------|---|
| -a comments=Value | Describes the resource. |
| -a group=Value | Specifies the name of a resource group to which this resource should be added. |
| -a verbose=Value | Displays information for debugging. To show maximum detail, specify a value of 5. |
| -a source=Value | Specifies an existing exclude_files resource to be replicated when defining a new resource. The file pointed to by the source resource will be copied to the new location. |
| -a nfs_vers=Value | Specifies the NFS protocol version required for NFS access. |
| -a nfs_sec=Value | Specifies the security method required for NFS access. |

Using the fb_script resource

Use an **fb_script** resource to provide device-configuration information.

An **fb_script** resource represents a file that is used to configure devices when a NIM client is booting for the first time after the BOS installation process is completed. During BOS installation, certain customization operations (such as device configuration) cannot be performed because they require certain daemons to be running. However, at this point in the BOS installation process, daemons are not available. As a result, certain devices may not be configured during system reboot, and have to be manually configured after the system has booted.

You can use an **fb_script** resource to provide device-configuration information. The BOS installation process adds the content of the **fb_script** resource to the **/etc/firstboot** file, which is run the first time that a client is booted. The **/etc/firstboot** file then performs the device configuration.

Defining an fb_script resource:

You can use the following command-line syntax and attributes for defining a **fb_script** resource.

The command line syntax for defining an **fb_script** resource is as follows:

```
nim -o define -t fb_script -a server=server_name \  
-a location=fbscript_file_location fbscript_object_name
```

After the **fb_script** resource is defined, you can allocate the resource and initiate a BOS installation operation using the **fb_script** resource, as follows:

```
nim -o bos_inst -a fb_script=fbscript_object_name client_name
```

The following attributes are required for the **fb_script** resource:

- a location=***Value* Specifies the full path name of the file being defined as the **fb_script** resource.
- a server=***Value* Specifies the name of the machine where the file for the **fb_script** resource resides.

The following attributes are optional for the **fb_script** resource:

- a comments=***Value* Describes the resource.
- a source=***Value* Specifies an existing **fb_script** resource to be replicated when defining a new resource. The file pointed to by the source resource will be copied to the new location.
- a nfs_vers***Value* Specifies the NFS protocol version required for NFS access.
- a nfs_sec***Value* Specifies the security method required for NFS access.

Using a **fix_bundle** resource

A **fix_bundle** resource represents a file containing **fix** keywords to be used by the **instfix** command, which is called by the NIM **cust** and **fix_query** operations.

NIM mounts the **fix_bundle** resource on the client so it can be used by the local **instfix** command. NIM automatically unmounts the resource when the operation has completed.

A fix can include either a single fileset update or multiple fileset updates that are related in some way; fixes are identified by unique keywords. When a fix is identified with an Authorized Program Analysis Report (APAR) number, it includes all the fileset updates that are necessary to fix the reported software problem identified by that number.

Defining a *fix_bundle* resource:

You can use the following command-line syntax and attributes for defining a **fix_bundle** resource.

The command line syntax for defining a **fix_bundle** resource is:

```
nim -o define -t fix_bundle -a Attribute=Value ... fix_bundleName
```

The following attributes are required for the **fix_bundle** resource:

- a location=***Value* Specifies the full path name of the file containing the list of fixes to manage.
- a server=***Value* Specifies the name of the machine where the **fix_bundle** resource file resides.

The following attributes are optional for the **fix_bundle** resource:

- a comments=***Value* Describes the resource.
- a group=***Value* Specifies the name of a resource group to which this resource should be added.
- a verbose=***Value* Displays information for debugging. To show maximum detail, specify a value of **5**.
- a source=***Value* Specifies an existing **fix_bundle** resource to be replicated when defining a new resource. The file pointed to by the source resource will be copied to the new location.
- a nfs_vers***Value* Specifies the NFS protocol version required for NFS access.
- a nfs_sec***Value* Specifies the security method required for NFS access.

Using a **home** resource

A **home** resource represents a directory in which client **/home** directories are maintained.

When **home** resource is allocated to a client, NIM creates a subdirectory for the client's exclusive use. This allocated subdirectory is subsequently initialized when you perform the **dkls_init** or **dtls_init** operation. After initialization, any time the client performs a network boot, the client NFS mounts this

subdirectory over **/home** to gain access to the **home** directory that has been set up for its use. This subdirectory remains mounted over **/home** on the client as long as the client is running.

Note: Whenever this resource is deallocated, NIM removes the subdirectory that was created for the client's use. Therefore, back up any files you want to save in the client's subdirectory before you deallocate a resource of this type.

Defining a home resource:

You can use the following command-line syntax and attributes for defining a **home** resource.

The command line syntax for defining a **home** resource is:

```
nim -o define -t home -a Attribute=Value ... HomeName
```

The following attributes are required for the **home** resource:

-a location=Value	Specifies the full path name of the parent directory for the client /home directories.
-a server=Value	Specifies the name of the machine where the directory for the home resource will be created.

The following attributes are optional for the **home** resource:

-a comments=Value	Describes the resource.
-a group=Value	Specifies the name of a resource group to which this resource should be added.
-a verbose=Value	Displays information for debugging. To show maximum detail, specify a value of 5 .

Using an image_data resource

An **image_data** resource represents a file that contains information for the BOS installation program. This information describes how physical disks and file systems should be configured in the root volume group during installation.

Normally, the BOS installation program determines default values that should be used, or uses an **image.data** file from a **mksysb** being restored. Use a customized **image_data** resource only in special cases.

A sample **image.data** file (*SPOT_Offset/usr/lpp/bosinst/image.template*) is located on the **SPOT** resource server. For more information about the **image.data** file, see the *AIX Version 6.1 Files Reference*.

Defining an image_data resource:

You can use the following command-line syntax and attributes for defining an **image_data** resource.

The command line syntax for defining an **image_data** resource is:

```
nim -o define -t image_data -a Attribute=Value ... image_dataName
```

The following attributes are required for the **image.data** resource:

-a location=Value	Specifies the full path name of the image_data resource file.
-a server=Value	Specifies the name of the machine where the image_data resource file resides.

The following attributes are optional for the **image.data** resource:

-a comments=Value	Describes the resource.
-a group=Value	Specifies the name of a resource group to which this resource should be added.

-a verbose= <i>Value</i>	Displays information for debugging. To show maximum detail, specify a value of 5 .
-a source= <i>Value</i>	Specifies an existing image_data resource to be replicated when defining a new resource. The file pointed to by the source resource will be copied to the new location.
-a nfs_vers <i>Value</i>	Specifies the NFS protocol version required for NFS access.
-a nfs_sec <i>Value</i>	Specifies the security method required for NFS access.

Using an **installp_bundle** resource

An **installp_bundle** resource represents a file that contains the names of filesets that should be managed by NIM.

During an installation or maintenance operation, NIM mounts the **installp_bundle** file on the client machine so it can be used by the local **installp** command. NIM automatically unmounts the resource from the client when the operation has completed.

Defining an *installp_bundle* resource:

You can use the following command-line syntax and attributes for defining an **installp_bundle** resource.

The command line syntax for defining an **installp_bundle** resource is:

```
nim -o define -t installp_bundle -a Attribute=Value ... installp_bundleName
```

The following attributes are required for the **installp_bundle** resource:

-a location= <i>Value</i>	Specifies the full path name of the file containing the list of software to manage.
-a server= <i>Value</i>	Specifies the name of the machine where the installp_bundle resource file resides.

The following attributes are optional for the **installp_bundle** resource:

-a comments= <i>Value</i>	Describes the resource.
-a group= <i>Value</i>	Specifies the name of a resource group to which this resource should be added.
-a verbose= <i>Value</i>	Displays information for debugging. To show maximum detail, specify a value of 5 .
-a source= <i>Value</i>	Specifies an existing installp_bundle resource to be replicated when defining a new resource. The file pointed to by the source resource will be copied to the new location.
-a nfs_vers <i>Value</i>	Specifies the NFS protocol version required for NFS access.
-a nfs_sec <i>Value</i>	Specifies the security method required for NFS access.

Using an **lpp_source** resource

An **lpp_source** resource represents a directory in which software installation images are stored.

If the **lpp_source** contains the minimum set of support images required to install a machine, it is given the **simages** attribute and can be used for BOS installation (**bos_inst**) operations. If an **lpp_source** does not contain enough software to be an **simages lpp_source**, then it can only be used in NIM **cust** operations to install software on running machines and **SPOTs**.

NIM uses an **lpp_source** for an installation operation by first mounting the **lpp_source** on the client machine. The **installp** commands are then started on the client using the mounted **lpp_source** as the source for installation images. When the installation operation has completed, NIM automatically unmounts the resource.

In addition to providing images to install machines, **lpp_source** resources can also be used to create and update **SPOT** resources.

The minimum set of images required for an **lpp_source** to have the **simages** attribute are:

POWER-based	Itanium-based
bos	bos
bos.64bit	N/A
bos.rte.up	N/A
bos.rte.mp	N/A
bos.up	N/A
bos.mp	bos.mp
bos.net	bos.net
bos.diag	bos.diag
bos.sysmgmt	bos.sysmgmt
bos.terminfo	bos.terminfo
bos.terminfo.data	bos.terminfo.data
devices.base	devices.ia64.base
devices.buc	N/A
devices.common	devices.common
devices.graphics	devices.graphics
devices.mca	devices.pci
devices.rs6ksmp.base	N/A
devices.scsi	devices.scsi
N/A	devices.ide
devices.sio	devices.isa_sio
devices.sys	N/A
devices.tty	devices.tty
xlC.rte	xlC.rte

Note: When copying device images to a directory that you plan to define as an **lpp_source**, be sure to copy all the device images for a given type of device. For example:

```
cp /cdfs/usr/sys/inst.images/devices.pci.* lpp_source_directory
```

You can define an **lpp_source** in several ways:

- If a directory containing installation images already exists, it can be directly defined as an **lpp_source** resource.
- If a directory should be created and populated by NIM with the default set of support images for a BOS install, use the **source** attribute when defining the resource. This attribute specifies the name of the device that contains the installation images. NIM copies the software images from this device into the location specified for the **lpp_source**. The images copied will include those from the **simages** list, all available device support, and some additional software that is typically installed as well (for example, X11).
- If an **lpp_source** should be created from a source device using a list of software other than the default set of images, specify the **packages** attribute when defining the **lpp_source**. Use the **packages** attribute to list the alternative set of software images to copy.

The size of an **lpp_source** may vary greatly with the amount of software it includes. A minimum **lpp_source** with just enough software to qualify for the **simages** attribute may be under 100 MB, but a default **lpp_source** created from a CD-ROM may be over 350 MB. It is recommended that a separate file

system be created to contain an **lpp_source** so the space can be more easily managed. By default, NIM automatically expands a file system as needed when creating an **lpp_source** and copying images from a source device.

The **simages** message displays only if the user is creating an **lpp_source** resource with the default installation packages. The **simages** message will display if the **simages** attribute could not be set for the **lpp_source**. If a user creates an **lpp_source** and specifies a list of packages, the **simages** message is not printed. The **simages** attribute is set correctly, whether or not a **simages** message is printed or not.

If a user attempts to do an **rte** BOS installation with an **lpp_source** that does not have the **simages** attribute, the user receives an error. The error message instructs the user to run **nim -o check** on the **lpp_source** to determine the missing packages needed for an **rte** BOS installation. Whenever a user runs **nim -o check** on an **lpp_source** after it has been created, the **simages** message is printed if the **lpp_source** does not contain all the images needed for a **rte** BOS installation.

Defining an lpp_source resource:

You can use the following command-line syntax and attributes for defining a **lpp_source** resource.

The command line syntax for defining an **lpp_source** resource is:

```
nim -o define -t lpp_source -a Attribute=Value ... lpp_sourceName
```

The following attributes are required for the **lpp_source** resource:

- a location=Value** Specifies the directory that will contain the installation images.
- a server=Value** Specifies the name of the machine where the **lpp_source** is to be created.

The following attributes are optional for the **lpp_source** resource:

- a comments=Value** Describes the **lpp_source**.
- a group=Value** Specifies the name of a resource group to which this resource should be added.
- a multi_volume=Value** Specifies whether the user should be prompted to insert a second CD into the CD-ROM drive when creating an **lpp_source** with **/dev/cd*** as its source. This attribute's default value is **no**. If the attribute is set to **yes**, and the server of the resource is not the master, a warning is displayed, and a single-volume **lpp_source** is created.
- a packages=Value** Specifies a list of filesets to copy into the **lpp_source** if the default list of images is not desired.
- a show_progress=Value** Enables display of informational output when an **lpp_source** is created. The default value for this attribute is **yes**. If the **show_progress** attribute is set to **yes**, and the **server** attribute is set to another machine with an earlier version of the **bos.sysmgt.nim.client** fileset, a warning is displayed indicating that informational output can not be enabled.
- a source=Value** Identifies the source device for copying installation images when defining the **lpp_source**. This attribute is not required if the location of the **lpp_source** already contains installation images.
- a verbose=Value** Displays information for debugging. To show maximum detail, specify a value of **5**.
- a nfs_vers=Value** Specifies the NFS protocol version required for NFS access.
- a nfs_sec=Value** Specifies the security method required for NFS access.

If a migration installation will be performed on NIM client machines, the **lpp_source** used in the operation must contain all the required software to migrate the machine.

If the directory specified in the **location** attribute does not exist, NIM will create the directory. NIM will also remove the directory and its contents if the **lpp_source** is later removed.

power	POWER-based architecture (used for platforms of the type rs6k, rspc, and chrp)
ia64	Itanium-based architecture (used for platform of type ia64)

Using a mksysb resource

A **mksysb** resource represents a file that is a system backup image created using the **mksysb** command. This type of resource can be used as the source for the installation of a client.

The **mksysb** image must reside on the hard disk of a machine in the NIM environment in order to be defined as a resource. It cannot be located on a tape or other external media.

A **mksysb** resource can be defined from an image that already exists on the hard disk of the NIM master or any NIM client. If such an image does not exist, it can be created when the resource is defined. To create the image when the resource is defined, specify the name of the NIM client that will be the **source** for the backup, and set the **mk_image** attribute to **yes** in the command to define the **mksysb** resource. Use an **exclude_files** resource to list any files and directories that should not be included in the backup image.

Defining a mksysb resource:

You can use the following command-line syntax, flags, and attributes for defining a **mksysb** resource.

The command line syntax for defining a **mksysb** resource is:

```
nim -o define -t mksysb -a Attribute=Value ... mksysbName
```

The following flags are valid for the **mksysb** resource:

- **-a**
- **-i**
- **-m**
- **-e**
- **-b**
- **-X**
- **-p**

For descriptions of these flags, see the **nim** command.

The following attributes are required for the **mksysb** resource:

-a location= <i>Value</i>	Specifies the full path name of the mksysb image.
-a server= <i>Value</i>	Specifies the name of the machine where the mksysb image resides or is to be created.

The following attributes are optional for the **mksysb** resource:

-a comments= <i>Value</i>	Describes the mksysb .
-a exclude_files= <i>Value</i>	Specifies an exclude_files resource to use to exclude files and directories from the system backup.
-a group= <i>Value</i>	Specifies the name of a resource group to which this resource should be added.
-a mk_image= <i>Value</i>	Specifies the flag to use to create a mksysb image from a machine in the NIM environment.

-a mksysb_flags= <i>Value</i>	Specifies the flags to use to tell the command how to create the backup.
-a size_preview= <i>Value</i>	Specifies the flag to verify that space is available before creating a mksysb image.
-a source= <i>Value</i>	Specifies the name of the machine to be backed up in the mksysb image.
-a verbose= <i>Value</i>	Displays information for debugging. To show maximum detail, specify a value of 5 .
-a source= <i>Value</i>	Specifies the name of the machine to be backed up in the mksysb image if the mk_image attribute is specified. If the mk_image attribute is not specified, this value specifies an existing mksysb resource to be replicated when defining a new mksysb resource. The file pointed to by the source resource will be copied to the new location.
-a nfs_vers <i>Value</i>	Specifies the NFS protocol version required for NFS access.
-a nfs_sec <i>Value</i>	Specifies the security method required for NFS access.

Using the **nim_script** resource

The **nim_script** resource is an internally-managed NIM resource used to indicate that a script should be run by NIM as part of a NIM operation.

The **nim_script** resource is automatically allocated to support some NIM operations, and it is automatically deallocated when the operations complete.

Depending on the operation, NIM will use the following rules to determine which NIM server to place the **nim_script** resource on:

- For a **bos_inst** operation, the **nim_script** resource will be placed on the **SPOT** server.
- For **cust** operation with an **lpp_source**, the **nim_script** resource will be placed on the **lpp_source** server.
- For a **cust** operation without an **lpp_source**, the **nim_script** resource will be placed on the script server.
- Otherwise, the **nim_script** resource will be placed on the NIM master.

Using a paging resource

A **paging** resource represents a directory where client paging files are maintained.

When this type of resource is allocated to a client, NIM creates a subdirectory for the client's exclusive use. This allocated subdirectory is initialized by the **dkls_init** or **dtls_init** operation, which creates a file in this subdirectory that the client configures as a paging device when it performs a network boot. By default, 32 MB are reserved for this file. A different value can be specified using the **size** flag when the **dkls_init** or **dtls_init** operation is performed.

After this resource has been initialized for a client, it is configured as a paging device by the client each time the client performs a network boot.

Note: If you subsequently deallocate this resource, NIM removes the **paging** file and the subdirectory it created for the client's use.

Defining a paging resource:

You can use the following command-line syntax and attributes for defining a **paging** resource.

The command line syntax for defining a **paging** resource is:

```
nim -o define -t paging -a Attribute=Value ... PagingName
```

The following attributes are required for the **paging** resource:

- a location=***Value* Specifies the full path name of the parent directory for the client **paging** files.
- a server=***Value* Specifies the name of the machine where the directory for the **paging** resource will be created.

The following attributes are optional for the **paging** resource:

- a comments=***Value* Describes the resource.
- a group=***Value* Specifies the name of a resource group to which this resource should be added.
- a verbose=***Value* Displays information for debugging. To show maximum detail, specify a value of **5**.

Using a **resolv_conf** resource

A **resolv_conf** resource represents a file containing valid **/etc/resolv.conf** entries that define Domain Name Protocol name-server information for local resolver routines.

A **resolv_conf** resource can be allocated to a standalone machine as part of a **bos_inst** operation, or to a diskless or dataless machine as part of a **dkls_init** or **dtls_init** operation. Upon successful installation and reboot, the machine will be configured to use the domain name services defined by the resource.

The following are sample entries in a **resolv_conf** resource file:

```
nameserver 129.35.143.253
domain test.ibm.com
```

Defining a *resolv_conf* resource:

You can use the following command-line syntax and attributes for defining a **resolv_conf** resource.

The command line syntax for defining a **resolv_conf** resource is:

```
nim -o define -t resolv_conf -a Attribute= ... resolv_confName
```

The following attributes are required for the **resolv_conf** resource:

- a location=***Value* Specifies the full path name of the file containing the information for domain name server (DNS) name resolution.
- a server=***Value* Specifies the name of the machine where the **resolv_conf** resource file resides.

The following attributes are optional for the **resolv_conf** resource:

- a comments=***Value* Describes the resource.
- a group=***Value* Specifies the name of a resource group to which this resource should be added.
- a verbose=***Value* Displays information for debugging. To show maximum detail, specify a value of **5**.
- a source=***Value* Specifies an existing **resolv_conf** resource to be replicated when defining a new resource. The file pointed to by the source resource will be copied to the new location.
- a nfs_vers***Value* Specifies the NFS protocol version required for NFS access.
- a nfs_sec***Value* Specifies the security method required for NFS access.

Using a **root** resource

A **root** resource represents a directory in which client **root** directories are maintained.

When a **root** resource is allocated to a diskless or a dataless client, NIM creates a subdirectory for the client's exclusive use. This allocated subdirectory is subsequently initialized when you perform the **dkls_init** or **dtls_init** operation.

After initialization, anytime the client performs a network boot, the client NFS mounts this subdirectory over */* to gain access to the **root** directory that has been set up for its use. This subdirectory remains mounted over */* on the client as long as the client is running.

Note: Whenever this resource is deallocated, NIM removes the subdirectory that was created for the client's use. Therefore, any files you want to save in the client's subdirectory should be backed up before you deallocate a resource of this type.

Defining a root resource:

You can use the following command-line syntax for defining a **root** resource.

The command line syntax and attributes for defining a **root** resource is:

```
nim -o define -t root -a Attribute=Value ... RootName
```

The following attributes are required for the **root** resource:

- a location=Value** Specifies the full path name of the directory under which client **root** directories will be created.
- a server=Value** Specifies the name of the machine where the directory for the **root** resource will be created.

The following attributes are optional for the **root** resource:

- a comments=Value** Describes the resource.
- a group=Value** Specifies the name of a resource group to which this resource should be added.
- a verbose=Value** Displays information for debugging. To show maximum detail, specify a value of **5**.

Using a script resource

A **script** resource represents a file that is a user-defined shell script. After it is defined, this type of resource can be used to perform processing on a client as part of a NIM **cust** or **bos_inst** operation.

The **script** resources are always run by NIM after software installation is performed in **cust** or **bos_inst** operations. This allows the scripts to perform configuration processing on the client after all the software is installed. Multiple **script** resources can be allocated for client use, but the order in which the scripts will be run is not predictable.

Note: The **script** resources must not point to files that reside in the **/export/nim/scripts** directory. This directory is used for the **nim_script** resource that is managed by NIM. NFS restrictions prevent defining multiple resources in the same location.

Defining a script resource:

You can use the following command-line syntax and attributes for defining a **script** resource.

The command line syntax for defining a **script** resource is:

```
nim -o define -t script -a Attribute=Value ... ScriptName
```

The following attributes are required for the **script** resource:

- a location=Value** Specifies the full path name of the **script** resource file.
- a server=Value** Specifies the name of the machine where the **script** resource file resides.

The following attributes are optional for the **script** resource:

-a comments= <i>Value</i>	Describes the resource.
-a group= <i>Value</i>	Specifies the name of a resource group to which this resource should be added.
-a verbose= <i>Value</i>	Displays information for debugging. To show maximum detail, specify a value of 5 .
-a source= <i>Value</i>	Specifies an existing script resource to be replicated when defining a new resource. The file pointed to by the source resource will be copied to the new location.
-a nfs_vers <i>Value</i>	Specifies the NFS protocol version required for NFS access.
-a nfs_sec <i>Value</i>	Specifies the security method required for NFS access.

Using a **shared_home** resource

A **shared_home** resource represents a directory that can be used as a common **/home** directory by one or more clients

When a **shared_home** resource is allocated to a client, and when the **dkls_init** or **dtls_init** operation is performed, NIM configures the client's configuration to use this common directory. After initialization, anytime the client performs a network boot, the client NFS mounts this common directory over its **/home** directory. This common directory remains mounted as long as the client is running.

Note: Whenever this resource is deallocated, NIM changes only the client's configuration, so the client no longer uses this directory. NIM does not remove the common directory.

Defining a shared_home resource:

You can use the following command-line syntax and attributes for defining a **shared_home** resource.

The command line syntax for defining a **shared_home** resource is:

```
nim -o define -t shared_home -a Attribute=Value ... shared_homeName
```

The following attributes are required for the **shared_home** resource:

-a location= <i>Value</i>	Specifies the full path name of the directory to be used as a common /home directory among clients.
-a server= <i>Value</i>	Specifies the name of the machine where the directory for the shared_home resource will be created.

The following attributes are optional for the **shared_home** resource:

-a comments= <i>Value</i>	Describes the resource.
-a group= <i>Value</i>	Specifies the name of a resource group to which this resource should be added.
-a verbose= <i>Value</i>	Displays information for debugging. To show maximum detail, specify a value of 5 .

Using the **SPOT (Shared Product Object Tree)** resource

The **SPOT (Shared Product Object Tree)** is a fundamental resource in the NIM environment. It is required to install or initialize all types of machine configurations.

A **SPOT** provides a **/usr** file system for diskless and dataless clients, as well as the network boot support for all clients.

Everything that a machine requires in a **/usr** file system, such as the AIX kernel, executable commands, libraries, and applications are included in the **SPOT**. Machine-unique information or user data is usually

stored in the other file systems. A **SPOT** can be located on any standalone machine within the NIM environment, including the master. The **SPOT** is created, controlled, and maintained from the master, even though the **SPOT** can be located on another system.

You can create a **SPOT** by converting the **/usr** file system (**/usr SPOT**, or you can locate the **SPOT** elsewhere within the file system (**non-/usr SPOT**) on the server.

The **/usr SPOT** inherits all the optional software that is already installed on the server. All the clients using the **/usr SPOT** have access to the optional software installed on the server. The **non-/usr SPOT** can be used to manage a different group of optional software than those that are installed and licensed for the server.

Creating a **SPOT** by converting the **/usr** file system has the advantage of being fast and using much less disk space. However, this method does not give you the flexibility to choose which software packages will be included in the **SPOT**, because all the packages and filesets installed in the **/usr** file system of the machine serving the **SPOT** will be included in the **SPOT**. The second method, creating a **non-/usr SPOT**, uses more disk space, but it is more flexible. Initially, only the minimum set of software packages required to support NIM clients is installed in the **SPOT**, but additional packages and filesets can be installed. Also, it is possible to have multiple **SPOTs**, all with different additional packages and filesets installed, serving different clients.

Note: Do not create a **non-/usr SPOT** in a subdirectory of the **/usr** file system.

A **SPOT** varies in size from 100 MB up to, and sometimes in excess of, 300 MB depending on the software that is installed. Because all device support is installed in the **SPOT** and the number of device filesets typically increases, the size is not easily predictable from one release of AIX to another.

SPOTs are used to support all NIM operations that require a machine to boot over the network. These operations are as follows:

- **bos_inst**
- **maint_boot**
- **diag**
- **dkls_init**
- **dtls_init**

When a **SPOT** is created, network boot images are constructed in the **/tftpboot** directory of the **SPOT** server, using code from the newly created **SPOT**. When a client performs a network boot, it uses **tftp** to obtain a boot image from the server. After the boot image is loaded into memory at the client, the **SPOT** is mounted in the client's RAM file system to provide all additional software support required to complete the operation.

Each boot image created is up to 12 MB in size. Before creating a **SPOT**, ensure there is sufficient space in the root (**/**) file system, or create a separate file system for **/tftpboot** to manage the space required for the network boot images.

The Micro Channel-based systems support booting from the network using Token-Ring, Ethernet, or FDDI. The POWER-based PCI bus-based systems support booting from the network using Token-Ring or Ethernet. The uniprocessor MCA and PCI bus-based systems can be used in a diskless or dataless configuration.

A single network boot image can be accessed by multiple clients; therefore, the network boot image cannot contain any client-specific configuration information. The platform type is specified when the machine object is defined, while the network type is determined from the primary interface definition. Two files are created in the **/tftpboot** directory on the **SPOT** server for each client to be network-booted:

ClientHostName and *ClientHostName.info*. The *ClientHostName* file is a link to the correct network boot image, while the *ClientHostName.info* file contains the client configuration information.

When the **SPOT** is defined (and created), the following occurs:

- The BOS image is retrieved from archive or, for **/usr** conversion, just the **root** directory is retrieved from archive (**/usr/lpp/bos/inst_root**).
- The device support required to support NIM operations is installed.
- Network boot images are created in the **/ftfboot** directory.

To list the software installed in a **SPOT**, enter the following command:

```
nim -o lsipp SPOTName
```

If you want to change your **/usr SPOT** back to a normal **/usr** file system, you must remove the **SPOT** from the NIM database.

For information about software installation and maintenance tasks you can perform on a **SPOT**, see “Customizing NIM clients and SPOT resources” on page 244.

Using network boot images for AIX 4.3 or later SPOTs:

You can use network boot images for AIX 4.3 or later to reduce the amount of disk space used and the time required to create boot images from SPOT resources.

In AIX 4.3 or later, by default NIM only creates the boot images required to support the machines and network types that are defined in the environment. This situation should significantly reduce the amount of disk space used, and the time required to create boot images from SPOT resources.

Defining a SPOT resource:

You can use the following command-line syntax and attributes for defining a **SPOT** resource.

The command line syntax for defining a **SPOT** resource is:

```
nim -o define -t spot -a Attribute=Value ... SPOTName
```

The following attributes are required for the **SPOT** resource:

-a location=Value	Specifies the parent directory under which the SPOT is to be created.
-a server=Value	Specifies the name of the machine where the SPOT is to be created.
-a source=Value	Identifies the source device for installation images to create and install the SPOT .

The following attributes are optional for the **SPOT** resource:

-a auto_expand=Value	Expands the file system as needed when installing the SPOT . The default value is yes .
-a comments=Value	Describes the SPOT .
-a debug=Value	Builds debug-enabled network boot images. The default value is no .
-a installp_flags=Value	Specifies the flags that describe how installp should install software into the SPOT . The default value is agQX .
-a show_progress=Value	Shows installp output as SPOT is installed. The default value is yes .
-a verbose=Value	Displays information for debugging. To show maximum detail, specify a value of 5 .
-a nfs_vers=Value	Specifies the NFS protocol version required for NFS access.
-a nfs_sec=Value	Specifies the security method required for NFS access.

Note: The creation of a **SPOT**, by default, produces a large amount of output. Be sure to scan the output to look for nonfatal errors and warnings that may not be evident from a successful return code.

Using a tmp resource

A **tmp** resource represents a directory where client **/tmp** files are maintained.

When this type of resource is allocated to a client, NIM creates a subdirectory for the client's exclusive use. This allocated subdirectory is subsequently initialized when you perform the **dkls_init** or **dtls_init** operation. After initialization, anytime the client performs a network boot, the client NFS mounts this subdirectory over **/tmp** to gain access to the **/tmp** directory that has been set up for its use. This subdirectory remains mounted over **/tmp** on the client as long as the client is running.

Note: Whenever this resource is deallocated, NIM removes the subdirectory that was created for the client's use. Therefore, back up any files you want to save in the client's subdirectory before you deallocate a resource of this type.

Defining a tmp resource:

You can use the following command-line syntax and attributes for defining a **tmp** resource.

The command line syntax for defining a **tmp** resource is:

```
nim -o define -t tmp -a Attribute=Value ... TmpName
```

The following attributes are required for the **tmp** resource:

-a location=Value	Specifies the full path name of the directory where client/ tmp directories will be created.
-a server=Value	Specifies the name of the machine where the directory for the tmp resource will be created.

The following attributes are optional for the **tmp** resource:

-a comments=Value	Describes the resource.
-a group=Value	Specifies the name of a resource group to which this resource should be added.
-a verbose=Value	Displays information for debugging. To show maximum detail, specify a value of 5 .

Distributing NIM resources

Usually, a NIM administrator will use the NIM master as the server for all resources. This strategy keeps all resources together on one machine. However, there are several reasons to distribute resources onto client machines.

- If the NIM environment requires several large resources to be defined, it may not be possible to put them all on the same server because of disk space limitations. Creating resources on different machines allows the burden of disk consumption to be distributed over several machines.
- Serving resources from different machines helps avoid bottlenecks when performing NIM operations on large numbers of clients. Bottlenecks can occur on server machines or on network gateways, so it may be beneficial to distribute resources across servers running in different subnets.
- Multiple resources of the same type can be created on different machines to increase the availability of resources when servers are taken offline for scheduled maintenance.
- Some **SPOT** resources at certain levels cannot be served by some machines at certain levels. Specifically, **SPOT** creation is not supported when the level of AIX installed in the **SPOT** is higher than the level of AIX running on the server. When you are creating **SPOTs** at multiple levels, it may be necessary to distribute the **SPOTs** on different servers.

Distributing resources on different machines in the NIM environment is simply a matter of specifying the correct server information when the resource is defined. After the resources are created, they are used no differently than resources defined on the master.

NIM operations

A large number of operations can be performed to manage a NIM environment and perform software installation and maintenance.

The Web-based System Manager and SMIT interfaces are designed to hide much of the detail required for the command line interface. Therefore, this section only documents the operations for the command line. All of this information applies to the other interfaces as well, but discussion of those interfaces is deferred to the online contextual help available for those applications.

Most NIM operations are performed by running the **nim** command with various attributes for each possible operation. The command line syntax is as follows:

```
nim -o OperationName -a Attribute=Value ... TargetName |TargetNames
```

Using the NIM allocate operation

Use the **allocate** operation to make resources available to NIM clients for subsequent operations.

The command line syntax for the **allocate** operation is as follows:

```
nim -o allocate -a ResourceType=ResourceName ... TargetName |TargetNames
```

The target of an **allocate** operation may be a NIM client or group of NIM clients.

The following attribute can be specified for the **allocate** operation:

-a <i>ResourceType=ResourceName</i> (required)	Specifies the resource to allocate to the client, for example, <code>lpp_source=42_images</code> .
---	--

When a resource is allocated to a client, an entry is added to the **/etc/exports** file on the resource server to NFS export the resource to the client. The allocation count for the resource is also incremented. When the allocation count is greater than 0, the resource cannot be modified. During NIM operations, a client mounts and uses the resources that have been allocated to it.

Using the NIM alt_disk_install operation

You can use the **alt_disk_install** operation (available in AIX 4.3 or later) to install a **mksysb** image on a client system alternate disk or disks or to clone a client running **rootvg** to an alternate disk.

The command line syntax for the **alt_disk_install mksysb** operation is as follows:

```
nim -o alt_disk_install -a source=mksysb -a mksysb=mksysb_resource \  
-a disk=target_disk(s) -a attribute=Value.... TargetName |TargetNames
```

The command line syntax for the **alt_disk_install rootvg** clone operation is as follows:

```
nim -o alt_disk_install -a source=rootvg -a disk=target_disk(s) \  
-a attribute=Value.... TargetName |TargetNames
```

The target of an **alt_disk_install** operation can be a standalone NIM client or a group of standalone NIM clients. The clients must also have the **bos.alt_disk_install.rte** fileset installed.

To display the alternate disk installation status while the installation is progressing, enter the following command on the master:

```
lsnim -a info -a Cstate ClientName
```

OR

lsnim -l *ClientName*

The following are required attributes for **alt_disk_install mksysb** operation:

- a source=mksysb** Specifies the type of **alt_disk_install** to perform.
- a disk=target_disk(s)** Specifies the disks on the client system that the **mksysb** image will be restored. This disk or these disks must not currently contain any volume group definition. The **lspv** command should show these disks as belonging to volume group **None**. If you are specifying more than one disk, the disk names must be enclosed in a set of single quotes; for example, 'hdisk2 hdisk3'.
- a mksysb=mksysb_resource** Specifies the **mksysb** resource to use.

The following are required attributes for the **alt_disk_install rootvg** clone operation:

- a source=rootvg** Specifies the type of **alt_disk_install** to perform.
- a disk=target_disk(s)** Specifies the disks on the client system that the **mksysb** image will be restored. This disk or these disks must not currently contain any volume group definition. The **lspv** command shows these disks as belonging to volume group **None**. If you are specifying more than one disk, the disk names must be enclosed in a set of single quotes; for example, 'hdisk2 hdisk3'.

The following are optional attributes that can be specified for both **alt_disk_install mksysb** and the **alt_disk_install rootvg** clone operation:

- a concurrent=Value** Specifies the maximum number of machines from the selected group that should be installing at any given time. This attribute is only valid when the target of the operation is a machine group. If specified, NIM will monitor the progress of all machines in the group and attempt to keep no more or less than the number specified installing until all machines in the group are installed.
- a set_bootlist=Value** Specifies whether to set the bootlist to point to the new **rootvg** when the install is complete. *Value* can be yes or no, where yes is the default value. The next time the system is rebooted, it will boot from the newly installed alternate disk if *Value* is set to yes.
- a boot_client=Value** Specifies whether to reboot the client when the **alt_disk_install** operation is completed. *Value* can be yes or no, where no is the default value. This attribute would normally be set only if the **set_bootlist** attribute was also set to yes.
- a debug=Value** Specifies whether to print debug (**set -x**) output from the **alt_disk_install** script. *Value* can be yes or no, where no is the default value. This output does not go to the screen, but is saved to the NIM log, */var/adm/ras/nim.alt_disk_install*, on the client system. This file can be checked after the **alt_disk_install** has completed.
- a image_data=Value** Specifies the *image_data* resource to use when creating the new alternate **rootvg** and its logical volumes and file systems. The new volume group created must be large enough to restore the **mksysb** image or a copy of the running **rootvg**. An **exclude_files** attribute can also be used with an **alt_disk_install rootvg** clone to specify files or directories that should not be backed up.
- a resolv_conf=Value** Specifies the **resolv_conf** resource to use for configuring the domain and name resolution on the client system when the system is rebooted. This is the */etc/resolv_conf* file that will be copied into the alternate disk's file system. This may be useful if the **mksysb** image you are using has a different */etc/resolv_conf* file than the one you want the client to retain.
- a script=Value** Specifies the script resource to call at the end of the **alt_disk_install** operation. This script is called on the running system before the */alt_inst* file systems are unmounted, so files can be copied from the running system to the */alt_inst* file systems before the reboot. This is the only opportunity to copy or modify files in the alternate file system because the logical volume names will be changed to match those of **rootvg**, and they will not be accessible until the system is rebooted with the new alternate **rootvg**.

- a time_limit=Value**, Specifies the maximum number of hours that should elapse before ceasing to initiate installation of additional members of the selected group of machines. This value can only be specified when limiting the number of concurrent operations on a group.
- a verbose=Value** Specifies whether to show files as they are being backed up for a **rootvg** clone, or to show files as they are being restored for a **mksysb** install. *Value* can be yes or no, where no is the default value. The output goes to the **alt_disk_install** log on the client, **/var/adm/ras/alt_disk_inst.log**.

The following are optional attributes that can be specified only for the **alt_disk_install rootvg** clone operation:

- a exclude_files=Value** Specifies an **exclude_files** resource to use to exclude files and directories from the **rootvg**. Files and directories specified in this file will not be copied to the new cloned **rootvg**.
- a filesets=Value** Specifies the list of filesets to install into the alternate **rootvg** after the clone of the **rootvg** is complete.
- a fixes=Value** Specifies the APARs to install into the alternate **rootvg** after the clone of the running **rootvg**. The fixes are in the format "IX123456" or "update_all".
- a fix_bundle=Value** Specifies the **fix_bundle** resource that lists the APARs to install into the alternate **rootvg** after the clone of the running **rootvg**.
- a installp_bundle=Value** Specifies an **installp_bundle** resource that lists filesets to install into the alternate **rootvg** after the clone of the running **rootvg**.
- a installp_flags=Value** Tells **installp** how to apply the filesets, **installp_bundle**, fixes, or **fix_bundles** attributes. The default value is **installp_flags=-acgX**.

Using the NIM bos_inst operation

Use the **bos_inst** operation to install the AIX BOS on standalone clients.

The command line syntax for the **bos_inst** operation is as follows:

```
nim -o bos_inst -a source=Value -a Attribute=Value ... TargetName|TargetNames
```

The target of a **bos_inst** operation can be a standalone NIM client or a group of standalone NIM clients.

The following NIM resources are required attributes that can be specified for the **bos_inst** operation to install and customize a machine:

- a lpp_source=Value**
Identifies the **lpp_source** resource to be used. The **lpp_source** resource is only required for an **rte** installation. The **lpp_source** resource specified must have the **simages** attribute set. However, if you are performing a **bos_inst** operation using a **mksysb** resource and an **lpp_source** resource, then the **simages** attribute is optional. The **lpp_source** provides software for machine customization. It also provides the BOS image for installation if the **source** attribute is **rte**.
- a source=Value**
Identifies the source for BOS run-time files. Valid values are:
 - rte** Installs from a BOS image in the **lpp_source**.
 - mksysb** Installs the machine from a **mksysb** image.
 - spot** Installs the machine from a **SPOT** copy.

Note: If a **SPOT** copy is not complete, the installation will succeed, but the target machine might not be bootable. A **SPOT** copy must have the proper device support to boot the target system. While installing from a **SPOT** copy is the fastest installation method, using **rte** or **mksysb** is more reliable and functional.

-a spot=*Value*

Identifies the **SPOT** resource to be used. The **SPOT** provides support for network boot and operations in the boot environment.

The following NIM resources are optional attributes that can be specified for the **bos_inst** operation:

-a accept_licenses=*Value*

Specifies whether license agreements should be accepted during BOS installation. Before the installation process can complete, this attribute must be set to **yes**. The default value is **accept_licenses=no**. If the **bosinst_data** resource resides on the NIM master, the **ACCEPT_LICENSES** field in the **bosinst_data** resource can also be set to **yes**. You can also set the **NIM_LICENSE_ACCEPT** global environment variable to **yes** on the NIM master.

-a adapter_def=*Value*

Specifies the directory containing secondary adapter definition files. The **nimadapters** command parses a secondary-adapters stanza file to build the files required to add NIM secondary adapter definitions to the NIM environment as part of the **adapter_def** resource. The **nimadapters** command does not configure secondary adapters. The actual configuration takes place during a **nim -o bos_inst** or **nim -o cust** operation that references the **adapter_def** resource.

-a async=*Value*

Specifies whether NIM should perform operations on group members asynchronously and not wait for the operation to complete on one member before beginning the operation on the next. The default value is **async=yes**.

-a auto_expand=*Value*

Indicates whether to expand file systems when setting up a client for a **force_push** installation. The default value is **auto_expand=yes**.

-a boot_client=*Value*

Indicates whether NIM should attempt to reboot the client immediately for BOS installation. The **boot_client** attribute is the converse of the **no_client_boot** attribute. The default value is **boot_client=yes**, indicating that NIM should attempt to reboot the client.

-a bosinst_data=*Value*

Specifies the **bosinst_data** resource to use for nonprompted installation.

-a concurrent=*Value*

Specifies the maximum number of machines from the selected group that should be installing at any given time. This attribute is only valid when the target of the operation is a machine group. If specified, NIM will monitor the progress of all machines in the group and attempt to keep no more or less than the number specified installing until all machines in the group are installed.

-a filesets=*Value*

Specifies a list of filesets to install on the target after BOS installation.

-a force_push=*Value*

Indicates whether or not a **force_push** installation should occur. A **force_push** should be used for installing machines that are running, but are not configured with the NIM client fileset. See "Using the **force_push** attribute" on page 211 for more information.

-a group=*Value*

Specifies the name of a resource group to use for installation. A resource group can be specified as an alternative to specifying multiple resources as separate attributes. If a resource group is specified, and it contains a **SPOT** and **lpp_source**, the **spot** and **lpp_source** attributes are no longer required.

-a image_data=*Value*

Specifies an **image_data** resource to describe how physical and logical data is organized on the client.

-a installp_bundle=Value

Specifies an **installp_bundle** resource that lists filesets to install on the target after BOS installation.

-a installp_flags=Value

Tells **installp** how to apply the filesets specified by the **filesets** or **installp_bundle** attributes. The default value is **installp_flags=-agQX**.

-a mksysb=Value

Provides the run-time files for BOS and other filesets if the **source** attribute is **mksysb**. The level of BOS run-time files in the **mksysb** must be equal to the level of the **SPOT** resource used for the installation.

If the level of the **SPOT** resource is greater than the level of the **mksysb** resource, then an **lpp_source** resource must be used and match the level of the **SPOT** resource. When this situation occurs, an update operation is performed by default.

-a no_client_boot=Value

Indicates whether the target should remain in the NIM environment after installation completes. The default value is **no**, indicating that the target system should remain in the NIM environment.

-a physical_loc=Value

Specifies the physical location code or AIX location code of the installation disk to the BOS installation process. This attribute allows you to specify the location code for the installation disk or disks on the command line, and allows you to have a *generic bosinst.data* file that does not contain location code information.

To determine a disk's physical location code, type the following:

```
lsdev -Cc disk -l hdisk0 -F "name physloc"
```

For more information about location codes, see Device Location Codes in *Operating system and device management*.

-a preserve_res=Value

Indicates whether resources in non-rootvg file systems should be preserved on the client system being installed. The default value is **preserve_res=no**.

-a resolv_conf=Value

Specifies the **resolv_conf** resource to use for configuring domain and name resolution on a client.

-a script=Value

Specifies the **script** resource to be run on the target system after all software has been installed.

-a set_bootlist=Value

Indicates whether NIM should set the bootlist of the client so that the client boots over the network on the next reboot. Usually, **set_bootlist** would be **yes** if the client is not going to be rebooted immediately for installation (**no_client_boot=yes** or **boot_client=no**). The default value is **set_bootlist=no**.

-a show_progress=Value

Indicates whether status should be displayed for each group member when the installation target is a group of machines. The default value is **yes**.

-a time_limit=Value

Specifies the maximum number of hours that should elapse before ceasing to initiate installation of additional members of the selected group of machines. This value can only be specified when limiting the number of concurrent operations on a group.

-a verbose=Value

Displays information for debugging. Valid values are 1-5. Use **verbose=5** to show maximum detail. The default is to show no debugging output.

When a **bos_inst** operation is performed on a client, the following occurs:

On the **SPOT** server:

1. A link is created in **/tftpboot** to a boot image matching the platform type, kernel type, and network adapter of the client.
2. The **/etc/bootptab** file is updated with client information to allow the boot image to be used.
3. A **ClientName.info** file is created in **/tftpboot** to provide client-specific installation and configuration information in the boot environment.
4. The **/etc/tftpaccess.ctl** file is modified, if necessary, to allow access to the **/tftpboot** directory.

On the target system:

1. The bootlist is modified so the network adapter is the default boot device for normal mode boot, unless **no_client_boot=yes**, **set_bootlist=no**, and **force_push=no** are specified.
2. The client is rebooted to begin the installation, unless **no_client_boot=yes**, **boot_client=no**, and **force_push=no** are specified.

When the client boots over the network adapter, it obtains the boot image from the **SPOT** server. The boot image configures devices and sets up the machine for the BOS installation. The **Client.info** file is transferred to the client machine; and based on its contents, the network adapter is configured, routes are added, and NIM resources are mounted in the boot environment. Processing control is then passed to the BOS installation program.

NIM BOS installation data:

The BOS installation program requires access to an image that contains the BOS run-time files. This image is used by the BOS installation program to populate the target's **/usr** filesystem.

In the NIM environment, this image can come from one of the following resources:

- A BOS run-time image that is part of the **lpp_source** resource that has been allocated to the target
- A **SPOT** resource that has been allocated to the target
- A **mksysb** image that has been allocated to the target

A **spot** and **lpp_source** are always required to support the **bos_inst rte** operation. A **bos_inst mksysb** operation only requires a **spot** resource be used.

To indicate which BOS image to use, specify the **source** attribute when performing the **bos_inst** operation. The **source** attribute may have one of the following values:

rte When an **rte** value (the default) is used for the **source** attribute, NIM directs the BOS installation program to use the BOS run-time image that is in the **lpp_source** directory. This image contains only the BOS run-time files; it does not contain any optional software packages. Selecting an **rte** source may increase the BOS installation time, because the BOS installation program installs the appropriate device support after populating the target's **/usr** file system to make the target viable. The installation time may also be increased due to additional **installp** activity during the NIM customization phase.

Note: The **rte** source must be used when performing BOS migration installation.

mksysb

Using **mksysb** as the source results in a target machine that has the same configuration as the machine from which the **mksysb** image was created. This may save installation and configuration time. The **mksysb** images could be very large, and the installation will fail if the target does not have enough disk space to accommodate the image.

After the installation is initiated from the master, the NIM master attempts to contact the target and execute a script that will force the system to reboot. The target system issues a BOOTP request to the server after it has shut down. The **bos_inst** operation is considered complete even if the target does not immediately issue a BOOTP request. The target must issue a BOOTP request to load a network boot image from the server to start the installation.

If the master is unable to contact the target system for any reason (for example, the system is turned off, it is not a running NIM client, or there is a network problem), a message is displayed and user intervention is then required at the target to issue the BOOTP request using the IPL ROM.

By default (`no_nim_client=no`), NIM also includes the customization required for the target to remain a NIM client after the install. This customization includes the installation and configuration of the **bos.sysmgt.nim.client** fileset and its requisite filesets, **bos.net.tcp.client** and **bos.net.nfs.client**, so that the NIM master can communicate with and control the client after installation. The **installp_flags** are passed to the **installp** command for installing the software on the standalone client. The **filesets** attribute can be used to install a list of additional filesets or software packages from the allocated **lpp_source**.

To display BOS installation status information while the installation is progressing, enter the following command on the master:

```
lsnim -a info -a Cstate ClientName
```

OR

```
lsnim -l ClientName
```

Errors in the allocation of a **nim_script** or **boot** resource type are fatal errors because the network BOS installation process cannot proceed without these resources. On the other hand, any error encountered during the attempt to cause the target to issue a BOOTP request is a nonfatal error to NIM because, at that point, NIM has successfully initialized the environment to perform a network installation. As soon as the target has successfully loaded its allocated network boot image, the BOS installation process begins.

Using the force_push attribute:

When assigned a value of **yes**, the **force_push** attribute tells NIM that the target of the **bos_inst** operation does not necessarily have the **bos.sysmgt.nim.client** fileset installed and configured.

NIM will attempt to NFS mount or copy the minimal client support to the target system to perform an unattended installation or migration of the base operating system. If client support is copied to the target machine, NIM will automatically expand the necessary file systems on the target unless the **auto_expand** attribute to **bos_inst** is set to **no**.

The **force_push** attribute requires that the client grant root **rsh** permissions to the master and that the key on the client be in the normal position. The **force_push** attribute also requires that a **bosinst_data** file be allocated to the target machine to indicate that a no-prompt installation should occur. The **force_push** attribute is set to **yes** by setting the Force Unattended Installation Enablement? option to **yes** when using SMIT to perform the **bos_inst** operation.

Using the boot_client attribute:

When assigned a value of **no**, the **boot_client** attribute is used to instruct NIM not to attempt to initiate the BOS installation on the target machine after setting up the installation with the **bos_inst** operation. This allows a BOS installation to be set up while deferring the actual installation until the client is rebooted at a later time.

Also, if the client is not a running machine, this attribute will avoid waiting for the reboot attempt to time-out or fail. If the installation of the client system is going to be initiated later from the server, the normal mode boot device list on the client must be set so that a network boot is attempted when the client

is rebooted. No attempt is made to modify the boot list when **boot_client** is set to **no** unless the **force_push** or **set_bootlist** attributes are specified and set to a value of **yes**. The **boot_client** attribute is set to **no** by setting Initiate Boot Operation on Client to **no** when using SMIT to perform the **bos_inst** operation.

Using the *set_bootlist* attribute:

The **set_bootlist** attribute can be used with the **boot_client** attribute to modify the boot device list on the client for normal mode so a network boot is attempted when the client is rebooted.

It is not necessary to specify the **set_bootlist** attribute if the **force_push** attribute is set to **yes** or if **boot_client** is unspecified or set to **yes**. In both instances, the boot list will be modified as the default. The only valid values for **set_bootlist** are **yes** and **no**. The **set_bootlist** attribute is set to **yes** by setting Set Boot List if Boot not Initiated on Client? when using SMIT to perform the **bos_inst** operation.

Using the *preserve_res* attribute:

The **preserve_res** attribute can be used to preserve the NIM database definitions for resources residing on a NIM client that is being reinstalled.

When the **preserve_res** is set to **yes**, any resources that reside in file systems, which are being preserved by the BOS installation process, will also be preserved.

Using the NIM change operation

Use the **change** operation to modify attributes of NIM objects.

The command line syntax is as follows:

```
nim -F -o change -a Attribute=Value ... TargetName | TargetNames
```

-F (optional) Tells NIM to **force** the operation if the target is currently in use.

The target of a **change** operation can be any network, machine, resource, or group in the NIM environment. Not all attributes can be modified on targets. Usually, the attributes are changed automatically as parts of other operations, so there is little need for you to use the **change** operation explicitly.

Using the NIM check operation

Use the **check** operation to verify the usability of a machine or resource in the NIM environment.

The command line syntax for the **check** operation is as follows:

```
nim -F -o check -a debug=Value TargetName | TargetNames
```

The target of a **check** operation can be any NIM client, a group of NIM clients, a **SPOT** resource, or an **lpp_source** resource.

The flags and attributes that can be specified for the **check** operation are as follows:

- F** (optional) Tells NIM to "force" the operation if the target is currently in use. If the **-F** flag is specified when the target is a **SPOT** resource, it will force the **SPOT**'s network boot images to be rebuilt. The **-F** flag is typically not required when performing the **check** operation on client machines.
- a debug=Value** (optional) Builds a **SPOT**'s network boot images in debug mode if **debug=yes** is specified. This attribute is only valid if the target is a **SPOT** resource. The default value is **debug=no**. For more information on the **debug** attribute, refer to "Producing debug output from a network boot image" on page 353.

When applied to NIM clients, the **check** operation updates the machine state (**Mstate**) of the client. A ping test is performed to check whether the client is reachable. After the **check** operation is performed, the client's **Mstate** is set to either **running** or **not running**.

When applied to **SPOT** resources, the **check** operation performs root synchronization for diskless and dataless clients and rebuilds the **SPOT**'s network boot images, if necessary.

When applied to **lpp_source** resources, the **check** operation rebuilds the table of contents (**.toc**) file in the **lpp_source** directory. It also determines whether all filesets are included in the resources to qualify the **lpp_source** for the **simages** attribute.

Using the NIM cust operation

Use the **cust** operation to install software filesets and updates on standalone clients and **SPOT** resources.

See "Customizing NIM clients and SPOT resources" on page 244 for information on performing a software customization of standalone NIM clients.

The command line syntax for the **cust** operation is as follows:

```
nim -o cust -a Attribute=Value ... TargetName |TargetNames
```

The target of a **cust** operation can be a standalone NIM client, a group of standalone NIM clients, or a **SPOT** resource.

The following are required attributes that can be specified for the **cust** operation:

- a filesets=Value** Specifies a list of filesets to install on the target. This attribute is required unless an **installp_bundle** is used for the operation.
- a installp_bundle=Value** Specifies an **installp_bundle** resource that lists filesets to install on the target. This attribute is required unless the **filesets** attribute is specified.
- a lpp_source=Value** Identifies the **lpp_source** resource that will provide the installation images for the **cust** operation.

The following are optional attributes that can be specified for the **cust** operation:

- a accept_licenses=Value** Specifies whether software licenses should be automatically accepted during installation. If **accept_licenses=yes**, the **-Y** flag is passed on the **installp** command and licenses are automatically accepted. If **accept_licenses=no**, license processing is controlled by the **installp_flags** attribute. The default value is **accept_licenses=no**.
- a async=Value** Specifies whether NIM should perform operations on group members asynchronously and not wait for the operation to complete on one member before beginning the operation on the next. The default value is **async=yes**.
- a concurrent=Value** Specifies the maximum number of machines from the selected group that should be installing at any given time. This attribute is only valid when the target of the operation is a machine group. If specified, NIM will monitor the progress of all machines in the group and attempt to keep no more or less than the number specified installing until all machines in the group are installed.
- a fix_bundle=Value** Contains a list of fixes to install on the target. Fixes should be listed in the **fix_bundle** resource by APAR number with one number per line.
- a fixes=Value** Identifies a list of fixes to install on the target. Fixes should be listed by APAR number. For example, **fixes="IX12345 IX54321"**.
- a group=Value** Specifies the name of a resource group to use for the installation. A resource group can be specified as an alternative to specifying multiple resources as separate attributes. If a resource group is specified, and it contains an **lpp_source**, the **lpp_source** attribute is no longer required.

-a installp_flags= <i>Value</i>	Identifies the flags that tell installp how to apply the filesets specified by the filesets , installp_bundle , fixes , and fix_bundle attributes. The default value is installp_flags=agQX .
-a resolv_conf= <i>Value</i>	Specifies a resolv_conf resource for configuring domain and name resolution on a client.
-a script= <i>Value</i>	Specifies a script resource to be run on the target system after all software has been installed.
-a show_progress= <i>Value</i>	Indicates whether status should be displayed while software is installed. The default value is show_progress=yes .
-a time_limit= <i>Value</i> ,	Specifies the maximum number of hours that should elapse before ceasing to initiate installation of additional members of the selected group of machines. This value can only be specified when limiting the number of concurrent operations on a group.

Using the NIM deallocate operation

Use the **deallocate** operation to unlock and unexport resources when they are no longer needed by NIM clients.

It is generally unnecessary to perform explicit deallocations after NIM operations, because upon successful completion, operations will automatically deallocate resources from the clients.

The command line syntax for the **deallocate** operation is as follows:

```
nim -o deallocate -a ResourceType=ResourceName ... -a subclass=all TargetName |TargetNames
```

The target of a **deallocate** operation may be a NIM client or group of NIM clients.

The following list includes all the attributes that can be specified for the **deallocate** operation:

-a <i>ResourceType=ResourceName</i>	Specifies the resource to deallocate from the client, for example, <code>lpp_source=42_images</code> . This attribute is required.
-a subclass=all	Specifies that all resources should be deallocated from the target. This attribute is optional.

When a resource is deallocated from a client, the **/etc/exports** file on the resource server is modified to unexport the resource from the client. The allocation count for the resource is also decremented.

Using the NIM define operation

Networks, machines, and resources can be created using the **define** operation.

The command line syntax for the **define** operation is as follows:

```
nim -o define -t ObjectType -a Attribute=Value ... ObjectName
```

The attributes for the **define** operation vary for the different object types. For a complete description of the attributes required to define the various NIM objects, see “Establishing NIM networks” on page 184, “NIM machines” on page 178, “NIM resources” on page 188, and “Using NIM groups” on page 224.

Note: NIM resource class objects should not be defined with a location attribute of **/tmp** or **/tmp** subdirectories (including filesystems mounted under **/tmp**).

Using the NIM diag operation

Use the **diag** operation to prepare resources for a client to be network-booted into diagnostics mode.

The command line syntax for the **diag** operation is as follows:

```
nim -o diag -a Attribute=Value ... TargetName |TargetNames
```

The target of a **diag** operation can be any standalone NIM client or group of standalone NIM clients.

The following are required attributes that can be specified for the **diag** operation:

-a spot=Value Specifies the **SPOT** resource to be used to provide network boot and diagnostics support.

The following are optional attributes that can be specified for the **diag** operation:

-a group=Value Specifies the name of a resource group to use for the operation. A resource group can be specified as an alternative to specifying multiple resources as separate attributes.

-a verbose=Value Displays information for debugging. Valid values are 1-5. Use **verbose=5** to show maximum detail. The default is to show no debugging output.

Using the NIM **dkls_init** operation

Use the **dkls_init** operation to prepare resources for use by a diskless client.

The command line syntax for the **dkls_init** operation is as follows:

```
nim -o dkls_init -a Attribute=Value ... TargetName |TargetNames
```

The target of a **dkls_init** operation can be any diskless NIM client or group of diskless NIM clients.

The following are required attributes that can be specified for the **dkls_init** operation:

-a dump=Value Specifies the **dump** resource that contains client dump files.

-a paging=Value Specifies the **paging** resource that contains client paging files.

-a root=Value Specifies the **root** resource that contains the client root (*/*) directories. The **root** resource must be served by the same machine that serves the **SPOT**.

-a spot=Value Specifies the **SPOT** resource to be used to provide network boot support and the **/usr** file system for clients.

The following are optional attributes that can be specified for the **dkls_init** operation:

-a group=Value Specifies the name of a resource group to use for the installation. A resource group can be specified as an alternative to specifying multiple resources as separate attributes.

-a home=Value Specifies the **home** resource that contains client **/home** directories.

-a resolv_conf=Value Specifies the **resolv_conf** resource to configure Domain Name Protocol name server information on the client.

-a shared_home=Value Specifies the **shared_home** resource that contains a common **/home** directory for multiple clients.

-a size=Value Specifies the size in megabytes for client paging files.

-a tmp=Value Specifies the **tmp** resource that contains client **/tmp** directories.

-a verbose=Value Displays information for debugging. Valid values are 1-5. Use **verbose=5** to show maximum detail. The default is to show no debugging output.

The **dkls_init** operation populates client directories and creates client paging and dump files. A network boot image is also allocated to the client. When the client boots over the network, it obtains the boot image and is configured to mount the remaining resources.

Using the NIM **dtls_init** operation

Use the **dtls_init** operation to prepare resources for use by a dataless client.

The command line syntax for the **dtls_init** operation is as follows:

```
nim -o dtls_init -a Attribute=Value ... TargetName |TargetNames
```

The target of a **dtls_init** operation can be any dataless NIM client or group of dataless NIM clients.

The following are required attributes that can be specified for the **dtls_init** operation:

-a dump=Value	Specifies the dump resource that contains client dump files.
-a spot=Value	Specifies the SPOT resource to be used to provide network boot support and the /usr file system for clients.
-a root=Value	Specifies the root resource that contains the client root (<i>/</i>) directories. The root resource must be served by the same machine that serves the SPOT .

The following are optional attributes that can be specified for the **dtls_init** operation:

-a paging=Value	Specifies the paging resource containing client paging files.
-a group=Value	Specifies the name of a resource group to use for the installation. A resource group can be specified as an alternative to specifying multiple resources as separate attributes.
-a home=Value	Specifies the home resource that contains client /home directories.
-a resolv_conf=Value	Specifies the resolv_conf resource to configure Domain Name Protocol name server information on the client.
-a shared_home=Value	Specifies the shared_home resource that contains a common /home directory for multiple clients.
-a size=Value	Specifies the size in megabytes for client paging files.
-a tmp=Value	Specifies the tmp resource that contains client /tmp directories.
-a verbose=Value	Displays information for debugging. Valid values are 1-5. Use verbose=5 to show maximum detail. The default is to show no debugging output.

The **dtls_init** operation populates client directories and creates client paging and dump files. A network boot image is also allocated to the client. When the client boots over the network, it obtains the boot image and is configured to mount the remaining resources.

Using the NIM **fix_query** operation

Use the **fix_query** operation to display whether specified fixes are installed on a client machine or a **SPOT** resource.

The command line syntax for the **fix_query** operation is as follows:

```
nim -o fix_query -a Attribute=Value ... TargetName |TargetNames
```

The target of a **fix_query** operation can be any standalone NIM client, group of standalone NIM clients, or **SPOT** resource.

The following are optional attributes that can be specified for the **fix_query** operation:

-a fix_bundle=Value	Specifies a fix_bundle resource containing a list of fix keywords. This attribute is required unless the fixes attribute is specified for the operation.
-a fixes=Value	Specifies a list of keywords for the fix_query operation. Fix keywords are APAR numbers used to identify software updates that can span multiple filesets. This attribute is required unless a fix_bundle is used for the operation.
-a group=Value	Specifies the name of a resource group to use for the operation. A resource group can be specified as an alternative to specifying multiple resources as separate attributes.
-a fix_query_flags=Value	Tells the fix_query operation how to display information. Valid flags are those used by the instfix command.

-a show_progress=Value Indicates whether status should be displayed as the operation is performed. The default value is **show_progress=yes**.

Note: There are no required attributes for the **fix_query** operation.

Using the NIM **lppchk** operation

Use the **lppchk** operation to verify that software was installed successfully by running the **lppchk** command on a NIM client or **SPOT** resource.

The command line syntax for the **lppchk** operation is as follows:

```
nim -o lppchk -a Attribute=Value ... TargetName |TargetNames
```

The target of a **lppchk** operation can be any standalone NIM client, a group of standalone NIM clients, or a **SPOT** resource.

The following are optional attributes that can be specified for the **lppchk** operation:

-a async=Value	Specifies whether NIM should perform operations on group members asynchronously and not wait for the operation to complete on one member before beginning the operation on the next. The default value is async=yes .
-a filesets=Value	Specifies a list of filesets on the target on which the lppchk operation will be performed.
-a lppchk_flags=Value	Tells the lppchk command how to perform software verification.
-a show_progress=Value	Indicates whether status should be displayed as the operation is performed. The default value is show_progress=yes .
-a verbose=Value	Displays information for debugging. Valid values are 1-5. Use verbose=5 to show maximum detail. The default is to show no debugging output.

Note: There are no required attributes for the **lppchk** operation.

Using the NIM **lppmgr** operation

The NIM **lppmgr** operation helps to manage base installation images and update images in an **lpp_source**.

Although the **lppmgr** command is a separate command, it does use NIM objects as parameters. By having the **lppmgr** operation in NIM, the **lppmgr** command is called by NIM to be executed on **lpp_source** resources on other servers, and allows NIM to do sufficient checking of the **lpp_source** before and after **lppmgr** is executed. The format of the operation will be as follows:

The format of the command is as follows:

```
nim -o lppmgr -a lppmgr_flags=<flags> <lpp_source_object>
```

The NIM **lppmgr** operation is also available in SMIT using the **nim_lppmgr** fast path.

The **lppmgr** operation does not check the **lppmgr_flags** attribute for conflicts.

Note: Do not use the **-p** flag for prompting to move or remove installation images.

To list the names of duplicate filesets which should be removed with space usage information, type the following:

```
nim -o lppmgr -a lppmgr_flags="-lsb" lpp_source1
```

For more information on the **lppmgr** command, see the *AIX Version 6.1 Commands Reference*.

Using the NIM maint operation

Use the **maint** operation to uninstall software filesets and commit and reject updates on standalone clients and **SPOT** resources.

The command line syntax for the **maint** operation is as follows:

```
nim -o maint -a Attribute=Value ... TargetName |TargetNames
```

The target of a **maint** operation can be a standalone NIM client, a group of standalone NIM clients, or a **SPOT** resource.

The following are required attributes that can be specified for the **maint** operation:

-a installp_flags=Value Identifies the flags that tell **installp** what to do with the installed software.

The following are optional attributes that can be specified for the **maint** operation:

-a async=Value Specifies whether NIM should perform operations on group members asynchronously and not wait for the operation to complete on one member before beginning the operation on the next. The default value is **async=yes**.

-a filesets=Value Specifies a list of filesets to be maintained on the target.

-a group=Value Specifies the name of a resource group to use for the operation. A resource group can be specified as an alternative to specifying multiple resources as separate attributes.

-a installp_bundle=Value Specifies an **installp_bundle** resource that contains a list of filesets to be maintained on the target.

-a show_progress=Value Indicates whether status should be displayed as maintenance is performed. The default value is **show_progress=yes**.

Using the NIM maint_boot operation

Use the **maint_boot** operation to prepare resources for a client to be network-booted into maintenance mode.

The command line syntax for the **maint_boot** operation is as follows:

```
nim -o maint_boot -a Attribute=Value ... TargetName |TargetNames
```

The target of a **maint_boot** operation can be any standalone NIM client or group of standalone NIM clients.

The following are required attributes that can be specified for the **maint_boot** operation:

-a spot=Value Specifies the **SPOT** resource to be used to provide network boot and maintenance mode support.

The following are optional attributes that can be specified for the **maint_boot** operation:

-a group=Value Specifies the name of a resource group to use for the operation.

-a verbose=Value Displays information for debugging. Valid values are 1-5. Use **verbose=5** to show maximum detail. The default is to show no debugging output.

After the **maint_boot** operation is performed, the client must be rebooted over the network to load the network boot image and enter maintenance mode.

Using the NIM reboot operation

Use the **reboot** operation to reboot a NIM client machine.

The command line syntax for the **reboot** operation is as follows:

```
nim -o reboot -a Attribute=Value ... TargetName |TargetNames
```

The target of a **reboot** operation can be any standalone NIM client or group of standalone NIM clients.

The following are optional attributes that can be specified for the **reboot** operation:

-a inst_warning=Value Indicates whether a warning should be displayed to warn users that the machine will be rebooted. The default value is **inst_warning=yes**.

Note: There are no required attributes for the **reboot** operation.

Using the NIM remove operation

Use the **remove** operation to remove objects from the NIM environment.

The command line syntax for **remove** is as follows:

```
nim -o remove TargetName |TargetNames
```

The **remove** operation does not take any attributes. The target of this operation can be any network, machine, resource, or group in the NIM environment.

Using the NIM reset operation

Use the **reset** operation to change the state of a NIM client or resource, so NIM operations can be performed with it.

A **reset** may be required on a machine or resource if an operation was stopped before it completed successfully.

The command line syntax for the **reset** operation is as follows:

```
nim -F -o reset TargetName |TargetNames
```

The target of a **reset** operation can be any NIM client, a group of NIM clients, or a **SPOT** resource.

The following list includes all the flags and attributes that can be specified for the **reset** operation:

-F (optional) Tells NIM to "force" the operation if the target is currently in use.

When applied to NIM clients, the **reset** operation updates the control state (**Cstate**) of the client. After the **reset** operation is performed, the client's **Cstate** is set to **ready**, and it is possible to perform NIM operations on the client. Although the **Cstate** of the client is reset by the operation, resources are not deallocated automatically. For information on deallocating resources, see "Using the NIM deallocate operation" on page 214.

When applied to **SPOT** resources, the **reset** operation updates the resource state (**Rstate**) of the **SPOT**. After the **reset** operation is performed, the **SPOT**'s **Rstate** is set to **ready**, and you can use the **SPOT** in NIM operations.

Using the NIM select operation

Use the **select** operation to include and exclude group members from operations performed on the group.

The command line syntax for the **select** operation is as follows:

```
nim -o select -a Attribute=Value ... TargetName |TargetNames
```

The target of a **select** operation must be a group of NIM clients.

The following are optional attributes that can be specified for the **select** operation:

-a exclude=Value	Specifies the name of the group member to exclude from operations on the group.
-a exclude_all=Value	Indicates that all members of the group should be excluded from operations on the group. Valid values are yes and no .
-a include=Value	Specifies the name of the group member to include in operations on the group.
-a include_all=Value	Indicates that all members of the group should be included in operations on the group. Valid values are yes and no .
-a verbose=Value	Displays information for debugging. Valid values are 1-5. Use verbose=5 to show maximum detail. The default is to show no debugging output.

To display the group members that are included and excluded from operations, use the **lsnim -g GroupName** command syntax.

Using the NIM showlog operation

Use the **showlog** operation to list software installed on a NIM client or **SPOT** resource.

The command line syntax for the **showlog** operation is as follows:

```
nim -o showlog -a Attribute=Value ... TargetName |TargetNames
```

The target of a **showlog** operation can be any standalone NIM client, a group of standalone NIM clients, or a **SPOT** resource.

The following are optional attributes that can be specified for the **showlog** operation:

-a full_log=Value	Indicates whether the entire log is displayed or only the last entry. The default value is full_log=no .
-a log_type=Value	Specifies the type of log to display. The log types supported for both standalone clients and SPOT resources are: boot Machine's boot log bosinst Output from the BOS installation program devinst Output from the installation of key system and device-driver software lppchk Log of the output from the lppchk operation executed on a standalone NIM client nimerr Errors encountered during execution of the nim command niminst Output from the installation of user-specified software (including installation of NIM client software during a bos_inst operation) script Output from any configuration script resources allocated for a bos_inst operation.
-a show_progress=Value	Indicates whether status should be displayed as the operation is performed. The default value is show_progress=yes .
-a verbose=Value	Displays information for debugging. Valid values are 1-5. Use verbose=5 to show maximum detail. The default is to show no debugging output.

Note: The **showlog** operation has no required attributes.

Using the NIM showres operation

Use the **showres** operation to display the contents of a resource.

The contents displayed will be appropriate for the type of resource on which the operation is run.

The command line syntax for the **showres** operation is as follows:

```
nim -o showres -a Attribute=Value ... TargetName
```

The target of a **showres** operation may be a **SPOT**, **lpp_source**, **script**, **bosinst_data**, **image_data**, **installp_bundle**, **fix_bundle**, **resolv_conf**, **exclude_files**, or an **adapter_def** resource.

The following are optional attributes that can be specified for the **showres** operation:

-a client=*Value*

Specifies which client's secondary adapter configuration file is displayed from an **adapter_def** resource. This attribute is only applicable when the target of the operation is an **adapter_def** resource.

-a filesets=*Value*

Specifies a list of filesets for which information should be displayed. This attribute is only applicable to **lpp_source** and **SPOT** targets.

-a installp_flags=*Value*

Specifies flags that tell the **installp** command how to format the display of filesets. This attribute is only applicable to **lpp_source** and **SPOT** targets.

-a instfix_flags=*Value*

Specifies flags that tell the **instfix** command how to format the display of fixes. This attribute is only applicable to **lpp_source** targets.

-a lsipp_flags=*Value*

Specifies flags that tell the **lsipp** command how to format the display of installed software. This attribute is only applicable to **SPOT** targets.

-a reference=*Value*

Specifies a reference machine or **SPOT** resource for fileset comparison. This attribute is only applicable when the target of the operation is an **lpp_source**. Available filesets in the **lpp_source** are compared against installed filesets in the reference machine or **SPOT**. If the **showres** operation is performed from a NIM client, the **reference** attribute is automatically set to the name of the client.

-a resource=*Value*

Specifies the name of the resource whose contents should be displayed. This attribute is only necessary when the **showres** operation is performed from a NIM client.

-a sm_inst_flags=*Value*

Specifies flags that tell the **sm_inst** command how to format the display of filesets. This attribute is only applicable to **lpp_source** and **SPOT** targets. This attribute must be used in conjunction with the **reference** attribute and is normally used only within the SMIT application.

Note: There are no required attributes for the **showres** operation.

- When the target of the **showres** operation is a **SPOT**, the list of filesets installed in the **SPOT** is displayed.
- When the target of the **showres** operation is an **lpp_source**, the list of filesets contained in the **lpp_source** is displayed.
- For all other resources that are valid targets for the **showres** operation, the character contents of the files are displayed.

Using the NIM sync operation

The **sync** operation synchronizes the NIM database with an alternate master.

The command backs up the local NIM database, restores the database onto the alternate master, and then updates the restored database.

The command line syntax for the **sync** operation is as follows:

```
nim [-F] -o sync -a Attribute=Value ... TargetName
```

The target of a sync operation must be an **alternate_master**.

The following are optional attributes that can be specified for the showres operation:

-a verbose=Value	Displays information for debugging. Valid values are 1-5. Use verbose=5 to show maximum detail. The default is to show no debugging output.
-F	Specifies that NIM should force the operation. Use the force operation if the database on the alternate_master should be overwritten.

Note: There are no required attributes for the **sync** operation.

Using the NIM sync_roots operation

Use the **sync_roots** operation to verify that diskless and dataless clients have the correct root files for the **SPOT** resource they use.

The command line syntax for the **sync_roots** operation is as follows:

```
nim -F -o sync_roots -a num_parallel_syncs=Value TargetName
```

The target of a **sync_roots** operation must be a **SPOT** resource.

The following are optional flags and attributes that can be specified for the **sync_roots** operation:

-a num_parallel_syncs=Value	Specifies the number of client root directories to simultaneously synchronize with the SPOT 's root files. Valid values are numeric. The default value is num_parallel_syncs=5 .
-F	Specifies that NIM should force the operation.

A **sync_roots** operation can be performed automatically when the **check** operation is performed on a **SPOT**.

Using the NIM takeover operation

The **takeover** operation allows a machine that is configured as an **alternate_master** to take control of the NIM environment.

The alternate master attempts to become the current master of each client defined in its database by updating each client's **/etc/niminfo** file. This operation also attempts to update the database on the target **alternate_master**.

The command line syntax for the takeover operation is as follows:

```
nim [-F] -o takeover -a Attribute=Value ... TargetName
```

The target of a takeover operation must be an **alternate_master**.

The following are optional attributes that can be specified for the **takeover** operation:

-a verbose= <i>Value</i>	Displays information for debugging. Valid values are 1-5. Use verbose=5 to show maximum detail. The default is to show no debugging output.
-a show_progress [<i>yes no</i>]	Indicates whether status should be displayed as the operation is performed. The default value is show_progress=yes .
-a async= [<i>yes no</i>]	If this attribute is set to "yes", then the clients will be updated with the new master information asynchronously. The default is to run this command asynchronously.
-F	Specifies that NIM should force the operation. Use the force operation if the database on the alternate_master should be overwritten.

Note: The **takeover** operation has no required attributes.

Using the NIM unconfig operation

Use the **unconfig** operation to unconfigure the NIM master.

The **unconfig** operation must be performed before the NIM master can be reconfigured or the NIM master fileset can be uninstalled.

Attention: Performing the **unconfig** operation removes all information from the NIM database and should be used with caution.

The command line syntax for the **unconfig** operation is as follows:

```
nim -o unconfig master
```

The target of the **unconfig** operation must be the NIM master.

No attributes can be specified for the **unconfig** operation.

The **unconfig** operation completely unconfigures the NIM master by performing the following:

- Removes the **nimesis** and **nimd** daemon entries from the System Resource Controller (SRC)
- Removes all data from the **nim_attr** and **nim_object** databases

Using the NIM update operation

The NIM **update** operation updates **lpp_source** resources by adding and removing packages.

The format of the **update** operation is as follows:

```
nim -o update -a packages=<all | list of packages with levels optional> \  
  [-a gencopy_flags=<flags>] ] [-a installp_bundle=<bundle_file>] \  
  [-a smit_bundle=<bundle_file>] [-a rm_images=<yes>] \  
  [-a source=<dir | device | object>] [-a show_progress=<yes | no>] \  
  <lpp_source_object>\
```

The NIM **update** operation is also available in SMIT using the **nim_update** fast path.

The source attribute must be a directory or device that is local to the server of the target **lpp_source** resource or an existing NIM **lpp_source** resource. The default operation is to add packages to the target **lpp_source**. If the **rm_images** attribute is present, the operation will remove packages from the **lpp_source**. A user must specify either the source or **rm_images** attribute and must specify the **packages**, **installp_bundle**, or **smit_bundle** attribute, but not more than one.

Generally, the **all** keyword means to perform a multi-volume installation when the source is a CD-ROM. However, the **update** operation will only do a single volume copy (equivalent to passing the **gencopy -S** flag).

The default behavior for this command is to display output. To turn off the output, pass **show_progress=no**.

To add packages to an **lpp_source** resource, run the following:

```
# nim -o update -a packages=all -a source=/tmp/inst.images lpp_source1
```

To remove packages from an **lpp_source** resource, run the following:

```
# nim -o update -a packages="bos.games 5.1.0.25 bos.sysmgt.nim" -a rm_images=yes lpp_source2
```

Using NIM groups

NIM groups are essentially lists of machines and resources. Groups can be used in NIM operations to simplify repetitive administrative tasks.

Working with NIM machine groups

Machine groups are used to represent collections of machines of similar types. The machine types in a group must all be the same (for example, standalone, diskless, or dataless) and of the same architecture, because some NIM operations are restricted to certain target types.

The first member added to a group determines the architecture and type of machine the group can contain. By having multiple machines defined as members of a single group, you can perform a single operation on all machines by specifying the group as the target. NIM iterates through the list of machines in the group, and performs the operation on each member, in turn.

Group members can be excluded from NIM group operations by marking them for exclusion before performing the operation. Excluding a member marks the member list in the group representation, so NIM skips the member when it iterates through the list. Excluding a member does not change the definition of the client in the NIM database. For information on marking group members for inclusion and exclusion, see “Including and excluding group members from operations on the group” on page 295.

Machines can be added or removed from groups, as well as be members of multiple groups. When all members of a group are removed, the group definition in the NIM database is automatically deleted. For information on adding and removing group members, see “Adding new members to machine groups” on page 294 and “Removing members from machine groups” on page 295.

The command line syntax for defining a machine group is:

```
nim -o define -t mac_group -a Attribute=Value ... MachineGroupName
```

where the following attributes are optional:

add_member=Value	Specifies the name of a NIM client to add to the machine group. NIM automatically converts this attribute to a member attribute with an appropriate sequence number.
member=Value	Specifies the name of a NIM client to add to the machine group. This attribute requires a sequence number.

Operations performed on machine groups are, by default, performed asynchronously on the non-excluded members of the group. NIM does not wait for an operation to complete on one group member before initiating the operation on the next member. When performing operations asynchronously, it is not possible for NIM to display all the output as it occurs on each client. Therefore, you should use the **lsnim** command to check the states of the group members to determine how far, and how successfully, the operations have executed. If errors do occur, the log files on client machines can be viewed using the NIM **showlog** operation.

To change the behavior of NIM group operations from asynchronous to synchronous, use the **async=no** attribute when running the **nim** command.

The number of machines permitted in a machine group is not explicitly limited by NIM. However, the following factors limit the number for practical reasons:

Operation being Performed	Operations that are not resource-intensive (such as the maint or showlog operations) may be performed on a group containing any number of machines. Operations that are resource-intensive (such as cust or bos_inst) are limited by the throughput of the network, the disk access throughput of the installation servers, and the platform type of servers.
NFS Export Limitations	The maximum number of hosts to which a file or directory may be exported with root permissions is limited by NFS to 256. Also, the length of a line in an exports file has an upper limit which could determine the maximum number of machines permitted in a group. For information on how to increase the number of machines to which a resource can be allocated, refer to “Exporting NIM resources globally” on page 315.

Working with NIM resource groups

Resource groups are used to represent collections of NIM resources.

A resource group can contain multiple **installp_bundle** and **script** resources, and one resource from each of the other types. If a resource group is allocated or specified for use in a NIM operation, all applicable resources in the group are allocated to the target. The use of resource groups can save NIM administrators from having to repeatedly specify the same set of resources individually, when the allocation of a single resource group would suffice.

The command line syntax for defining a resource group is:

```
nim -o define -t res_group -a default=Value \  
-a ResourceType=ResourceName ... ResourceGroupName
```

where the following attributes are optional:

default=Value	Specifies whether a resource group should be made the default. The default value is default=no .
<i>ResourceType</i>	Specifies the type (for example, spot , lpp_source , script , etc.) and name of the resource to add to the group. One resource of each type may be specified, except for script and installp_bundle resources, which may have multiple resources participate in an operation.

The allocation of individual resource group members can be overridden by specifying additional resource attributes for the members to be changed.

For example, the resource group, `res_grp1`, contains the `spot1`, `lpp_source1`, `bosinst_data1`, `script1`, and `resolv_conf1` resources. To use the resource group to perform an **rte bos_inst** operation on `client1`, but using no **bosinst_data** resource, and using `resolv_conf2` instead of `resolv_conf1`, use the following command:

```
nim -o bos_inst -a source=rte -a group=res_group1 \  
-a bosinst_data= -a resolve_conf=resolv_conf2 client1
```

A resource group can be specified as the default set of resources to use for all NIM operations. This is done by setting the master's **default_res** attribute to the name of the resource group that will be the default. When a default resource group is defined, the applicable member resources will always be automatically allocated during NIM operations, unless they are specifically overridden.

To set the default resource group to `res_group1`, enter:

```
nim -o change -a default_res=res_group1 master
```

or enter:

```
nim -o change -a default=yes res_group1
```

To stop using a default resource group, enter:

```
nim -o change -a default_res=master
```

or enter:

```
nim -o change -a default=no res_group1
```

NIM Task Roadmap

The following are NIM configuration tasks and installation tasks and where they can be found in this topic. Also provided is a brief description of the task. Where appropriate, the SMIT fast path is provided.

Table 12. NIM Task Roadmap

NIM Task	SMIT Fast Path	Description
“Using EZNIM” on page 227	smit eznim	Configure the NIM environment using EZNIM. Allows you to configure your system as a NIM master or a NIM client. If you configure your system as a NIM master, EZNIM also creates the minimum basic installation resources.
“Configuring the NIM master and creating basic installation resources” on page 230	smit nim_config_env	Configure the NIM master, create the minimum basic installation resources required to install NIM client machines, and manage the resources for diskless and dataless clients.
“Adding standalone clients to the NIM environment” on page 232	smit nim_mkmac	Describes how to add standalone clients to the NIM environment.
“Using installation images to install the base operating system on a NIM client” on page 237	smit nim_bosinst	Describes how to perform a BOS installation on a NIM client.
“Using a mksysb image to install the base operating system on a NIM Client” on page 238	smit nim_bosinst	Describes how to restore a mksysb image and additional software to a target NIM client from a mksysb resource in the NIM environment.
“Performing a nonprompted BOS installation” on page 241	<ul style="list-style-type: none"> • smit nim_mkres • smit nim_bosinst 	Provides information about how to perform a nonprompted NIM BOS installation using a bosinst_data resource.
“Using NIM with ATM networks” on page 243		Provides information about how to configure NIM to work with ATM adapters.
“Using installation images to install the base operating system on a NIM client” on page 237	smit nim_task_inst	Describes how to use NIM to install software packages, updates, and maintenance levels on running, configured NIM clients and SPOT resources.
Remove Installed Software from a NIM Client or a SPOT Resource.	smit nim_remove	From the NIM master, you can uninstall software that resides on client machines. NIM also gives you the capability of committing and rejecting updates over the network.

Table 12. NIM Task Roadmap (continued)

Perform Maintenance Operations on NIM Client Machines	smit nim_mac_op	Hardware diagnostics can be performed on NIM clients using a diagnostic boot image from a NIM server, rather than booting from a diagnostic tape or CD-ROM. Not only does this eliminate the need for diagnostic boot media, it eliminates the need to have diagnostics installed on the local disks of machines. For maintenance operations, you can boot a NIM client into maintenance mode from the boot image on a NIM server instead of using a bootable tape or CD-ROM.
Perform Maintenance Operations on NIM Resources	smit nim_res	Allows you to list NIM resources; change characteristics of a resource; show the contents of a resource; and verify resources.
Software Maintenance and Utilities	smit nim_task_maint	Provides information about how to commit, reject, remove, copy, verify, and clean up software.
“Adding a diskless or dataless client to the NIM environment” on page 248	smit nim_task_dd	Provides information about how to add diskless and dataless systems to your NIM environment. You can also manage resources for diskless and dataless clients from the NIM master.
“Installing to an alternate disk on a NIM Client” on page 252	smit nim_alt_install	NIM can be used to clone the running of rootvg (root volume group) to an alternate disk, or install a mksysb image to an alternate disk.
“Performing an alternate disk migration installation” on page 69	smit nimadm	NIM can be used to perform an alternate disk migration installation to a NIM client.

Using EZNIM

The SMIT EZNIM feature organizes the commonly used NIM operations and simplifies frequently used advanced NIM operations.

Features of SMIT EZNIM include:

- Task-oriented menus
- Automatic resource naming that includes the level of the software used to create NIM resources.
- The user can review what steps will take place *before* executing a task, whenever possible.

Use the SMIT **eznim** fast path to open the EZNIM main menu. If the NIM environment has not been set up on your system, the EZNIM main menu displays the following options:

- Configure as a NIM Master
- Configure as a NIM Client

Using EZNIM to configure a NIM master

Follow these steps to configure your current system as a NIM master.

If you select **Configure as a NIM Master**, the following options display:

```
Setup the NIM Master environment
Enable Cryptographic Authentication
Add fixes to the NIM Master environment
Add client to the NIM environment
```

```
Update clients
Backup a client
Reinstall clients
Reset clients
```

```
Show the NIM environment
Verify the NIM environment
Remove NIM environment
```

- To configure your current system as a NIM master, select **Setup the NIM Master environment**. You can select the software source to configure from, select the volume group to use for the NIM resources, and select the file system to use for the NIM resources. When the NIM master environment is configured, the basic NIM resources are created. To view the NIM resources created by EZNIM, select **Show the NIM environment**, or run the **lsnim** command on the NIM master.
- To configure your NIM master for SSL authentication, select **Enable Cryptographic Authentication**. This option allows you to install and configure the cryptographic software in the OpenSSL RPM package. After you configure OpenSSL, NIM clients with OpenSSL installed can request cryptographic authentication during service requests from the NIM master.
- To install updates and maintenance or technology level packages to the NIM master, select **Add fixes to the NIM Master environment**. This option performs an update installation of a specified set of fixes onto the default **SPOT** resource. A second **SPOT** resource containing the newly installed fixes is created by this operation. You can optionally select to update all your NIM clients during this operation.
- To update a client using EZNIM, select **Update clients**. This option allows you to perform an **update_all** operation on a selected client (or clients) using an **lpp_source** resource.
- To back up a client using EZNIM, select **Backup a client**. This option allows you to create a system backup image of a selected client and store the backup image on the NIM master.
- To reinstall a client using EZNIM, select **Reinstall clients**. This option allows you to perform a **mksysb** restore or native, **rte** install on a selected client (or clients). You must then select a system backup image to restore or an **lpp_source** to install and decide whether to reboot and install the client now.
- To reset a NIM client to the *ready* state, select **Reset clients**. This option resets the state of a client or clients in the NIM environment. Use this option after a NIM operation has failed, and you want to return the client to the *ready* state.

Using EZNIM to configure a NIM client

Follow these steps to configure a NIM client with EZNIM.

On a client system, use the SMIT **eznim** fast path. Select **Configure as a NIM Client**, and the following options display:

```
Add this system to a NIM environment
Configure Client Communication Services
Update this system
Reinstall this system
Reset this system
Show the NIM environment
```

- To define your client in the NIM environment, select **Add this system to a NIM environment**.
- To configure your NIM client for SSL authentication, select **Configure Client Communication Services**. This option allows you to install and configure the cryptographic software in the OpenSSL RPM package. After you configure OpenSSL, you can select **nimsh** as the communication protocol used by the client. Any incoming NIM master service requests are then authenticated through SSL socket connections.

- To update your client, select **Update this system**. This option allows you to perform an **update_all** operation on your client using an **lpp_source** resource.
- To reinstall your client, select **Update this system**. This option allows you to perform a **mksysb** restore or native, **rte** install on a selected client (or clients). You must then select a system backup image to restore or an **lpp_source** to install and decide whether to reboot and install the client now.
- To reset your client in the NIM environment, select **Reset this system**. This option resets the state of the client in the NIM environment. Use this option after a NIM operation has failed, and you want to return the client to the *ready* state.
- To view the default resources in the EZNIM environment, select **Show the NIM environment**. The resources are defined using EZNIM Master Operations.

Example of using EZNIM

Follow these steps to create EZNIM setup using a different volume group.

To create EZNIM setup using a different volume group, run **smitty eznim** → **Configure as a NIM Master** → **Setup the NIM Master environment**.

```

Easy NIM - Setup the NIM Master environment

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                [Entry Fields]
Select or specify software source   [cd0]      +
to initialize environment:

Select Volume Group for resources   [rootvg]   +

Select Filesystem for resources     [/export/eznim]

Options
CREATE system backup image?        [yes]      +
CREATE new Filesystem?              [yes]      +
DISPLAY verbose output?             [no]       +

```

For **Select Volume Group for resources**, select your volume group. If you prefer to use a different filesystem than the default **/export/eznim**, then fill in the desired value in the **Select Filesystem for resources** field.

The **nim_master_setup** command can also be used to select a different volume group or filesystem by specifying the flag attribute (**-a file_system=<value>** or **-a volume_group=<value>**). You can enter the value for **filesystem** and **rootvg**.

To define NIM resources in using install media located in device **/dev/cd0**, and create a new filesystem named **/export/nimfs** under volume group **myvg**, type:

```
nim_master_setup -a volume_group=myvg -a file_system=/export/nimfs
```

Note: If the **/export/nimfs** filesystem does not currently exist, then is created under the **myvg** volume group. If the **myvg** volume group does not exist, it is created using the next empty physical volume (disk) since the disk attribute was not specified.

Configuring NIM and other basic operations

You can use several methods for performing basic NIM operations and configuration tasks.

You can perform basic NIM operations and configuration tasks using the following methods:

- Web-based System Manager NIM interface
- System Management Interface Tool (SMIT)

- Command line

Note: For tasks performed at the command line, the root user must be using **ksh**. Unexpected results can occur if the root user is set to another shell, such as **csch**.

Starting the Web-based System Manager NIM interface

To start the Web-based System Manager NIM interface from an X-Windows session on the NIM master, type: `wsm`.

For assistance, use the online contextual help for Web-based System Manager. Extended help is also available in the interface. To view the extended help, select **Contents** from the Help menu in the NIM container.

Configuring the NIM master and creating basic installation resources

You can configure the NIM master, create the minimum basic installation resources required to install NIM client machines, and manage the resources for diskless and dataless clients with Web-based System Manager, SMIT, or the command line.

Note:

1. Using an AIX Version 5 or Version 6 **lpp_source** to install filesets on an AIX Version 4 client through NIM, is not supported. If installing Version 5 or Version 6 filesets on a Version 4 system is necessary, the user can NFS export the **lpp_source**, mount it on the client, and then use the **installp** command or **geninstall** command to perform the installation procedures.
2. This procedure produces a large amount of output, especially when creating the **SPOT** resource. Be sure to scan through the output to look for nonfatal errors and warnings that may not be evident from a successful return code.

Prerequisites

The NIM master must have at least 1 GB of available disk space. If such space is not available, see “Using client machines as resource servers” on page 292, and “Defining an `lpp_source` on CD/DVD-ROM versus hard disk” on page 271.

Configuring the NIM master and creating basic installation resources using Web-based System Manager:

Use this procedure for configuring the NIM master and creating basic installation resources using Web-based System Manager.

1. Insert the *AIX Volume 1* media into the appropriate drive of the designated master machine.
2. Start the Web-based System Manager Software application by entering `wsm`.
3. In the navigation area, expand and select the NIM container, then follow the directions in the wizard.

Configuring the NIM master and creating basic installation resources using SMIT:

Use this procedure for configuring the NIM master and creating basic installation resources using SMIT.

1. Insert the *AIX Volume 1* media into the appropriate drive of the designated master machine.
2. To install the **bos.sysmgt.nim.master** fileset, enter the **smit install_latest** fast path.
3. Using the LIST option, select **/dev/cd0** for the INPUT device/directory for software.
4. Specify **bos.sysmgt.nim.master** as the SOFTWARE to install.
5. Accept the default values for all other fields on this screen. After successful completion of this installation, exit SMIT.
6. To configure the NIM master, enter the **smit nim_config_env** fast path.
7. Using the LIST option, select the Primary Network Interface for the NIM Master.

8. Using the LIST option, select **/dev/cd0** or **/dev/rmt0** for the **Input device for installation / images** field.
9. If you will be supporting diskless and dataless clients, select **yes** at the **Create Diskless/Dataless Machine Resources?** field, and supply names for the resources to be created.
10. Select **yes** at the **Remove all newly added NIM definitions and file systems if any part of this operation fails?** field. This will make it easier to restart this procedure if failures occur.
11. Accept the default values for all other fields on this screen.

Note:

1. Depending on the speed of your machine, creating the basic NIM resources could be a lengthy process.
2. This procedure provides the capability for much more than just configuring the NIM master and creating the **lpp_source** and **SPOT** resources. However, for this simple configuration, only a subset of the available functions will be used. Advanced NIM administrators can use the SMIT screens accessed through this procedure to create a more complex environment.
3. As you develop a better understanding of configuration tasks, you may prefer to not automatically undo all configuration when failures occur (as in step 10 in the previous procedure). Continuing from the last point of failure results in faster configuration for experienced administrators.

Configuring the NIM master and creating basic installation resources from the command line:

Use this procedure for configuring the NIM master and creating basic installation resources from the command line.

1. Insert the *AIX Volume 1* media into the appropriate drive of the designated master machine.
2. To install the **bos.sysmgmt.nim.master** fileset from the disk, enter: `# installp -agXd /dev/cd0 bos.sysmgmt.nim.master`
To install the **bos.sysmgmt.nim.master** fileset from a tape, enter: `# installp -agXd /dev/rmt0 bos.sysmgmt.nim.master`
3. To configure the NIM master using the **nimconfig** command, enter:

For example, to configure a NIM master with the following configuration:

```
master host name = master1
primary network interface = tr0
ring speed = 16
platform = chrp
kernel type = mp
```

Enter the following command sequence: `# nimconfig -a netname=network1 -a pif_name=tr0 \ -a ring_speed=16 -a platform=chrp -a netboot_kernel=mp`

Note: For additional attribute information, see the **nimconfig** command.

4. To create a file system in the rootvg volume group with 400 MB of space with a mount point of **/export/lpp_source**, enter:

```
# crfs -v jfs -g rootvg -a size=$((2000*400)) \
-m /export/lpp_source -A yes -p rw -t no \
-a frag=4096 -a nbpi=4096 -a compress=no
```
5. To mount the file system, enter: `# mount /export/lpp_source`
6. The **lpp_source** contains the installation images copied from the source device (in this example, the CD-ROM). The server of the **lpp_source** will be the NIM master. The images will be stored in the **/export/lpp_source/lpp_source1** directory. To create the **lpp_source** resource named **lpp_source1**, enter:

```
# nim -o define -t lpp_source -a source=/dev/cd0 \
-a server=master -a location=/export/lpp_source/lpp_source1 \
lpp_source1
```

7. To create a file system in the rootvg volume group with 200 MB of space with a mount point of **/export/spot**, enter:

```
# crfs -v jfs -g rootvg -a size=$((2000*200)) \  
-m /export/spot -A yes -p rw -t no \  
-a frag=4096 -a nbpi=4096 -a compress=no
```

8. To mount the file system, enter: # mount /export/spot

9. The **SPOT** resource will be installed from images in the image source (in this case, the **lpp_source** that was created in step 6). The server of the resource will be the NIM master, and the **SPOT** will be stored in the **/export/spot/spot1** directory. To create the **SPOT** resource named **spot1**, enter:

```
# nim -o define -t spot -a source=lpp_source1 \  
-a server=master -a location=/export/spot spot1
```

10. If you are not supporting diskless and dataless clients, you do not need to continue with this procedure. If you are supporting diskless and dataless clients, create and mount a file system for their resources.

To create a file system in the rootvg volume group with 150 MB of space and a mount point of **/export/dd_resource**, enter:

```
# crfs -v jfs -g rootvg -a size=$((2000*150)) \  
-m /export/dd_resource -A yes -p rw -t no \  
-a frag=4096 -a nbpi=4096 -a compress=no
```

11. To mount the file system, enter: # mount /export/dd_resource

12. Create the diskless and dataless client resources in subdirectories of the **/export/dd_resource** directory. Not all resources are required. Create only the resources to be used in your environment.

To create the **root** resource named **root1** (required for diskless and dataless clients), enter:

```
# nim -o define -t root -a server=master \  
-a location=/export/dd_resource/root1 root1
```

To create the **dump** resource named **dump1** (required for diskless and dataless clients), enter:

```
# nim -o define -t dump -a server=master \  
-a location=/export/dd_resource/dump1 dump1
```

To create the **paging** resource named **paging1** (required for diskless clients), enter:

```
# nim -o define -t paging -a server=master \  
-a location=/export/dd_resource/paging1 paging1
```

To create the **home** resource named **home1** (optional), enter:

```
# nim -o define -t home -a server=master \  
-a location=/export/dd_resource/home1 home1
```

To create the **shared_home** resource named **shared_home1** (optional), enter:

```
# nim -o define -t shared-home -a server=master \  
-a location=/export/dd_resource/shared_home1 shared_home1
```

To create the **tmp** resource named **tmp1** (optional), enter:

```
# nim -o define -t tmp -a server=master \  
-a location=/export/dd_resource/tmp1 tmp1
```

Adding standalone clients to the NIM environment

You can add standalone clients to the NIM environment with Web-based System Manager, SMIT, or the command line.

Standalone clients are machines that, once installed, can obtain a boot image and mount all file systems from the local hard disk, unlike diskless and dataless clients which depend on remote servers. You can add a client with or without the network information.

Adding a client with the network information with Web-based System Manager:

To add a client with the network information with Web-based System Manager, you can use the wizard.

- The NIM master must be configured. For more information, see “Configuring the NIM master and creating basic installation resources” on page 230.
 - You must know the subnet mask, the default gateway for the client machine, and the default gateway for the NIM master.
1. To start the Web-based System Manager Software application, type `wsm`.
 2. In the navigation area, expand and select the **NIM container**.
 3. Select the Machines container.
 4. From the Machines menu, select **New** → **Machine**.
 5. Use the wizard to complete the task.

Adding a client with the network information using SMIT:

Follow these instructions to add a standalone NIM client to the NIM environment using SMIT.

To add a standalone NIM client to the NIM environment using SMIT, use Method A if the client machine is not running or if the client does not have AIX installed. Method A can also be used if BOS is to be installed on the client and the client is to be network-booted manually or to initiate the installation from a **force-push** operation. This procedure automatically adds NIM networks when needed.

To add a standalone NIM client that already has AIX installed, use Method B.

If the NIM client being defined is on a network that is not currently defined in the NIM environment, the **niminit** command will fail. If this is the case, use Method A of this procedure to define the client on the NIM master, and then follow the steps in Method B to complete the configuration.

Prerequisites

- The NIM master must be configured. For more information, see “Configuring the NIM master and creating basic installation resources” on page 230.
- You must know the subnet mask, the default gateway for the client machine, and the default gateway for the NIM master.

Adding a client with the network information using SMIT when client is not running (method A):

Follow these steps to add a client with the network information using SMIT when the client is not running.

1. On the NIM master, add a standalone client to the NIM environment by typing the **smit nim_mkmac** fast path.
2. Specify the host name of the client.
3. The next SMIT screen displayed depends on whether NIM already has information about the client’s network. Supply the values for the required fields or accept the defaults. Use the help information and the LIST option to help you specify the correct values to add the client machine.

Adding a client with the network information using SMIT when client is running (method B):

Follow these steps to add a client with the network information using SMIT when the client is running.

1. On a system that you have chosen to be a NIM client, verify that if the **bos.sysmgt.nim.client** fileset is installed by typing the following: `# ls1pp -L bos.sysmgt.nim.client`
2. If the **bos.sysmgt.nim.client** fileset is not installed, then install the fileset from the *AIX Volume 1* CD/DVD by typing the following: `# installp -acXd /dev/cd0 bos.sysmgt.nim.client`
3. Enter the **smit niminit** fast path.
4. Supply the values for the required fields or accept the defaults. Use the help information and the LIST option to help you specify the correct values for defining your client machine.

Adding a client with the network information from the command line:

Follow these instructions to add a standalone NIM client to the NIM environment from the command line.

To add a standalone NIM client to the NIM environment from the command line, use Method A if the client machine is not running or if the client does not have AIX installed. Method A can also be used if BOS is to be installed on the client and the client is to be network-booted manually or to initiate the installation from a **force-push** operation. This procedure automatically adds NIM networks when needed.

To add a standalone NIM client that already has AIX installed, use Method B.

If the NIM client being defined is on a network that is not currently defined in the NIM environment, the **niminit** command will fail. If this is the case, use Method A of this procedure to define the client on the NIM master, and then follow the steps in Method B to complete the configuration.

Prerequisites

- The NIM master must be configured. For more information, see “Configuring the NIM master and creating basic installation resources” on page 230.
- You must know the subnet mask, the default gateway for the client machine, and the default gateway for the NIM master.

Adding a client with the network information from the command line when client machine is not running (method A):

Follow these steps to add a client with the network information from the command line when client machine is not running.

On the NIM master, type:

```
# nim -o define -t standalone -a platform=PlatformType \  
-a netboot_kernel=NetbootKernelType \  
-a if1=InterfaceDescription \  
-a net_definition=DefinitionName -a ring_speed1=SpeedValue \  
-a cable_type1=TypeValue -a iplrom_emu=DeviceName MachineName
```

Example 1:

To add the machine with host name `machine1` with the following configuration:

```
host name=machine1  
platform=chrp  
kernel=up  
network type=ethernet  
subnet mask=255.255.240.0  
default gateway=gw1  
default gateway used by NIM master=gw_master  
cable type=bnc  
network boot capability=yes (no emulation needed)
```

enter the following command sequence:

```
# nim -o define -t standalone -a platform="chrp" \  
-a netboot_kernel="up" -a if1="find_net machine1 0" \  
-a cable_type1="bnc" \  
-a net_definition="ent 255.255.240.0 gw1 gw_master" machine1
```

Example 2:

To add the machine with host name `machine2` with the following configuration:

```
host name=machine2  
platform=chrp  
netboot_kernel=up  
network type=token ring
```

```
subnet mask=255.255.225.0
default gateway=gw2
default gateway used by NIM master=gw_master
ring speed=16
```

enter the following command sequence:

```
# nim -o define -t standalone -a platform="chrp" \
-a netboot_kernel="up" -a if1="find_net machine2 0" \
-a ring_speed1="16" \
-a net_definition="tok 255.255.225.0 gw2 gw_master" machine2
```

Note:

1. If the **find_net** keyword in the **if** attribute causes NIM to successfully match a network definition to the client definition, the **net_definition** attribute is ignored.
2. For more information about the attributes you can specify when defining NIM clients, see “Defining NIM clients” on page 179

Adding a client with the network information from the command line when client machine is running (method B):

Follow these steps to add a client with the network information from the command line when the client machine is running.

1. Install the **bos.sysmgmt.nim.client** fileset on the client machine.
2. From the machine being defined as a client, enter:

```
# niminit -a name=ClientDefinitionName -a master=MasterName \
-a pif_name=Interface -a platform=PlatformType \
-a netboot_kernel=NetbootKernelType -a ring_speed1=SpeedValue \
-a cable_type1=TypeValue -a iplrom_emu=DeviceName
```

Note: For detailed attribute information, see the **niminit** command.

Example 1:

To add the machine with host name machine1 with the following configuration:

```
host name=machine1
NIM master's host name=master_mac
primary interface adapter=en0
platform=chrp
kernel=up
cable type=bnc
network boot capability=yes (no emulation needed)
```

enter the following command sequence:

```
# niminit -a name=machine1 -a master=master_mac \
-a pif_name=en0 -a platform=chrp -a netboot_kernel=up \
-a cable_type1=bnc
```

Example 2:

To add the machine with host name machine2 with the following configuration:

```
host name=machine2
NIM master's host name=master_mac
primary interface adapter=tr0
platform=chrp
netboot_kernel=up
ring speed=16
```

enter the following command sequence:

```
# niminit -a name=machine2 -a master=master_mac \  
-a pif_name=tr0 -a platform=chrp -a netboot_kernel=up \  
-a ring_speed1=16
```

Adding a client without the network information using SMIT:

You can use a new remote service for defining clients in the NIM environment. Follow these directions to use this new service with SMIT.

The new service is called the NIM Service Handler (NIMSH), and it runs on potential NIM clients. When you define a system using NIMSH, no information is required for defining the client object. For additional information, see “Using the NIM service handler for client communication” on page 286.

To define NIM clients using **nimquery**, complete the following steps:

1. Type the fast path **smitty nim_query** on the NIM master.
2. Specify the hostname of the machine to query.

Note: The machines must have NIMSH daemon active.

3. Select **yes** as the option for **Adding Machine to the NIM Environment** if you are adding the machine as a NIM client object.
4. Specify the new client object name.

Adding a client without the network information from the command line:

You can use a new remote service for defining clients in the NIM environment. Follow these directions to use the new service from the command line.

The new service is called the NIM Service Handler (NIMSH), and it runs on potential NIM clients. When you define a system using NIMSH, no information is required for defining the client object. For additional information, see “Using the NIM service handler for client communication” on page 286.

To define NIM clients using the **nimquery** command on the command line, type the following:

```
# nimquery -a host=hostname -a name=obj_name -d
```

For more information on defining NIM clients using NIMSH, see the **nimquery** command.

Verifying the status of your client machine:

Use the **niminit** command to verify the status of your client machine.

To verify that the **niminit** command completed successfully, enter the following command at the NIM client:

```
# nimclient -l -l MachineObjectName
```

The system returns output similar to the following:

```
Standalone2:  
  class      = machines  
  type       = standalone  
  Cstate     = ready for a NIM operation  
  platform   = chrp  
  netboot_kernel = up  
  if1        = Network2 standalone2 08005acd536d  
  cable_type1 = bnc  
  iplrom_emu = /dev/fd0  
  prev_state = customization is being performed  
  cpuid      = 000247903100  
  Mstate     = currently running  
  Cstate_result = success
```

If the system output to this query indicates any errors, you must validate all of your data, checking for accurate spelling, nonduplication of NIM names, and so forth, and redo the **nimit** operation.

Be sure to coordinate this operation with the system administrator of the NIM master, and ensure that *all* NIM object names are unique in the entire NIM environment.

Note: You cannot perform this task with Web-based System Manager or SMIT.

Using installation images to install the base operating system on a NIM client

Using installation images to install the base operating system (BOS) on a NIM client is similar to the traditional BOS installation from a tape or media device because the BOS image is installed from the installation images in the **lpp_source** resource.

Prerequisites

- The NIM master must be configured, and **lpp_source** and **SPOT** resources must be defined. See “Configuring the NIM master and creating basic installation resources” on page 230.
- The NIM client to be installed must already exist in the NIM environment. To add the client to the NIM environment, see “Adding standalone clients to the NIM environment” on page 232.

Using installation images to install the base operating system on a NIM client using Web-based System Manager:

With this procedure you can use installation images to install the base operating system on a NIM client using Web-based System Manager.

1. From the NIM container, select the Machines container.
2. In the contents area, select a target standalone machine for the installation.
3. From the Selected menu, choose **Install Operating System**.
4. If the client machine being installed is not already a running, configured NIM client, NIM will not automatically reboot the machine over the network for installation. If the client was not rebooted automatically, initiate a network boot from the client to install it. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.
5. After the machine boots over the network, the display on the client machine will begin prompting for information about how to configure the machine during installation. Specify the requested information to continue with the installation.

Note: To perform a nonprompted installation, follow the instructions in “Performing a nonprompted BOS installation” on page 241 to complete the prerequisite tasks.

Using installation images to install the base operating system on a NIM client using SMIT:

Follow this procedure to install use installation images to install the base operating system a NIM client using SMIT.

1. To install BOS on a NIM client using an **rte** installation, type `smit nim_bosinst` from the NIM master.
2. Select the TARGET for the operation.
3. Select **rte** as the installation TYPE.
4. Select the SPOT to use for the installation.
5. Select the LPP_SOURCE to use for the installation.
6. In the displayed dialog fields, supply the correct values for the installation options or accept the default values. Use the help information and the LIST option to help you.
7. If the client machine being installed is not already a running, configured NIM client, NIM will not automatically reboot the machine over the network for installation. If the client was not rebooted automatically from SMIT, initiate a network boot from the client to install it. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.

8. After the machine boots over the network, the display on the client machine will begin prompting for information about how the machine should be configured during installation. Specify the requested information to continue with the installation.

Note: To perform a nonprompted installation, follow the instructions in “Performing a nonprompted BOS installation” on page 241 to complete the prerequisite tasks.

Using installation images to install the base operating system on a NIM client from the command line:

Follow this procedure for using installation images to install the base operating system on a NIM client from the command line.

1. To initiate the **bos_inst** operation, type:

```
# nim -o bos_inst -a source=rte -a lpp_source=Lpp_Source \  
-a spot=SPOTName -a accept_licenses=yes -a boot_client=yes/no ClientName
```

Specify the resources to be used to support the installation and any additional options for customizing the installation. To perform a simple **rte** installation, specify the **lpp_source** and **SPOT** resources.

If the client machine being installed is not already a running, configured NIM client, NIM will not automatically reboot the machine over the network for installation. A network boot must be performed manually on the machine. If that is the case, supply the **boot_client=no** attribute to the **bos_inst** command. If the **boot_client** attribute value is not specified, it defaults to **boot_client=yes**.

2. If the client was not rebooted automatically, initiate a network boot from the client to install it. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.
3. After the machine boots over the network, the display on the client machine will begin prompting for information about how to configure the machine during installation. Specify the requested information to continue with the installation.

Example

The client machine, `machine1`, is not a running, configured NIM client. You should specify **boot_client=no**. To install the client using the **lpp_source** named `lpp_source1` and the **SPOT** named `spot1`, enter:

```
# nim -o bos_inst -a source=rte -a lpp_source=lpp_source1 \  
-a spot=spot1 -a accept_licenses=yes -a boot_client=no machine1
```

Note:

- a. The steps to perform an **rte** installation are almost identical to the steps to perform other types of BOS installations. The main difference is that **rte** must be specified in the **source** attribute of the **nim bos_inst** command.
- b. To perform a nonprompted installation, follow the instructions in “Performing a nonprompted BOS installation” on page 241 to complete the prerequisite tasks.
- c. For a complete description of the different ways that a BOS installation can be customized by NIM, see “Using the NIM `bos_inst` operation” on page 207.

Using a mksysb image to install the base operating system on a NIM Client

A **mksysb** installation restores BOS and additional software to a target from a **mksysb** image in the NIM environment.

For a complete description of different ways to customize a BOS installation using NIM, see “Using the NIM `bos_inst` operation” on page 207.

The **mksysb** images enable you to clone one system image onto multiple target systems. The target systems might not contain the same hardware devices or adapters, require the same kernel (uniprocessor or multiprocessor).

Because NIM configures TCPIP at the end of an installation, it is recommended that a **bosinst_data** resource be allocated for cloning **mksysb** installations with the **RECOVER_DEVICES** field set to no. This will prevent the BOS installation process from attempting to configure the devices as they were on the source machine of the **mksysb** image.

In AIX, devices are not recovered if the **mksysb** image that is being installed was not created on the same system.

Attention: If the system you have cloned is using OpenGL or graPHIGS, there may be some device filesets from these LPPs that must be installed after a clone. OpenGL and graPHIGS have graphics adapter-specific filesets, so if you cloned onto a system with a different graphics adapter, you will need to create a bundle as follows:

```
echo OpenGL.OpenGL_X.dev > /usr/sys/inst.data/user_bundles/graphic_dev.bnd
echo PEX_PHIGS.dev >> /usr/sys/inst.data/user_bundles/graphic_dev.bnd
```

You can allocate this bundle when you install the **mksysb**, and the device filesets will be installed automatically if OpenGL and graPHIGS are in your **lpp_source**.

Prerequisites

- The NIM master must be configured, and **SPOT** and **mksysb** resources must be defined. See “Configuring the NIM master and creating basic installation resources” on page 230.
- The NIM client to be installed must already exist in the NIM environment. To add the client to the NIM environment, see “Adding standalone clients to the NIM environment” on page 232.
- The **mksysb** must be available on the hard disk of the NIM master or a running NIM client, or the **mksysb** image is created during this procedure from either the NIM master or a running NIM client.
- The **SPOT** and **mksysb** resources should be at the same level of AIX when used for NIM BOS installations.
- Many applications, particularly databases, maintain data in *sparse files*. A sparse file is one with empty space, or gaps, left open for future addition of data. If the empty spaces are filled with the ASCII null character and the spaces are large enough, the file will be sparse, and disk blocks will not be allocated to it.

This situation creates an exposure in that a large file will be created, but the disk blocks will not be allocated. As data is then added to the file, the disk blocks will be allocated, but there may not be enough free disk blocks in the file system. The file system can become full, and writes to any file in the file system will fail.

It is recommended that you either have no sparse files on your system or that you ensure you have enough free space in the file system for future allocation of the blocks.

Using a mksysb image to install the base operating system on a NIM Client using Web-based System Manager:

Follow this procedure for using a **mksysb** image to install the base operating system on a NIM Client using Web-based System Manager.

1. In the NIM container, select the Resources container.
2. From the Resources menu, select **New** → **Resource** → **New Resources**.
3. Use the wizard to complete the task.

Note: To perform a nonprompted installation, follow the instructions in “Performing a nonprompted BOS installation” on page 241 to complete the prerequisite tasks.

Using a mksysb image to install the base operating system on a NIM Client using SMIT:

Follow this procedure for using a **mksysb** image to install the base operating system on a NIM Client using SMIT.

1. If the **mksysb** resource has already been created, skip to step 6. Otherwise, to create the **mksysb** resource, enter the **smit nim_mkres** fast path.
2. Select **mksysb** from the list of resource types that can be defined.
3. In the displayed dialogs, supply the values for the required fields. Use the help information and the **LIST** option to help you specify the correct values for defining your **mksysb** resource.
4. If the **mksysb** image does not exist, create it by supplying the values for the fields under **System Backup Image Creation Options**.

Note: If the **mksysb** image already exists as a file on the hard disk of the NIM master or client, no additional information is needed to define your **mksysb** resource.

5. Upon successful completion of this task, exit SMIT.
6. To use the **mksysb** resource to install a NIM client, enter the **smit nim_bosinst** fast path.
7. Select a TARGET for the operation.
8. Select **mksysb** as the installation TYPE.
9. Select the MKSYSB to use for the installation.
10. Select the SPOT to use for the installation.
11. In the displayed dialog fields, supply the correct values for the installation options or accept the default values. Use the help information or the LIST option to help you.
12. Run the SMIT dialog to install the NIM client.
13. If the client machine being installed is not already a running, configured NIM client, NIM will not automatically reboot the machine over the network for installation. If the client was not rebooted automatically from SMIT, initiate a network boot from the client to install it. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.
14. After the machine boots over the network, the display on the client machine will begin prompting for information about how to configure the machine during installation. Specify the requested information to continue with the installation.

Note: To perform a nonprompted installation, follow the instructions in “Performing a nonprompted BOS installation” on page 241 to complete the prerequisite tasks.

Using a mksysb image to install the base operating system on a NIM client from the command line:

Follow this procedure for using a mksysb image to install the base operating system on a NIM client from the command line.

1. If the **mksysb** resource has already been created, skip to step 2. To create the **mksysb** resource, enter:

```
nim -o define -t mksysb -a server=ServerName \  
-a location=LocationName -a mk_image=yes \  
-a source=SourceMachine ResourceName
```

Specify the server name and location of the **mksysb** image. The **mk_image** and **source** attributes are used to create the **mksysb** image if it does not already exist.

For a complete description of all the options that can be specified when creating a **mksysb** resource, see “Using a mksysb resource” on page 197.

Example 1:

To define a **mksysb** resource, **mksysb_res1**, from an existing **mksysb** image located in **/export/backups/client_mksysb** on the master, enter:

```
nim -o define -t mksysb -a server=master \  
-a location=/export/backups/client_mksysb mksysb_res1
```

Example 2:

To create a **mksysb** image of the client machine, **client1**, in **/export/resources/new_mksysb** on the master, and to define a **mksysb** resource, **mksysb_res2**, enter:

```
nim -o define -t mksysb -a server=master \  
-a location=export/resources/new_mksysb -a mk_image=yes \  
-a source=client1 mksysb_res2
```

2. To initiate the **bos_inst** operation, enter:

```
nim -o bos_inst -a source=mksysb -a mksysb=mksysb \  
-a spot=SPOTName -a boot_client=yes/no ClientName
```

Specify the resources to be used to support the installation and any additional options for customizing the installation. To perform a simple **mksysb** installation, specify the **mksysb** and **SPOT** resources.

If the client machine being installed is not already a running, configured NIM client, NIM will not automatically reboot the machine over the network for installation. A network boot must be performed manually on the machine. If that is the case, supply the **boot_client=no** attribute to the **bos_inst** command. If the **boot_client** attribute value is not specified, it defaults to **boot_client=yes**.

3. If the client was not rebooted automatically, initiate a network boot from the client to install it. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.
4. After the machine boots over the network, the display on the client machine will begin prompting for information about how to configure the machine during installation. Specify the requested information to continue with the installation.

Example 3:

To perform a **mksysb** installation using the **mksysb**, **mksysb1**, an optional **lpp_source**, **lpp_source1**, and the **SPOT**, **spot1**, on client machine, **machine1**, which is not a running, configured NIM client, enter:

```
nim -o bos_inst -a source=mksysb -a mksysb=mksysb1 \  
-a lpp_source=lpp_source1 -a spot=spot1 -a boot_client=no machine1
```

Note:

1. The steps to perform a **mksysb** installation are almost identical to the steps to perform other types of BOS installations. The main differences are that **mksysb** must be specified in the **source** attribute of the **nim bos_inst** command, and a **mksysb** resource must be allocated for the operation.
2. To perform a nonprompted installation, follow the instructions in “Performing a nonprompted BOS installation” to complete the prerequisite tasks.

Performing a nonprompted BOS installation

This procedure provides information about how to create a **bosinst_data** resource to use for a nonprompted BOS installation.

After you have created the **bosinst_data** resource, refer to the following procedures to perform the nonprompted installation:

- “Using installation images to install the base operating system on a NIM client” on page 237
- “Using a mksysb image to install the base operating system on a NIM Client” on page 238

Prerequisites

1. The NIM master must be configured, and **lpp_source** and **SPOT** resources must be defined. See “Configuring the NIM master and creating basic installation resources” on page 230.
2. The NIM client to be installed must already exist in the NIM environment. To add the client to the NIM environment, use the procedure “Adding standalone clients to the NIM environment” on page 232.
3. If any of the software to be installed during the BOS installation requires acceptance of a license agreement, determine whether to accept the license agreement during BOS installation or defer

acceptance until after the client has booted. Note that license acceptance takes place at the client. For a sample **bosinst.data** file that specifies the syntax to control license acceptance, see “Using the bosinst.data file” on page 55.

Performing a nonprompted BOS installation using Web-based System Manager:

You can use the Install Base OS wizard to create a **bosinst_data** resource.

The **bosinst_data** resource can be used for a **rte** installation or a **mksysb** installation.

If you want to create the **bosinst_data** resource, continue with the following steps:

1. In the Resources container, from the Resources menu, select **New** → **Resource**. The Add New Resource wizard displays.
2. Follow the wizard instructions to create a **bosinst_data** resource. The wizard creates a basic **bosinst.data** file, which can be used “as is” or can be enhanced according to sample files. For a sample **bosinst.data** file, see “bosinst.data file nonprompted network installation” on page 55. To do a nonprompted installation, the **bosinst_data** resource must be created first.

Performing a nonprompted BOS installation using SMIT:

You can perform a nonprompted BOS installation using SMIT.

1. On the NIM master or any running NIM client, create a **bosinst.data** file that describes how a machine should be configured during a BOS installation. For a sample **bosinst.data** file, see “Using the bosinst.data file” on page 55.
2. To define the **bosinst.data** file as a **bosinst_data** resource in the NIM environment, enter the **smit nim_mkres** fast path.
3. Select **bosinst_data** from the list of resource types displayed on your screen.
4. Supply the values for the required fields. Use the help information and the LIST option to help you specify the correct values for defining your **bosinst_data** resource.
5. After the **bosinst_data** resource has been defined, follow the procedures for performing an **rte** or **mksysb** installation on a standalone machine. Be sure to specify the **bosinst_data** resource to use during the installation.

Performing a nonprompted BOS installation from the command line:

You can perform a nonprompted BOS installation from the command line.

1. On the NIM master or any running NIM client, create a **bosinst.data** file that describes how a machine should be configured during a BOS installation.

Note: To accept license agreements for software to be installed during the BOS installation, specify `-a accept_licenses=yes` on the **nim -o bos_inst** command.

2. To define the **bosinst.data** file as a **bosinst_data** resource, enter:

```
# nim -o define -t bosinst_data -a server=ServerName \  
-a location=LocationName NameValue
```

Using the **server** attribute, specify the name of the machine where the **bosinst.data** file is located.

Using the **location** attribute, specify the full path name of the **bosinst.data** file that is to be used as a resource.

3. After the **bosinst_data** resource has been defined, follow the normal procedure for performing an **rte** or **mksysb** installation on standalone machines. Be sure to specify that the **bosinst_data** resource be used for the installation.

For example, to perform a nonprompted **rte** installation of machine1 using the `lpp_source1`, `spot1`, and `bosinst_data1` resources, enter:

```
# nim -o bos_inst -a source=rte -a lpp_source=lpp_source1 \  
-a spot=spot1 -a accept_licenses=yes -a bosinst_data=bosinst_data1 \  
machine1
```

Using NIM with ATM networks

Special processing is required to install a machine over an ATM network.

Unlike other network adapters, ATM adapters cannot be used to boot a machine. Installing a machine over an ATM network requires special processing. Normally when a machine performs a network boot over a specified adapter, the adapter is configured by IPL-ROM or firmware. Then a boot image is transferred from the boot server to the client using **ftpp**. This boot image performs further configuration and mounts network installation resources before starting the BOS installation.

Because an ATM adapter cannot be configured by IPL-ROM or firmware, a boot image cannot be obtained over the network to perform a BOS installation. The NIM **bos_inst** operation must copy a boot image to the hard disk of the client before the machine is rebooted. Some Object Data Manager (ODM) information is also saved on the client machine so that when the machine is rebooted, the ATM adapter can be configured properly.

NIM clients may not have the programs installed to support the special processing required for installation over ATM, so the **/usr/lib/boot/bin** and **/usr/lpp/bos.sysmgt/nim/methods** directories are mounted at the client from the NIM master. These directories contain the programs that run during the setup performed by the NIM **bos_inst** operation.

After the initial setup completes, an **at** job is issued to reboot the machine after one minute has elapsed. When the machine reboots, the boot image that was copied to the hard disk configures the ATM adapter and mounts network installation resources for the BOS installation. The installation then proceeds as normal until the customization phase. During NIM customization, the ATM adapter is not reconfigured with a **mktcpip** command because the ODM already contains information carried over from before the machine was reinstalled. All other aspects of NIM customization are the same as for non-ATM clients.

Converting a generic network into an ATM network:

You can convert generic networks into ATM networks.

Prerequisites

- Machines that will have the BOS installed over ATM must be running and configured NIM clients.

Note: Configured NIM clients have the **bos.sysmgt.nim.client** fileset installed, are registered in the NIM master database, and have a valid **/etc/niminfo** file.

- BOS installations over ATM adapters will always use the **at0** interface on the client.
- The NIM master fileset must be installed at AIX 4.3 or later with the update for ATM installation or any superseding level.
- The SPOT that will be used to install the clients must be at version AIX 4.3 or later with the update for ATM installation or any superseding level.

Prior to the support of BOS installations over ATM, it was necessary to define ATM networks as "generic" networks for performing other types of NIM operations. To convert generic networks into ATM networks, enter the following command:

```
nim -o change -a new_type=atm (network)
```

The adapter names for the client interfaces on the ATM network will automatically be set to **at0** in the NIM database.

To change the name of the network, type the following:

```
nim -o change -a new_name=new_network_name current_network_name
```

Recovering a client on an ATM network after boot failure:

Follow this procedure for recovering a client on an ATM network after boot failure.

Because BOS installation over ATM requires a special boot image to be written to the hard disk of the client, the original boot image on the machine will be lost. If the installation is stopped or fails before BOS is reinstalled, it will not be possible to perform a normal reboot of the client unless system maintenance is performed. By performing system maintenance, a new boot image can be created on the hard disk to allow the machine to be booted for normal use. Use the following procedure:

1. Boot the client from the CD/DVD.
2. When the installation options are displayed, select the option to perform system maintenance.
3. Make the necessary selections to access the machine's root volume group.
4. In the maintenance shell, run the following sequence of commands:
 - a. `bosboot -ad /dev/ipldevice`
 - b. `BLVDISK=$(lslv -l hd5 | grep hdisk | head -1 | cut -d' ' -f1)`
 - c. `bootlist -m normal $BLVDISK`
 - d. `sync`
 - e. `sync`
 - f. `sync`
 - g. `reboot -q`

Stopping the reboot of a client on an ATM network:

Follow this procedure for stopping the reboot of a client on an ATM network.

If errors are detected during the NIM `bos_inst` operation and the client machine has not rebooted, it is possible to stop the machine from rebooting, and then execute the sequence of commands in the above step 4 on the running system. To stop the reboot, use the following procedure:

1. List the **at** jobs on the machine by entering the command: `at -l`
The first name in the output field will be the name of the job. For example:

```
$ at -l
root.884205595.a Wed Jan 7 14:39:55 1998
```
2. To remove the **at** job, enter the following command: `at -r name of job`
For example:

```
$ at -r root.884205595.a
at file: root.884205595.a deleted
```

Note: The reboot can also be prevented by removing the shutdown script that the **at** job was instructed to run by typing:

```
rm/tmp/_NIM_shutdown
```

Customizing NIM clients and SPOT resources

This procedure describes how to use NIM to install software on running, configured NIM clients and **SPOT** resources.

Prerequisites

- If the software is to be installed on a machine, the machine must be a running, configured NIM client with push permissions enabled for the NIM master. Push permissions are enabled by default when a client is configured or installed by NIM.
- If the software is to be installed on a **SPOT** resource, the server of the **SPOT** must be running.

- The installation image to be installed on the target is available in an **lpp_source** resource, and a **check** operation was performed on the **lpp_source** at some point after the image was first copied there. (The **check** operation updates the **.toc** file with information about the images present in the **lpp_source**.)

Customizing NIM clients and SPOT resources using Web-based System Manager:

Follow this procedure for customizing NIM clients and SPOT resources using Web-based System Manager.

1. From the NIM container, select the Machines container.
2. In the contents area, select a target machine (master or standalone), or in the Resources container, select a target **SPOT**.
3. From the Selected menu, choose **Install/Update Software** → **Install Additional Software (Custom)** to display the Install Software dialog.
4. Use the dialog to complete the task.

Customizing NIM clients and SPOT resources using SMIT:

Follow this procedure for customizing NIM clients and SPOT resources using SMIT.

The SMIT screens follow the same structure as those used for local installation operations performed on a system. When performing NIM customization operations, select the SMIT screen that most closely describes the installation you want to perform.

1. From the command line, enter the **smit nim_task_inst** fast path.
2. Select the SMIT menu item that matches the type of installation you want to perform.
3. Select a TARGET for the operation.
4. Select the **lpp_source** that contains the installation images to be used.
5. Select any other required resources.
6. In the final SMIT dialog, supply the values for the required fields or accept the defaults. Use the help information and the LIST option to help you specify the correct values.

Customizing NIM clients and SPOT resources from the command line:

Follow this procedure for customizing NIM clients and SPOT resources from the command line.

To perform the installation operation, enter:

```
nim -o cust -a lpp_source=Lpp_Source -a filesets=FilesetsList \
-a installp_bundle=InstallpBundle \
-a installp_flags=InstallpFlags TargetName
```

You will specify the resources to use to support the installation and any additional attributes for customization.

The software to be installed on the client can be specified on the command line using either the **filesets** attribute or by specifying an **installp_bundle** resource that lists the software.

The default **installp** flags to be used to install the software are **-a**, **-g**, **-Q**, and **-X**. To specify a different set of **installp** flags, you can list them in the **installp_flags** attribute.

Example 1:

To install the **bos.diag** and **bos.dosutil** filesets on the client, machine1, using the **lpp_source** resource named lpp_source1, enter:

```
nim -o cust -a lpp_source=lpp_source1 \
-a filesets="bos.diag bos.dosutil" machine1
```

Example 2:

To install software into the **SPOT** resource, `spot1`, using the **lpp_source** resource, `lpp_source1`, and the list of filesets specified in the **installp_bundle** resource, `installp_bundle1`, enter:

```
nim -o cust -a lpp_source=lpp_source1 \  
-a installp_bundle=installp_bundle1 spot1
```

Note: Several other resources and attributes can be specified on the command line with the **cust** operation. For a complete description of the **cust** operation, see “NIM operations” on page 205.

Configuring the NIM master and creating resources to support diskless and dataless clients

Use this procedure only if the NIM environment is to be used exclusively for diskless and dataless client management.

If the NIM environment is also to be used for installing and maintaining software on standalone machines, follow the procedure for “Configuring the NIM master and creating basic installation resources” on page 230.

Note: This procedure produces a large amount of output, especially when creating the **SPOT** resource. Be sure to scan through the output to look for nonfatal errors and warnings that may not be evident from a successful return code.

Prerequisites

The NIM master must have at least 300 MB of available disk space. If such space is not available, see “Using client machines as resource servers” on page 292, and “Defining an `lpp_source` on CD/DVD-ROM versus hard disk” on page 271.

Configuring the NIM master and creating resources to support diskless and dataless clients using Web-based System Manager:

Follow this procedure for configuring the NIM master and creating resources to support diskless and dataless clients using Web-based System Manager.

1. Insert the AIX media into the appropriate drive of the designated master machine.
2. Start the Web-based System Manager application by typing `wsm`.
3. In the navigation area, select and expand the Software container.
4. While still in the navigation area, select the Installed Software container.
5. From the Software menu, choose **New Software (Install/Update)** → **Install Additional Software**.
6. In the Install Software dialog, select **/dev/cd0** as the software source.
7. Specify **bos.sysmgt.nim** as the software to install.
8. In the navigation area, select the NIM container.
9. From the NIM menu, select **Configure Environment**.
10. Follow the wizard instructions to guide you through the configuration.

Configuring the NIM master and creating resources to support diskless and dataless clients using SMIT:

Follow this procedure for configuring the NIM master and creating resources to support diskless and dataless clients using SMIT.

1. Insert the AIX media into the media or tape drive of the designated master machine.
2. To install the **bos.sysmgt.nim** fileset, enter the **smit install_latest** fast path.
3. Using the LIST option, select **/dev/cd0** or **/dev/rmt0** for the INPUT device / directory for software.

4. Specify **bos.sysmgmt.nim** as the SOFTWARE to install.
5. Accept the default values for all other fields on this screen. After completion of this installation, exit SMIT.
6. To configure the NIM master, enter the **smit nimconfig** fast path.
7. Specify a name in the Network Name field to be assigned to the NIM master's network.
8. Using the LIST option, select the Primary Network Interface for the NIM Master.
9. Accept the default values for all other fields on this screen.
10. After the master is configured, exit SMIT.
11. Restart SMIT using the **smit nim_mkres_dd_name_server** fast path.
12. When prompted, select the NIM master as the server of the client resources.
13. Select **yes** in the **Create a new SPOT?** field, because there is not a **SPOT** currently defined in your environment.
14. Using the LIST option, select **/dev/cd0** or **/dev/rmt0** as the input device for installation images.
15. Specify a name in the **SPOT Name** field.
16. Specify names for the other resources to be created in the NIM environment. If a name is not specified, the resource will not be created.
17. Select **yes** at the **Remove all newly added NIM definitions and file systems if any part of this operation fails?** field. This will make it easier to restart this procedure if failures occur.
18. Accept the default values for all other fields on this screen.

Note: In most NIM environments, the **SPOT** will already exist to support base operating system installation operations on standalone machines. In such environments, it is not necessary to create a new **SPOT**.

Configuring the NIM master and creating resources to support diskless and dataless clients from the command line:

Follow this procedure for configuring the NIM master and creating resources to support diskless and dataless clients from the command line.

1. Insert the AIX media into the media or tape drive of the designated master machine.
2. If installing from a tape, skip to step 5. To create a mount point for the CD, type: `mkdir /cdfs`.
3. To create a **cdrom** file system, type: `crfs -v cdrfs -p ro -d'cd0' -m'/cdfs'`
4. To mount the disk, type: `mount /cdfs`
5. To install the **bos.sysmgmt.nim** fileset from the disk, type: `installp -agX -d /cdfs/usr/sys/inst.images bos.sysmgmt.nim`
or to install the **bos.sysmgmt.nim** fileset from a tape, type: `installp -agX -d /dev/rmt0 bos.sysmgmt.nim`
6. If installing from CD/DVD, to unmount the **cdrom** file system, type: `umount /cdfs`
7. To configure the NIM master using the **nimconfig** command, type:

```
nimconfig -a attr1=value1 \  
          -a attr2=value2 \  
          ...
```

For example, to configure a NIM master with the following configuration:

```
master host name = master1  
primary network interface = tr0  
ring speed = 16  
platform = chrp  
kernel type = mp
```

enter the following command sequence:

```
nimconfig -a netname=network1 -a pif_name=tr0 -a ring_speed=16 \  
-a platform=chrp -a netboot_kernel=mp
```

Note: For additional attribute information, see the **nimconfig** command.

8. To create a file system in the rootvg volume group with 200 MB of space and a mount point of /export/spot, enter:

```
crfs -v jfs -g rootvg -a size=$((2000*200)) \  
-m /export/spot -A yes -p rw -t no \  
-a frag=4096 -a nbpi=4096 -a compress=no
```

9. To mount the file system, enter:

```
mount /export/spot
```

10. The **SPOT** resource will be installed from images in the image source (in this example, the CD). The server of the resource will be the NIM master, and the **SPOT** will be stored in the **/export/spot/spot1** directory. To create the **SPOT** resource, enter:

```
nim -o define -t spot -a source=/dev/cd0 -a server=master \  
-a location=/export/spot spot1
```

11. To create a file system in the rootvg volume group with 150 MB of space and a mount point of /export/dd_resource, enter:

```
crfs -v jfs -g rootvg -a size=$((2000*150)) \  
-m /export/dd_resource -A yes -p rw -t no \  
-a frag=4096 -a nbpi=4096 -a compress=no
```

12. To mount the file system, enter: mount /export/dd_resource

13. Create the diskless and dataless client resources in subdirectories of the **/export/dd_resource** directory. Not all resources are required. Create only the resources to be used in your environment.

To create the root resource named root1 (required for diskless and dataless clients), enter:

```
nim -o define -t root -a server=master \  
-a location=/export/dd_resource/root1 root1
```

To create the dump resource named dump1 (required for diskless and dataless clients), enter:

```
nim -o define -t dump -a server=master \  
-a location=/export/dd_resource/dump1 dump1
```

To create the paging resource named paging1 (required for diskless clients), enter:

```
nim -o define -t paging -a server=master \  
-a location=/export/dd_resource/paging1 paging1
```

To create the home resource named home1 (optional), enter:

```
nim -o define -t home -a server=master \  
-a location=/export/dd_resource/home1 home1
```

To create the shared_home resource named shared_home1 (optional), enter:

```
nim -o define -t shared_home -a server=master \  
-a location=/export/dd_resource/shared_home1 shared_home1
```

To create the tmp resource named tmp1 (optional), enter:

```
nim -o define -t tmp -a server=master \  
-a location=/export/dd_resource/tmp1 tmp1
```

Note:

- a. The file systems created for the NIM resources are not required, but they can be beneficial for storage management.
- b. For more information about NIM resources, see “NIM resources” on page 188.

Adding a diskless or dataless client to the NIM environment

Use this procedure to add diskless and dataless clients to the NIM environment by adding an entry for the client to the NIM database on the master.

This provides NIM with the information required to satisfy boot requests from the client. However, resources for the diskless or dataless client machine must be initialized before the client will be able to successfully boot and configure. See “Initializing and booting a diskless or dataless machine” on page 250 for more information. Diskless clients must mount all file systems from remote servers. Dataless clients can have paging space, as well as the **/tmp** and **/home** file systems on the local disk. Neither diskless nor dataless clients have a boot image on the local disk. Therefore, they must boot over the network.

Prerequisites

- The NIM master must be configured, and the resources for diskless or dataless clients must be defined. For more information, see “Configuring the NIM master and creating resources to support diskless and dataless clients” on page 246.
- You must know the subnet mask, the default gateway for the client machine, and the default gateway for the NIM master.

Adding a diskless or dataless client to the NIM environment with Web-based System Manager:

Follow this procedure for adding a diskless or dataless client to the NIM environment with Web-based System Manager.

1. In the Machines container, from the Machines menu, select **New** → **OK**. The Add New Machine wizard displays.
2. Follow the wizard instructions to add a diskless or dataless client to the NIM environment.

Adding a diskless or dataless client to the NIM environment using SMIT:

Follow this procedure for adding a diskless or dataless client to the NIM environment using SMIT.

1. To define a diskless or dataless client, enter the **smit nim_mkmac** fast path.
2. Specify the host name of the machine.
3. The SMIT screen displayed next depends on whether NIM already has information about the client’s network. Supply the values for the required fields or accept the defaults. Use the help information and the LIST option to help you specify the correct values to define the client machine.

Adding a diskless or dataless client to the NIM environment from the command line:

Follow this procedure for adding a diskless or dataless client to the NIM environment from the command line.

To define a diskless or dataless client, enter:

```
nim -o define -t Diskless/Dataless \  
-a platform=PlatformType -a netboot_kernel=NetbootKernelType \  
-a if1=InterfaceDescription -a net_definition=DefinitionName \  
-a ring_speed1=Speedvalue -a cable_type1=TypeValue \  
-a iplrom_emu=DeviceName MachineName
```

Note: For detailed attribute information, see the descriptions of diskless and dataless clients in “NIM machines” on page 178.

Example 1:

To add the diskless client with the host name `diskless1` to the NIM environment with the following configuration:

```
host name=diskless1  
platform=rspc  
kernel=up  
network type=ethernet  
subnet mask=255.255.240.0
```

```
default gateway=gw1
default gateway used by NIM master=gw_master
cable type=bnc
network boot capability=yes (no emulation needed)
```

enter the following command sequence:

```
nim -o define -t diskless -a platform="rspc" \
-a netboot_kernel="up" -a if1="find_net diskless1 0" \
-a cable_type1="bnc" \
-a net_definition="ent 255.255.240.0 gw1 gw_master" \
diskless1
```

Example 2:

To add the dataless client with the host name dataless1 to the NIM environment with the following configuration:

```
host name=dataless1
platform=rs6k
netboot_kernel=up
network type=token ring
subnet mask=255.255.225.0
default gateway=gw2
default gateway used by NIM master=gw_master
ring speed=16
network boot capability=no (use emulation on a diskette)
```

enter the following command sequence:

```
nim -o define -t dataless -a platform="rs6k" \
-a netboot_kernel="up" -a if1="find_net dataless1 0" \
-a ring_speed1="16" \
-a net_definition="tok 255.255.225.0 gw2 gw_master" \
-a ip1rom_emu="/dev/fd0" dataless1
```

Note: If the **find_net** keyword in the **if** attribute causes NIM to successfully match a network definition to the client definition, the **net_definition** attribute is ignored.

Initializing and booting a diskless or dataless machine

Use this procedure to configure and boot a machine as a diskless or dataless client in the NIM environment.

Prerequisites

- The NIM master must be configured, and the resources for diskless and dataless clients must be defined. See “Configuring the NIM master and creating resources to support diskless and dataless clients” on page 246.
- The NIM client must already exist in the NIM environment. To add the client to the NIM environment, use the “Adding a diskless or dataless client to the NIM environment” on page 248 procedure.

Initializing and booting a diskless or dataless machine with Web-based System Manager:

Follow this procedure for initializing and booting a diskless or dataless machine with Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select the diskless or dataless machine you want to initialize.
3. From the Selected menu, choose **Initialize Machine Resources**.
4. Use the dialog to specify or select the resources to use for initialization. You will specify either the Home resource or Shared Home resource for the machine, but not both.

5. After completion of the initialization operation, boot the client machine over the network. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.

Note: On older model **rspc** systems, it may be necessary to permanently set the bootlist from the firmware menus to make the client always boot over the network. For other systems, the bootlist is automatically set the first time the machine is booted as a diskless/dataless client.

6. After the client boots over the network and performs some initialization, the client will display instructions for you to select the console for the machine.

Initializing and booting a diskless or dataless machine using SMIT:

Follow this procedure for initializing and booting a diskless or dataless machine using SMIT.

1. On the NIM master, enter the **smit nim_dd_init** fast path.
2. Select the client to be initialized from the list of clients displayed on your screen.
3. Supply the values for the required fields. Use the help information and the LIST option to help you specify the correct values for the initialization options.
4. After completion of the initialization operation, boot the client machine over the network. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.

Note: On older model **rspc** systems, it may be necessary to permanently set the bootlist from the firmware menus to make the client always boot over the network. For other systems, the bootlist is automatically set the first time the machine is booted as a diskless/dataless client.

5. After the client boots over the network and performs some initialization, the client will display instructions for you to select the console for the machine.

Initializing and booting a diskless or dataless machine from the command line:

Follow this procedure for initializing and booting a diskless or dataless machine from the command line.

1. To initialize the client resources for diskless clients, enter the following on the NIM master:

```
nim -o dkls_init -a spot=SPOTName -a root=RootName \  
-a dump=DumpName -a paging=PagingName ClientName
```

2. To initialize the client resources for dataless clients, enter the following on the NIM master:

```
nim -o dtls_init -a spot=SPOTName -a root=RootName \  
-a dump=DumpName ClientName
```

Note: For detailed information about other attributes you can specify for the **dkls_init** and **dtls_init** operations, see “Using the NIM dkls_init operation” on page 215 and “Using the NIM dtls_init operation” on page 215.

3. After completion of the initialization operation, boot the client machine over the network. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.

Note: On older model **rspc** systems, it may be necessary to permanently set the bootlist from the firmware menus to make the client always boot over the network. For other systems, the bootlist is automatically set the first time the machine is booted as a diskless/dataless client.

4. After the client boots over the network and performs some initialization, the client will display instructions for you to select the console for the machine.

Uninitializing diskless and dataless machines

Diskless and dataless machines are uninitialized by performing the **reset** operation.

The **reset** operation also provides the option to deallocate all resources for the machine. Deallocating all resources from the diskless or dataless machine removes all root data for the machine. Without deallocating resources, the uninitialize operation deallocates just the network boot image.

Uninitializing diskless and dataless machines using Web-based System Manager:

Follow this procedure for uninitializing diskless and dataless machines using Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select the diskless or dataless machine you want to initialize.
3. From the Selected menu, choose **Uninitialize Machine Resources**.
4. Use the dialog to uninitialize and, if desired, deallocate all resources from the client.

Uninitializing diskless and dataless machines using SMIT:

Follow this procedure for uninitializing diskless and dataless machines using SMIT.

1. To uninitialize diskless and dataless machines, enter the **smit nim_dd_uninit** fast path.
2. Select the Target.
3. If you want to remove all root data, change the DEALLOCATE Resources field to **yes**.

Uninitializing diskless and dataless machines from the command line:

Follow this procedure for uninitializing diskless and dataless machines from the command line.

1. To uninitialize the client machine, enter the following on the NIM master:

```
nim -F -o reset ClientName
```

2. To deallocate all resources and remove root data, enter the following on the NIM master:

```
nim -o deallocate -a subclass=all ClientName
```

Installing to an alternate disk on a NIM Client

NIM allows you to install an AIX 4.3 or later **mksysb** image (mksysb resource) on a NIM client's alternate disk or to clone a NIM client's current disk onto an alternate disk and apply updates. Because the client system is running during installation, less time is required than for a normal installation.

Note: For information about the different ways NIM can customize an alternate disk installation, see "Using the NIM alt_disk_install operation" on page 205.

Prerequisites

- The NIM master must be configured. To install a **mksysb** image onto the alternate disk, the **mksysb** resource must be defined. See "Configuring the NIM master and creating basic installation resources" on page 230.
- The NIM client must already exist in the NIM environment and must be running. To add the client to the NIM environment, see "Adding standalone clients to the NIM environment" on page 232.
- The **bos.alt_disk_install.rte** fileset must be installed on the NIM client. To install a new fileset on a NIM Client, see "Customizing NIM clients and SPOT resources" on page 244.

Installing to an alternate disk on a NIM Client using Web-based System Manager:

Follow this procedure for installing to an alternate disk on a NIM Client using Web-based System Manager.

1. Select the Machines Container.
2. In the contents area, select the standalone machine for the alternate disk installation.
3. From the Selected menu, choose **Alternate Disk Installation** → **Clone the Rootvg to an Alternate Disk** or **Install Mksysb on an Alternate Disk**.
4. Use the dialog to finish the installation.

Installing to an alternate disk on a NIM Client using SMIT:

Follow this procedure for installing to an alternate disk on a NIM Client using SMIT.

1. Enter the **smit nim_alt_mkysyb** fast path from the NIM master.
2. Select the Target Machine or Target Group to Install.
3. Enter the Target Disk or Disks on the Target machine.
4. Accept the default installation options, or supply different ones in the displayed dialog fields. Use the help information and the LIST option for guidance.
5. The alternate disk installation will be initiated on the client, and progress can be seen with the **lsnim** command (**smit lsnim**). If the **Reboot when complete?** option is set to **yes** and the **Phase to execute** is **all** or includes Phase 3, the client will reboot from the newly installed disk when the **alt_disk_install** command is complete.
6. To clone a disk onto a NIM client's alternate disk, enter the **smit nim_alt_clone** fast path from the NIM master.

Installing to an alternate disk on a NIM Client from the command line:

The **alt_disk_install** command is initiated on the target system, and progress is shown with the **lsnim** command.

A log kept on the target system, **/var/adm/ras/alt_disk_inst.log**, contains progress messages and any error or warning messages that might occur. The **/var/adm/ras/nim.alt_disk_install** log will contain debug information, if requested.

Installing mkysyb on an alternate disk:

Use this code for initiating the **alt_disk_install** operation.

Initiate the **alt_disk_install** operation by entering:

```
nim -o alt_disk_install -a source=mkysyb -a mkysyb=Mkysyb \  
-a disk='diskname(s)' ClientName
```

Specify the **mkysyb** resource to be used and any additional options for customizing the installation. To perform a simple alternate disk **mkysyb** install, specify the **source**, **mkysyb**, and **disk** resources.

Note: For detailed information about the **mkysyb** resources, see “Using a **mkysyb** resource” on page 197.

Cloning the rootvg to an alternate disk:

Use this command for cloning the rootvg to an alternate disk.

To clone a disk onto a NIM client's alternate disk, enter:

```
nim -o alt_disk_install -a source=rootvg -a disk=diskname(s) ClientName
```

Specify any additional options for customizing the installation.

Installing to an alternate disk on a NIM client from the command line - examples:

Here is an examples of performing an installation to an alternate disk on a NIM client from the command line.

The client machine **machine1** is a running system with a disk, **hdisk2**, that is not currently occupied by a volume group.

- To install this disk with a **mkysyb** resource named **51mkysyb** enter:

```
nim -o alt_disk_install -a source=mksysb -a mksysb=51mksysb \  
-a disk=hdisk2 machine1
```

- To clone the rootvg to hdisk2 enter:

```
nim -o alt_disk_install -a source=rootvg -a disk=hdisk2 machine1
```

Installing the Virtual I/O Server using NIM

You can use the following procedures to install the Virtual I/O Server into environments managed by the HMC or Integrated Virtualization Manager using Network Installation Management (NIM).

Prerequisites

You need the following files before beginning this procedure. These files are located on the Virtual I/O Server installation media:

- **nimol/ioserver_res/mksysb** (the mksysb image)

In addition, the following system requirements must be met:

- A system with a file system with at least 700 MB available.
- A logical partition of type Virtual I/O Server containing an Ethernet adapter connected to an active network for installing the Virtual I/O Server. For information about creating logical partitions, see *Creating the Virtual I/O Server logical partition and partition profile*.
- A storage controller containing at least 16 GB of disk space.

After the prerequisites have been met, follow these steps to use NIM to install the Virtual I/O Server:

1. Insert the *Virtual I/O Server* DVD into the DVD drive.
2. Run the **installios** command without any arguments to start the installation wizard. The **installios** wizard then guides you through the process of filling-out the necessary information to start an installation on the Virtual I/O Server or on a Integrated Virtualization Manager.

If you run **installios** on a NIM client, then you are prompted for the location to the **bos.sysmgt.nim.master** fileset. The NIM client is then configured as a NIM master. For more information about command-line usage of **installios**, see the **installios** command.

The **installios** setup process creates the following NIM resources to start the installation:

- bosinst_data
- installp_bundle
- lpp_source
- mksysb
- resolv_conf
- SPOT
- Client definition

If you are installing the Virtual I/O Server logical partition, and if Secure Shell (SSH) and credentials have been configured on the NIM master, then the partition is network-booted from the Hardware Management Console (HMC) to begin the installation.

If you are installing the Virtual I/O Server logical partition without SSH, or if you are installing the Integrated Virtualization Manager, then go to step 3.

3. On the system on which the Virtual I/O Server software will be installed, boot the Virtual I/O Server logical partition or the Integrated Virtualization Manager into System Management Services (SMS) mode by following these steps:
 - To boot the Virtual I/O Server logical partition into SMS:
 - a. On the HMC, right-click the partition to open the menu.
 - b. Click **Activate**. The Activate Partition menu opens with a selection of partition profiles. Be sure the correct profile is highlighted.

- c. Select the **Open a terminal window or console session** check box to open a virtual terminal (vterm) window.
 - d. Click **(Advanced...)** to open the advanced options menu.
 - e. For the Boot mode, select **SMS**.
 - f. Click **OK** to close the advanced options menu.
 - g. Click **OK**. A vterm window opens for the partition.
 - h. In the vterm window, select **Setup Remote IPL** (Initial Program Load).
 - i. Select the network adapter that will be used for the installation.
 - j. Select **IP Parameters**.
 - k. Enter the client IP address, server IP address, and gateway IP address. Optionally, you can enter the subnet mask. After you have entered these values, press Esc to return to the Network Parameters menu.
 - l. Select **Ping Test** to ensure that the network parameters are properly configured. Press Esc twice to return to the Main Menu.
 - m. From the Main Menu, select **Select Boot Options**.
 - n. Select **Select Install/Boot Device**.
 - o. Select **Network**.
 - p. Select the network adapter whose remote IPL settings you previously configured.
 - q. When prompted for **Normal** or **Service** mode, select **Normal**.
 - r. When asked if you want to exit, select **Yes**.
- To boot the Integrated Virtualization Manager into SMS:
 - a. Begin with the machine turned off.
 - b. Switch on the machine, and as icons begin to appear from left to right on the bottom of your display, press F1.

Note: If the last icon is displayed before pressing F1, then you get the normal mode boot list instead of SMS, so try again.
 - c. The System Management Services menu opens. Select **Utilities**.
 - d. From the System Management Services Utilities menu, select **Remote Initial Program Load Setup**.
 - e. From the Network Parameters panel, select **IP Parameters**.
 - f. Set or change the displayed values so they are correct for your client system. Specify the IP address of the following:
 - The client machine you are booting in the client address field.
 - Your NIM master server in the server address field.
 - Your client's gateway in the gateway address field.
 - Your client's subnet mask in the subnet mask field.
 - g. After you specify the addresses, press Enter to save the addresses and continue.
 - h. The Network Parameters window opens. Select the Ping option.
 - i. Select the network adapter to be used as the client's boot device.
 - j. Verify that the displayed addresses are the same as the addresses you specified for your boot device. If the addresses are incorrect, press Esc until you return to the main menu. Then, go back to step e. If they are correct, continue with k.
 - k. If the addresses are correct, press Enter to perform the ping test. The ping test might take several seconds to complete.
 - l. If the ping test fails, verify that the addresses are correct, and analyze the network problem. If the ping test is successful, press Enter to acknowledge the success message.
 - m. Press Esc until you return to the System Management Services menu.

- n. From the System Management Services menu, choose the **Select Boot Devices** option.
- o. Select the network adapter to be used for the network boot from the list of displayed bootable devices

After the installation is complete, the Virtual I/O Server logical partition or the Integrated Virtualization Manager is ready to be configured and managed.

To remove all the NIM resources that were created from the **installios** setup process, run the **installios** command with the **-u** flag. If the **installios** command fails to perform the cleanup, run **installios -u** and specify the **-f** flag to force NIM to reset and deallocate resources to the client. This still leaves the NIM environment, but removes all resources and directory structures created from the **installios** wizard. If, however, you want to unconfigure NIM, or to uninstall the **bos.sysmgt.nim.master** fileset and return the NIM master back to a NIM client if it was configured from a NIM client, specify **installios -u** with a **-U** flag.

You can also install a Virtual I/O Server or a Integrated Virtualization Manager through the SMIT interface. Run `smitty installios` to get access to the SMIT interface to the **installios** command. When invoked on a NIM master, the administrator will have access to two options to **Setup for Virtual I/O and Integrated Virtualization Manager Installation** and **Cleanup after Virtual I/O and Integrated Virtualization Manager Installation**, where **Configure Client as Master for Virtual I/O and Integrated Virtualization Manager Installation** is the only available option on a NIM client. Then fill out the specific fields as required from the **installios** wizard to invoke the **installios** command to setup the environment to initiate the installation, or to perform a cleanup.

NIM Commands

The following references provide more information on NIM commands.

The nim_master_setup command:

The **nim_master_setup** command installs the **bos.sysmgt.nim.master** fileset, configures the NIM master, and creates the required resources for installation, including a **mksysb** system backup.

The **nim_master_setup** command uses the **rootvg** volume group and creates an **/export/nim** file system, by default. You can change these defaults using the **volume_group** and **file_system** options. The **nim_master_setup** command also allows you to optionally not create a system backup, if you plan to use a **mksysb** image from another system. The **nim_master_setup** usage is as follows:

```
Usage nim_master_setup: Setup and configure NIM master.
    nim_master_setup [-a mk_resource={yes|no}]
    [-a file_system=fs_name]
    [-a volume_group=vgroup_name]
    [-a disk=disk_name]
    [-a device=device]
    [-B] [-v]
```

```
-B    Do not create mksysb resource.
-v    Enable debug output.
```

```
Default values:
mk_resource = yes
file_system = /export/nim
volume_group = rootvg
device = /dev/cd0
```

The nim_clients_setup command:

The **nim_clients_setup** command is used to define your NIM clients, allocate the installation resources, and initiate a NIM BOS installation on the clients.

The **nim_clients_setup** command uses the definitions in the **basic_res_grp** resource to allocate the necessary NIM resources to perform a **mksysb** restore operation on the selected clients. The usage for **nim_clients_setup** is as follows:

```
Usage nim_clients_setup: Setup and Initialize BOS install for NIM clients.
    nim_clients_setup [-m mksysb_resource]
[-c] [-r] [-v] client_objects
-m specify mksysb resource object name -OR- absolute file path.
-c define client objects from client.defs file.
-r reboot client objects for BOS install.
-v Enables debug output.
```

Note: If no client object names are given, all clients in the NIM environment are enabled for BOS installation; unless clients are defined using the **-c** option.

Other NIM commands reference:

The *AIX Version 6.1 Commands Reference* set provides reference information about the NIM commands, AIX operating system commands, and commands for other licensed programs for end users, system administrators, and programmers.

These books contain examples and descriptions of the commands and their available flags. The command entries are arranged in alphabetic order:

- *AIX Version 6.1 Commands Reference, Volume 1* contains commands ac through cx
- *AIX Version 6.1 Commands Reference, Volume 2* contains commands da through hy
- *AIX Version 6.1 Commands Reference, Volume 3* contains commands ib through mw
- *AIX Version 6.1 Commands Reference, Volume 4* contains commands na through rw
- *AIX Version 6.1 Commands Reference, Volume 5* contains commands sa through uu
- *AIX Version 6.1 Commands Reference, Volume 6* contains commands va through yp

For example, *AIX Version 6.1 Commands Reference, Volume 3* contains reference information for the NIM **lsnim** command. The *AIX Version 6.1 Commands Reference, Volume 4* contains reference information for the following NIM commands:

- **nim**
- **nimclient**
- **nimconfig**
- **nimdef**
- **niminit**
- **nimquery**
- **nim_update_all**

Migrating a NIM client to a POWER5 logical partition using **nim_move_up**

The **nim_move_up** application allows you to easily migrate a back-level AIX system onto an logical partition (LPAR) residing on a POWER5 (or newer) server.

The system must meet the following requirements before you can run the **nim_move_up** application properly.

- NIM Master Requirements
 - A configured NIM master
 - Perl 5.6 or above
 - Openssh (obtainable from the Linux Toolbox media)
 - At least one stand-alone NIM client running AIX

- AIX product media version, or equivalent **lpp_source** and **SPOT** NIM resources
- Server and resource requirements
- A POWER5 server with sufficient hardware resources to support the target clients' equivalent POWER5 configuration
- If virtual resources will be used to migrate the clients, an installed and configured Virtual I/O Server is required
- HMC controlling the POWER5 server, along with sufficient privileges to start, stop, and create LPARs
- root user authority

This **nim_move_up** process requires no downtime on the part of the original client. In addition, **nim_move_up** is capable of migrating a client onto virtualized hardware, such as virtual disks, using the Virtual I/O capabilities of the POWER5 server. This migration process can be completed by the **nim_move_up** application in phases to allow more control over the process, or it can be completed all at once without any user interaction required.

With the **nim_move_up** application, you can use a NIM master and its clients as the starting point for a migration that produces the following hardware environment:

- The original NIM master
- LPARs on POWER5 server that correspond to the original NIM clients and are controlled by the NIM master
- HMC to control the LPARs on the POWER5 servers, communicated with by the NIM master through SSH
- The original NIM clients

The **nim_move_up** migration process is completed in the following phases to allow more control over the process.

1. The *Create NIM Resources* phase creates the needed NIM resources to perform the migration steps if they don't already exist or are not provided beforehand.
2. The *Pre-migration Software Assessment* phase performs an assessment on each target client to determine what software is installed and can be migrated. Any software that is missing from the **lpp_source** will be added from the source of installation images that should be provided to **nim_move_up**.
3. The *Client Hardware and Utilization Data Gathering* phase gathers data about each target client's hardware resources and attempts to assess how much of those resources are utilized on average over a given amount of time.
4. The *POWER5 Resource Availability Data Gathering and Client Resource Data Translation* phase searches the given managed system for available hardware resources. Uses the data gathered in the previous phase to create an equivalent LPAR configuration that utilizes the managed system's available resources. Creates the client LPARs with virtual I/O resources instead of physical I/O resources if **nim_move_up** was provided a Virtual I/O Server LPAR to work with. Creates the appropriate adapters and configuration on the Virtual I/O Server as they are needed.
5. The *Create System Backups of Target Clients* phase creates an installable image of each target client and its resources using the **mksysb** command.
6. The *Migrate Each System Backup* phase uses the **nimadmin** command to migrate the newly-created installable images to the new level of AIX.
7. The *Allocate NIM Resources to New LPARs* phase uses the network information provided to the **nim_move_up** application to create NIM standalone client objects for the new LPARs created in the *POWER5 Resource Availability Data Gathering and Client Resource Data Translation* phase. Allocates the appropriate NIM resources and runs a **bos_inst pull** operation (i.e. NIM will not attempt to boot the client) on each NIM client.
8. The *Initiate Installation on LPARs* phase reboots each LPAR via the control host (HMC partition) and initiates the installation.

Note: This phase ends when the installation begins. The actual progress of the installation is not monitored.

9. **Post-migration Software Assessment**

Assesses the overall success of the migration after each installation, and reports on any software migration issues. It may be necessary to manually correct the errors reported for filesets that fail to migrate.

10. **Post-installation Customization**

Performs a NIM customization operation on each client with the values provided if an alternate lpp_source, fileset list, or customization script was provided to the **nim_move_up** application. This allows for the optional installation of additional software applications or for any additional customization that may be needed.

Migrating a NIM client to a POWER5 logical partition using nim_move_up from SMIT

The SMIT fastpath to the root menu of **nim_move_up** is `smitty nim_move_up`.

After all prerequisites needed to run the **nim_move_up** application have been met, **nim_move_up** performs the migration process in two steps: configuration and phase execution. You can run the **nim_move_up** allocation from SMIT by completing the following steps:

1. Enter `smitty nim_move_up_config`. The **Configure nim_move_up Input Values** panel opens.
2. Enter information in the required fields. This information is retained by the **nim_move_up** application, unless the application is reset. You can change this information at any time from the **Configure nim_move_up Input Values** panel.
3. To begin the actual migration process, enter `smitty nim_move_up_exec`. The **Execute nim_move_up Phases** panel opens.
4. Provide an appropriate answer to the option **Execute All Remaining Phases?** on the **Execute nim_move_up Phases** panel and press Enter.

You can use other panels to interact with the **nim_move_up** application, in addition to the **Configure nim_move_up Input Values** panel and the **Execute nim_move_up Phases** panel:

Display the Current Status of nim_move_up

Selecting this menu option is equivalent to running **nim_move_up** with the **-S** flag. The next phase to be executed and a listing of all the saved options are displayed.

Configure SSH Keys on Target HMC

This SMIT panel provides a simple interface to setting up SSH keys on the remote control host (HMC). Using this panel is the equivalent of using the **-K** command line option. Configuring SSH keys on the remote control host enables the unattended remote execution of commands from the NIM master.

Unconfigure nim_move_up

This SMIT panel provides an interface to unconfiguring the **nim_move_up** environment. Unconfiguring the environment removes all state information, including what phase to execute next, saved data files generated as a result of the execution of some phases, and all saved input values. Optionally, all NIM resources created through **nim_move_up** can also be removed. Using this panel is the equivalent of using the **-r** command line option.

Migrating a NIM client to a POWER5 logical partition using nim_move_up from the command line

Once all prerequisites needed to run the **nim_move_up** application have been met, **nim_move_up** performs the migration process in two steps: configuration and phase execution.

Command-Line Usage

nim_move_up {[**-S**] | [**-K** [-h control_host]] | [-r [-R]]} | { [-c NIM_client] [-i target_ip[-ending_ip]] [-s subnet_mask] [-g gateway] [-h control_host] [-m managed_sys] [-V vio_server [-e] [-D]] [-l img_src] [-l resource_dir] [-t seconds] [-p loops] [-j nimadm_vg] [-L lpp_source] [-U spot] [-B bosinst_data] [-E exclude_files] [-C script_resource] [-b installp_bundle] [-f fix_bundle] {{{[-n] [-d]} | -O} [-q] }

Table 13. Required Flags

Flag	
-c NIM_client	Either a NIM standalone client (standalone object type), or a NIM machine group (mac_group object type). The indicated clients must be reachable via the network from the NIM master and must allow the NIM master to execute commands on them. If you specify a NIM machine group in this argument, they must all reside in the same NIM network. The clients will be the target machines that will be migrated onto equivalent LPARs on a POWER5 server.
-i target_ip[-ending_ip]	The IP address that the new migrated client will be configured with after it is installed onto the POWER5 server. If a NIM machine group is supplied to the -c option, a range of IP addresses must be supplied here and there must be enough addresses in the range to enumerate the amount of clients that will be migrated.
-s subnet_mask	The subnet mask that the clients will be configured with after the migration to the POWER5 server.
-g gateway	The IP address of the default gateway that the clients will be configured with after the migration to the POWER5 server.
-h control_host	The hostname or IP address of the HMC that is used for hardware control of the POWER5 server that nim_move_up is to use.
-m managed_sys	The name of the managed system corresponding to the POWER5 server as tracked by the HMC.
-l img_src	Path to the source of the installation images to be used to create the NIM resources needed to perform the migration and installation. This path can be a device, such as dev/cd0 if using AIX product media, or a path to a location on the file system containing the installation images.
-l resource_dir	Path to a location on the file system that will contain any new NIM resources created through nim_move_up . The location should have enough space to accommodate an <i>lpp_source</i> and a spot unless existing resources were provided through the -L and -U options.

Table 14. Execution and Control Flags

Flag	
-S	Displays the status of the execution of the current phase or the next phase to be executed. All saved values are displayed as well. nim_move_up exits immediately after displaying the information. This flag cannot be used with any other options.

Table 14. Execution and Control Flags (continued)

Flag	
-n	Executes only the next phase of the nim_move_up migration process. nim_move_up will exit when the phase completes or fails. If you do not provide this flag, all the subsequent phases will be executed, and nim_move_up will exit when all the phases have executed, or one of them has failed.
-d	nim_move_up will execute in the background and return control of the terminal to the caller. The progress of nim_move_up can be tracked through the -S flag described above.
-q	Quiet mode. No output will be printed to the terminal, but will instead be kept in the logs. This flag has no effect if nim_move_up is being executed with the -d flag described above.
-O	Only save supplied values. nim_move_up will save values provided through other options and then exit without executing any phases. This flag cannot be used with any other of the execution or control flags.
-K	Configures SSH keys on the specified HMC to allow the unattended remote execution of commands from the NIM master without password prompts. This flag cannot be used with any other options except for the -h option.
-r	Unconfigures nim_move_up , which causes it to reset all its saved data, including saved options, phase-specific data, and current phase information. This operation must be executed if the migration process is to be started over for the migration of a new client or set of clients.
-R	Removes all NIM resources created by nim_move_up in addition to unconfiguring the environment. This flag can only be used with -r , described above.

Table 15. Optional Flags

Flag	
-V <i>vio_server</i>	LPAR name of a Virtual I/O Server residing on the POWER5 server denoted through the -m flag described above.
-e	Forces the use of physical network adapters instead of shared ethernet adapters in creating the new LPAR on the POWER5 server when a Virtual I/O Server LPAR has been specified. This flag is only valid when used with the -V option described above.
-D	Forces the use of physical storage controllers instead of virtual SCSI adapters in creating the new LPAR on the POWER5 server when a Virtual I/O Server LPAR has been specified. This flag is only valid when used with the -V option described above.

Table 15. Optional Flags (continued)

Flag	
-p <i>loops</i>	Number of times to execute system analysis tools on the target NIM clients in analyzing its resource utilization. The final resource utilization data will be the average of the values obtained from each loop and will be taken into account when determining the equivalent POWER5 resources from which the migrated LPAR will be derived. If you do not provide this option, it will default to 1 loop.
-t <i>seconds</i>	Number of seconds for which each loop runs. If you do not provide this option, it will default to 10 seconds.
-j <i>nimadm_vg</i>	The volume group to be used by the underlying nimadm call for data caching. If this option is not provided, the default value will be rootvg .
-L <i>lpp_source</i>	An existing <i>lpp_source</i> NIM resource to whose AIX level the target clients will be migrated to. If this option is not provided, nim_move_up will attempt to create a new <i>lpp_source</i> from the installation image source provided through the -I option, described above.
-U <i>spot</i>	An existing spot NIM resource that will be used in the migration and installation of the clients. If this option is not provided, a new spot will be created from the provided <i>lpp_source</i> NIM resource (see the -L and -I options above).
-B <i>bosinst_data</i>	An existing <i>bosinst_data</i> NIM resource that will be used by nim_move_up to install the new clients onto the POWER5 LPARs. If this option is not provided, nim_move_up will generate a <i>bosinst_data</i> resource with default unattended installation values.
-E <i>exclude_files</i>	An existing <i>exclude_files</i> NIM resource that nim_move_up will use when creating a mksysb of the original clients. If this option is not provided, nim_move_up will generate an <i>exclude_files</i> resource that will exclude the contents of /tmp from the backup.
-C <i>script_resource</i>	An existing script NIM resource that, if provided, nim_move_up will execute in phase 10 (Post-installation Customization) on all of the newly migrated LPARs.
-b <i>installp_bundle</i>	An existing <i>installp_bundle</i> NIM resource whose software will be installed on each of the new migrated LPARs in phase 10 (Post-installation Customization) if the option is provided to nim_move_up .
-f <i>fix_bundle</i>	An existing <i>fix_bundle</i> NIM resource whose APARs will be installed on each of the new migrated LPARs in phase 10 (Post-installation Customization) if the option is provided to nim_move_up .

Example:

To configure the **nim_move_up** application with the required options and to start the first phase of the migration process, you would enter the following:

```
nim_move_up -c client1 -i 192.168.1.100 -s 255.255.255.0 -g 192.168.1.1 -h hmc1.mydomain.com -m
my-p5 -l /big/dir -I /dev/cd0 -n
```

where

- *-c client1* is a NIM standalone client reachable via the network from the NIM master
- *-i 192.168.1.100* is the IP address that the new migrated client will be configured with after it is installed onto the POWER5 server
- *-s 255.255.255.0* is the subnet mask that the clients will be configured with after the migration to the POWER5 server
- *-g 192.168.1.1* is the IP address of the default gateway that the clients will be configured with after the migration to the POWER5 server
- *-h hmc1.mydomain.com* is the hostname or IP address of the HMC that is used for hardware control of the POWER5 server to be used by the `nim_move_up` application
- *-m my-p5* is the name of the managed system corresponding to the POWER5 server as tracked by the HMC
- *-l /big/dir* is the path to a location on the file system that will contain any new NIM resources created by the `nim_move_up` application
- *-l /dev/cd0* is the path to the source of the installation images to be used to create the NIM resources needed to perform the migration and installation
- *-n* begins the next phase of the migration process.

Then, to execute all remaining phases of the migration process in the background and save your agreement to accept all licenses, you would enter

```
nim_move_up -Y -d
```

Performing advanced NIM configuration tasks

You can perform many advanced Network Installation Management (NIM) configuration tasks using the Web-based System Manager NIM interface, System Management Interface Tool (SMIT), and the command line.

NFS client communication options management

AIX Network Installation Management (NIM) provides several options for network security and firewall enhancements.

The NIM Service Handler (NIMSH) provides you with several options for remote service authentication and limits the network socket selection of the service. NIMSH provides NIM users with a client configurable option for service authentication. Use Network File System (NFS) V4, which is part of NIM, to encrypt or secure network data on resource servers.

NFS V4 provides information-security functions:

Identification

Establishes the identity of any users, hosts, or services

Authentication

Confirms the identity of a user, host, or service

Authorization

Controls what shared information each user or entity can access

The information-security functions in the network installation environment use NIM's object-oriented description of an install model. Resource objects in the NIM database must contain additional attributes for describing the security options required when accessing NIM resources through NFS V4.

NFS V4 host identification:

The NFS V4 server identifies client hosts using these methods.

Basic host identification

An NFS V4 server identifies client hosts by the IP address given in the Remote Procedure Call (RPC) packets. The NFS server turns this IP address into a host name using a host resolver, which gets its information from the Domain Name System (DNS) or the local **/etc/hosts** file.

Kerberos host identification

Kerberos authentication uses a unique identifier called a machine principal to identify hosts. The machine principal is established when configuring a host into a Kerberos realm. The machine principal name is the fully qualified host name prefixed with `host/` (for example, `host/jsblade00.austin.ibm.com`).

Kerberos can indirectly identify a host is through the NFS service principal (the identification of the NFS service running on the host). The service principal name is the fully qualified host name prefixed with `nfs/` (for example, `nfs/jsblade00.austin.ibm.com`).

NFS V4 host authentication:

NFS servers always identify client hosts by IP addresses and host names, regardless of the authentication method that you use. When Kerberos authentication is the only allowed security method for an exported directory, the NFS client session must be properly authenticated before gaining access to any of the data in that directory.

NFS V4 normally authenticates clients at the user level rather than at the host level. The two user authentication methods are **auth_sys** (UNIX authentication) and **RPCSEC_GSS** (Kerberos). Under the **auth_sys** security method, the user is authenticated at the client, usually through a logon name and password. The NFS server trusts the user and group identities presented by its clients. When an NFS client and server are using Kerberos 5 authentication, the client and server must establish a security context for NFS requests. The security context is a data structure that indicates that the client and server have completed a mutual authentication procedure. If requested, the context also contains the encryption keys that are used for protecting exchanged data. The security context has a lifetime and might need to be refreshed by the client.

For more information about the **RPCSEC_GSS** authentication process, see the readme files, Network File System security, and the Commands reference.

NFS V4 host authorization:

Host authorization in an Network File System (NFS) context means controlling which NFS client hosts can mount exported directories from the NFS server. This is accomplished in AIX with a combination of the **/etc/exports** file and the **exportfs** command.

NFS V4 has the security-related options as shown in the following table.

Option	Description
vers	Controls which version NFS mounts you can use. Possible values are 2, 3, and 4. Versions 2 and 3 cannot be enforced separately. Specifying Version 2 or 3 allows access by clients using either NFS protocol Versions 2 or 3. Version 4 can be specified independently and must be specified to allow access by clients using Version 4 protocol. The default value in NIM is 3. Valid values in NIM are 3 and 4.

Option	Description
sec	Controls which security methods can be used. Possible values are: sys UNIX authentication, <i>default option</i> dh DES authentication krb5 Kerberos, authentication only krb5i Kerberos, authentication, and integrity krb5p Kerberos, authentication, integrity, and privacy none Allows mount requests to proceed with anonymous credentials The default value in NIM is sys . Valid values in NIM are sys and krb5 .

The **sec** option can appear more than once in the exports definition for a directory. This allows different access options, such as **ro**, **rw**, and **root**, to be specified for the different security options. For example, hosts using the **sys** security method might only be allowed read access, while hosts using the **krb5** security method might be allowed read and write access.

Using NIM in NFS, there is a standard set of export options that you can use. You can also use user-defined options, but they require you to manage NFS exports for the directory or file system using the NFS export commands, such as **mknfsexp**, **chnfsexp**, and **rmnfsexp**. These export options are separate from NIM export options.

Prerequisites for setting up a NIM environment with NFS security using Kerberos 5:

Your system must meet these prerequisites before you can configure Kerberos 5.

- The NIM master must have AIX 6.1 or later installed.
- The NIM master must be configured.
- IBM Network Access Server (NAS) Version 1.4 or later from the *AIX Expansion Pack CD* server files must be installed:
 - **krb5.lic**
 - **krb5.client**
 - **krb5.server**
 - **modcrypt.base**
- Kerberos services must be configured and authenticated with the Key Distribution Center (KDC) server.
- Any participating NIM clients must have AIX 6.1 or later installed.
- IBM NAS Version 1.4 or later from the *AIX Expansion Pack CD* client files must be installed:
 - **krb5.lic**
 - **krb5.client**
 - **modcrypt.base**
- The Kerberos client must be configured and authenticated with the KDC server.

While NIM is capable of configuring NFS V4, due to the variation of Kerberos configurations, you must manage the KDC configuration and services outside of NIM. Use the **sec** option in the NIM database for export-list generation only. You can use the sample scripts in the **bos.sysmgt.nim.client** fileset to set up Kerberos. After Kerberos 5 is configured in the NIM environment, you must authenticate and obtain tickets for each client and the NIM master. Use the **usr/krb5/bin/kinit** command for ticket-granting options.

For additional help for NIM and Kerberos 5, see the **/usr/lpp/bos.sysmgt/nim/README** file.

Managing NFS client communication options using SMIT:

Use the following procedure to configure the NFS client communication options using SMIT.

- Type `smitty nim_global_nfs` on the NIM client.
- Select any of the NFS client options as shown in the following table.

Option	Value
Enable/Disable Global Usage of NFS Reserved Ports?	Specifies that a non-reserved IP port number is to be used. The value is <code>disable</code> . A value of <code>enable</code> uses a reserved IP port number when the NFS client-communicates with the NFS server.
Allow NIM to enable port-checking on NIM master?	Checks whether an NFS request originated from a privileged port. The default value is <code>no</code> . A value of <code>yes</code> directs the NFS server to do port checking on the incoming NFS requests.
Specify the NFS Local Domain	Specify that the NFS local domain of the system should be changed. The value that you specify is used to create the NIM environment attribute <code>nfs_domain</code> and is used as the domain name in the <code>/etc/nfs/local_domain</code> file. Note: You must set this option before exporting NIM resources as NFS V4 mounts.

Managing NFS client-communication options from the command line:

Use these commands to configure NFS client-communication options on the NIM master.

Use the following commands on the NIM master:

- To enable global usage of NFS reserved ports, use the following command:
`nim -o change -a nfs_reserved_port=yes master`
- To disable global usage of NFS reserved ports, use the following command:
`nim -o change -a nfs_reserved_port=no master`
- To enable port checking on the NIM master NFS server, use the following command:
`nfso -o portcheck=1`
- To disable port checking on the NIM master NFS server, use the following command:
`nfso -o portcheck=0`
- To create a simple KDC server and principals on the NIM master NFS server, use the following command:
`/usr/samples/nim/krb5/config_rpcsec_server -p <password> -u <user principal name>`
This command creates a new-system user name based on the principal name and password provided. See Sample KDC Server Definition File.
- To delete the KDC server and principals on the NIM master NFS server, use the following command:
`/usr/sbin/unconfig.krb`
This command removes all Kerberos 5 configuration information.

Removing machines from the NIM environment

You can remove a machine from the NIM environment by removing the client information from the NIM database.

Note: When a client is removed from the NIM environment, NIM attempts to remove the `/etc/niminfo` file from the client machine. However, the client fileset and rhost permission for the NIM master must be removed manually from the client system if such additional cleanup is desired.

Removing machines from the NIM environment using the Web-based System Manager:

Follow this procedure to remove a machine from the NIM environment using the Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select a machine to remove from the NIM environment.
3. From the Selected menu, choose **Delete** to remove the machine.

Removing machines from the NIM environment using SMIT:

Follow this procedure for removing a machine from the NIM environment using SMIT.

1. Enter the **smit nim_rmmac** fast path.
2. Select the machine to remove.
3. In the displayed dialog fields, accept the defaults.

Removing machines from the NIM environment using the command line:

Follow this procedure for removing machines from the NIM environment using the command line.

Enter:

```
nim -o remove MachineName
```

where *MachineName* is the name of the machine to be removed.

Creating additional interface attributes

The primary interface or the first interface (**if1**) is created when the master is activated, and a sequence number is used to identify the additional interfaces (**if2**, **if3**, ...) in the machine object definition.

To create an additional **if** attribute for the master object, use either Web-based System Manager, SMIT, or the **nim -o change** command operation.

Creating additional interface attributes using the Web-based System Manager:

Follow this procedure for creating additional interface attributes using the Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select any machine (master, standalone, diskless, or dataless).
3. From the Selected menu, choose **Properties**. The General page of the Machine Properties notebook for the selected machine displays.
4. Select the NIM Interfaces tab.
5. Follow the dialog instructions.

Creating additional interface attributes from SMIT:

Follow this procedure for creating additional interface attributes from SMIT.

1. To create an additional **if** attribute, enter the **smit nim_mac_if** fast path.
2. Select the Define a Network Install Interface option.
3. Select the machine object name. In the example, this is master.
4. Enter the host name for the interface.
5. Complete the network-specific information in the entry fields on the Define a Network Install Interface screen.

Note: If a NIM network does not already exist corresponding to the IP address of the host name specified for the interface, additional network information will be requested so the network can be defined.

Creating additional interface attributes from the command line:

Use this procedure for creating additional interface attributes from the command line.

To create an additional **if** attribute for the master object, enter:

For Token-Ring:

```
nim -o change -a ifseq_no='NetworkObjectName AdapterHostName \  
AdapterHardwareAddress' -a ring_speedseq_no=Speed master
```

For Ethernet:

```
nim -o change -a ifseq_no='NetworkObjectName AdapterHostName \  
AdapterHardwareAddress' -a cable_typeseq_no=Type master
```

For FDDI:

```
nim -o change -a ifseq_no='NetworkObjectName AdapterHostName \  
AdapterHardwareAddress' master
```

For other networks:

```
nim -o change -a ifseq_no='NetworkObjectName AdapterHostName \  
AdapterHardwareAddress' master
```

Note: If you do not know the name of the NIM network to which the interface is attached or if a network corresponding to the interface has not been defined, use the **find_net** keyword and **net_definition** attribute as described in “Defining NIM clients” on page 179.

In the example, the following command is run:

```
nim -o change -a if2='Network2 srv1_ent 0' -a \  
cable_type2=bnc master
```

With this syntax, another **if** attribute is created for the master, which tells NIM that the master has an Ethernet interface that uses a host name of `srv1_ent`, that the Ethernet adapter’s hardware address is 0 (not used), and that the master connects to the `Network2` network object.

To display detailed information about the master which will now show the **if2** attribute, enter:

```
lsnim -l master
```

The command produces output similar to the following:

```
master:  
class           = machines  
type            = master  
Cstate         = ready for a NIM operation  
reserved       = yes  
platform       = rs6k  
serves         = boot  
serves         = nim_script  
comments       = machine which controls the NIM environment  
Mstate         = currently running  
prev_state     = ready for a NIM operation  
if1            = Network1 server1 10005AA88399  
master_port    = 1058  
registration_port = 1059  
ring_speed1    = 16  
if2            = Network2 Srv1_ent 02608c2e222c  
cable_type2    = bnc
```

Defining /usr versus non-/usr SPOTs

A **SPOT** resource contains operating system files that are normally installed in the **/usr** file system of a machine. If disk space is limited on a machine or a **SPOT** must be created quickly, it may be helpful to convert the machine's **/usr** file system to a **SPOT** instead of creating an entirely separate **SPOT** at a different location.

If the **/usr** file system of a machine is converted to a **SPOT**, additional software will be installed on the machine to provide support for machines with different hardware configurations. Most of the operating system files will already be installed on the system and will not be reinstalled when the **SPOT** is created.

After a **/usr** file system is converted to a **SPOT**, all software installation and maintenance operations on the machine should be performed using NIM on the **/usr SPOT** resource that was created. This will ensure that all necessary **SPOT** operations are performed in addition to software installation or maintenance on the machine.

Defining /usr versus non-/usr SPOTs using the Web-based System Manager:

Follow this procedure for defining **/usr** versus non-**/usr** SPOTs using the Web-based System Manager.

1. Select the Resources container.
2. From the Resources menu, select **New Resource**.
3. Follow the wizard instructions to create the **SPOT** resource.

Defining /usr versus non-/usr SPOTs using SMIT:

Follow this procedure for defining **/usr** versus non-**/usr** SPOTs using SMIT.

1. To create a **/usr SPOT**, enter the **smit nim_mkres** fast path.
2. Select the Resource Type.
3. Type **/usr** in the Location of Resource field.
4. Supply the values or accept the defaults for all other fields on this screen.

Creating the /usr-SPOT from the command line.:

Follow this procedure for creating the **/usr-SPOT** from the command line.

Enter:

```
nim -o define -t spot -a server=ServerName \  
-a location=/usr -a source=SourceName ResourceName
```

Example:

To convert the **/usr** file system on the machine, **client1**, to a **SPOT** named **usrspot** using **lppsource1** as the source for additional installation images, enter:

```
nim -o define -t spot -a server=client1 -a location=/usr \  
-a source=lpp_source1 usrspot
```

Using the installp command:

After you convert a **/usr** file system to a **SPOT**, it is not recommended that you use the **installp** command to install or maintain software on the machine serving the **SPOT**.

The diskless and dataless clients and network boot images associated with the **SPOT** will not be updated by the **installp** command unless it is invoked using NIM's **cust** or **maint** operations. If you need to use the **installp** command to install or maintain software on a **/usr SPOT** server, use the following steps:

1. Ensure that all NIM operations on the server and any clients associated with the **SPOT** are complete.

2. Deallocate the **SPOT** from all standalone clients.
3. Run the **installp** command.
4. Run the **check** operation on the **SPOT** after the **installp** command has completed:

```
nim -o check -F usrSPOTName
```

Note: The **-F** flag is required for rebuilding the boot images.

5. If this **SPOT** is being used to serve diskless or dataless clients, resynchronize all diskless and dataless clients with the **SPOT** after the **installp** command completes by issuing the **nim** command with the **sync_roots** operation for the **/usr SPOT**:

```
nim -o sync_roots usrSPOTName
```

```
nim -o check -F usrSPOTName
```

The **cust** and **maint** operations must be used to manage software installed on non-**/usr SPOTs**.

Re-creating SPOT resources from existing directories

Defining NIM resources from existing files and directories can usually be done by specifying the **server** and **location** attributes to the **nim -o define** command. SPOT resources take longer to define because software must be installed from installation images into the SPOT location.

The **nim -o** command line interface always builds a SPOT from installation images. However, if a directory structure for a SPOT already exists from a prior creation, it is possible to call a NIM method directly to redefine the SPOT without reinstalling all the software.

The need to define a SPOT from an existing SPOT directory typically arises only when it is necessary to rebuild the NIM database during system recovery.

To define a SPOT from a directory that previously had a SPOT installed in it, use the following command:

```
/usr/lpp/bos.sysmgt/nim/methods/m_mkspot -o -a server=server \  
-a location=location -a source=no spotname
```

Example:

A SPOT named **spot1** was created on the NIM master in the **/export/spot** directory. Later, the NIM database became corrupted and has to be rebuilt. The SPOT files are still on the machine, but the SPOT must be redefined to NIM using the following command:

```
/usr/lpp/bos.sysmgt/nim/methods/m_mkspot -o -a server=master \  
-a location=/export/spot -a source=no spot1
```

Creating a SPOT resource from a mksysb resource

Creating a SPOT from a **mksysb** resource allows you to only support the devices the **mksysb** uses.

Because the SPOT only contains boot images for the devices in the source **mksysb**, it is significantly smaller than a SPOT created from an installation image. A SPOT that you create from a **mksysb** resource is typically 30 to 50 MB, whereas a SPOT that you create from an installation image is typically 300 MB. You also do not need an **lpp_source** resource with this method.

You should only use a SPOT created from a **mksysb** to perform **bos_inst** operations of the **mksysb**. Performing other operations on standalone clients, such as **maint** and **diag** is not supported. Performing **cust** operations on a SPOT taken from a **mksysb** is also not supported.

The **mksysb_source** attribute is used to distinguish a SPOT created from a **mksysb** from other SPOTs. The **mksysb_source** attribute is set to the resource name of the **mksysb** you used to create the SPOT.

The **mksysb** from which you create a SPOT can be at any level greater than 4.3.3.75.

Creating a SPOT resource from a mksysb resource with SMIT or from a command line:

To create a SPOT from a **mksysb** on the command line, set the source attribute to the name of the **mksysb** resource you want to create the SPOT from.

If the **mksysb** resource is called "mksysb1," you would use the following command to create a SPOT called "spot1" served by the NIM master:

```
nim -o define -t spot -a source=mksysb1 -a server=master -a location=/export/spot spot1
```

To create a SPOT from a **mksysb** with SMIT, you can use fast paths **nim_mkres_spot_only** and **nim_mkres**. When the **source** attribute is expanded, all available **mksysb** resources, as well as other sources, are displayed as possible sources for the creation of a SPOT.

Defining an lpp_source on CD/DVD-ROM versus hard disk

You can define an **lpp_source** on a CD-ROM versus a disk using the Web-based System Manager, SMIT, or the command line.

Normally an **lpp_source** resource is created by copying installation images from installation media to the hard disk of the **lpp_source** server. If disk space is limited on the server or if an **lpp_source** is needed quickly, you can use a directory mounted from CD/DVD-ROM installation media as the **lpp_source**.

Defining an lpp_source on CD/DVD-ROM versus hard disk using the Web-based System Manager:

Follow this procedure for defining an **lpp_source** on CD/DVD-ROM versus hard disk using the Web-based System Manager.

1. Select the Resources container.
2. From the Resources menu, select **New Resource**.
3. Follow the wizard instructions to create the **lpp_source** resource.

Note: You can also define an **lpp_source** resource through the Configure NIM wizard, both when you are configuring your environment, and after configuration.

Defining an lpp_source on CD/DVD-ROM versus hard disk using SMIT:

Follow this procedure for defining an **lpp_source** on CD/DVD-ROM versus disk using SMIT.

1. Mount the CD/DVD as a **CDROM** file system. The installation images can be found in the **/usr/sys/inst.images** directory under the mount point of the **CDROM** file system.
2. To define the **lpp_source** using the directory of install images, enter the **smit nim_mkres** fast path.
3. Specify the name of the machine with the CD/DVD-ROM as the Server.
4. Specify **CD_MountPoint/ usr/sys/inst.images** as the location of the **lpp_source**, and leave the Source field blank.

Defining an lpp_source on CD/DVD-ROM versus hard disk from the command line:

Follow this procedure for defining an **lpp_source** on a CD/DVD-ROM versus a disk from the command line.

1. Mount the CD/DVD as a **CDROM** file system. The installation images can be found in the **/usr/sys/inst.images** directory under the mount point of the **CDROM** file system.
2. Define the **lpp_source** using the directory of install images for the **location** attribute. Do not specify a value for the **source** attribute, since an existing set of images will be used. With the CD/DVD mounted at **/cdfs** on the NIM master, to define an **lpp_source** named **cd_images**, enter:

```
nim -o define -t lpp_source -a server=master \  
-a location=/cdfs/usr/sys/inst.images cd_images
```

Establishing a default NIM route between networks

You can create default NIM routes for two Networks (for example, Network1 and Network3).

Establishing a default NIM route between networks using the Web-based System Manager:

Follow this procedure for establishing a default NIM route between networks using the Web-based System Manager.

1. Select the Networks container.
2. In the contents area, select any network.
3. From the Selected menu, choose **Properties**. The General page of the Properties notebook for the selected network displays.
4. Select the NIM Routes tab. The NIM Routes page of the Properties notebook displays.
5. Use the NIM Routes page to add the default route.

Establishing a default NIM route between networks using SMIT:

Follow this procedure for establishing a default NIM route between networks using SMIT.

1. Enter the **smit nim_mkdroute** fast path.
2. In the displayed dialog fields, supply the values or accept the defaults. Use the help information and the LIST option to help you.

Establishing a default NIM route between networks from the command line:

Follow this procedure to establish default NIM routes between networks from the command line.

To create a default NIM route for a network, enter:

```
nim -o change -a routingseq_no='default Gateway' NetworkObject
```

where `default` is the reserved keyword used by NIM to indicate a default route, and `Gateway` is the host name (or IP address) of the interface that clients on `NetworkObject` use to contact other networks in the NIM environment.

For example, to establish default NIM routes for Network1 and Network3, enter:

```
nim -o change -a routing1='default gw1_tok' Network1
nim -o change -a routing1='default gw1_fddi' Network3
```

where `gw1_tok` is the host name of the default gateway for machines on Network1, and `gw1_fddi` is the host name of the default gateway for machines on Network3.

The detailed information for the network objects now shows the added default routes. To display the detailed information for the two networks, enter:

```
lsmim -l Network1 Network3
```

which produces output similar to the following:

```
Network1:
  class      = networks
  type       = tok
  net_addr   = 9.101.1.0
  snm        = 255.255.255.0
  Nstate     = ready for use
  prev_state = ready for use
  routing1   = default gw1_tok
```

```
Network3:
  class      = networks
  type       = fddi
```



```

net_addr      = 9.101.3.0
snm           = 255.255.255.0
Nstate       = ready for use
prev_state    = information is missing from this
               object's definition
routing1      = default gw1_fddi

```

Establishing a static NIM route between networks

You can create a static NIM route between two networks (for example, Network1 and Network3) using the Web-based System Manager, SMIT, or the command line.

Establishing a static NIM route between networks using Web-based System Manager:

Follow this procedure for establishing a static NIM route between networks using Web-based System Manager.

1. Select the Networks container.
2. In the contents area, select any network.
3. From the Selected menu, choose **Properties**. The General page of the Properties notebook for the selected network displays.
4. Select the NIM Routes tab. The NIM Routes page of the Properties notebook displays.
5. Use the NIM Routes page to add the static route.

Establishing a static NIM route between networks using SMIT:

Follow this procedure for establishing a static NIM route between networks using SMIT.

1. Enter the **smit nim_mkroute** fast path.
2. In the displayed dialog fields, supply the values or accept the defaults. Use the help information and the LIST option to help you.

Establishing a static NIM route between networks from the command line:

Follow this procedure for establishing a static NIM route between networks from the command line.

To create a static NIM route between two networks, enter:

```
nim -o change -a routingseq_no='DestinationNetworkObject \
Gateway1 Gateway2' NetworkObject
```

where *Gateway1* is the host name of the interface that clients on *NetworkObject* use to get to *DestinationNetworkObject*, and *Gateway2* is the host name that clients on *DestinationNetworkObject* use to get back to *NetworkObject*.

For example, to establish a NIM route between Network1 and Network3, enter:

```
nim -o change -a routing1='Network3 gw1_tok gw1_fddi' Network1
```

where *gw1_tok* is the host name of the gateway that machines on Network1 use to communicate with machines on Network3, and *gw1_fddi* is the host name of the gateway that machines on Network3 use to communicate with machines on Network1.

The detailed information for the network objects now shows the added routing attributes.

To display the detailed information about the two networks, enter:

```
lsnim -l Network1 Network3
```

The command produces output similar to the following:

```

Network1:
  class      = networks
  type       = tok
  net_addr   = 9.101.1.0
  snm        = 255.255.255.0
  Nstate     = ready for use
  prev_state = ready for use
  routing1   = Network3 gw1_tok

Network3:
  class      = networks
  type       = fddi
  net_addr   = 9.101.3.0
  snm        = 255.255.255.0
  Nstate     = ready for use
  prev_state = information is missing from this object's
              definition
  routing1   = Network1 gw1_fddi

```

Recovering the `/etc/niminfo` file

The `/etc/niminfo` file, which resides on the master and running NIM clients, is required to run NIM commands and perform NIM operations. If the `/etc/niminfo` file is accidentally deleted, you can rebuild the file.

Recovering the `/etc/niminfo` file using Web-based System Manager:

Follow this procedure for recovering the `/etc/niminfo` file using Web-based System Manager.

1. Select the NIM container.
2. From the NIM menu, select **Advanced Configuration** → **Rebuild Master Configuration File**.

Note: The Configure NIM wizard will detect when you do not have a `niminfo` file, but do have NIM database entries. The wizard queries whether it should rebuild the master configuration file.

Recovering the `/etc/niminfo` file from the command line:

Follow this procedure for recovering the `/etc/niminfo` file from the command line.

Enter the following command from the master to rebuild the file:

```
nimconfig -r
```

To rebuild the `/etc/niminfo` file from a running NIM client, enter:

```
nimit -a master_port=PortNumber -a master=MasterHostName \
-a name=ClientMachineObjectName
```

Backing up the NIM database

You can back up the NIM database using Web-based System Manager, SMIT, or the command line.

To back up the NIM database, you will be prompted for the name of a device or a file to which the NIM database and the `/etc/niminfo` file will be backed up. The level of the installed NIM master fileset will also be written to a file called `/etc/NIM.level` and saved in the backup. A backup of a NIM database should only be restored to a system with a NIM master fileset which is at the same level or a higher level than the level from which the backup was created.

Backing up the NIM database using the Web-based System Manager:

Follow this procedure for backing up the NIM database using the Web-based System Manager.

1. From the NIM container, from the NIM menu, select **Back Up Database**.
2. Use the dialog to specify the backup device or file.

Backing up the NIM database using SMIT:

To back up the NIM database, enter the **smit nim_backup_db** fast path.

Backing up the NIM database from the command line:

Save these files to back up the NIM database from the command line.

Save the following NIM files:

/etc/niminfo

/etc/objrepos/nim_attr

/etc/objrepos/nim_attr.vc

/etc/objrepos/nim_object

/etc/objrepos/nim_object.vc

Restoring the NIM database and activating the NIM master

You can restore the NIM database and activate the NIM master using the Web-based System Manager, SMIT, or the command line.

Note: A NIM database should only be restored to the same or later level of NIM that was used for the backup.

Restoring the NIM database and activating the NIM master using the Web-based System Manager:

Follow this procedure for restoring the NIM database and activating the NIM master using the Web-based System Manager.

1. From the NIM container, from the NIM menu, select **Restore Database**.
2. Use the dialog to specify the restore device or file.

Restoring the NIM database and activating the NIM master using SMIT:

Follow this procedure for restoring the NIM database and activating the NIM master using SMIT.

To configure a NIM master from a NIM database backup, enter the **smit nim_restore_db** fast path.

Restoring the NIM database and activating the NIM master from the command line:

Follow this procedure for restoring the NIM database and activating the NIM master from the command line.

Restore the files saved in “Backing up the NIM database” on page 274.

Unconfiguring the NIM master

This operation removes the NIM daemons from the system and removes all configuration from the NIM database.

The NIM master should only be unconfigured if the NIM environment is to be completely redefined or if the NIM master files set is to be removed from the system.

Unconfiguring the NIM master using the Web-based System Manager:

Follow this procedure for unconfiguring the NIM master using the Web-based System Manager.

1. From the NIM Container, from the NIM menu, select **Unconfigure Environment**.

2. You have the option to back up the NIM database before starting the unconfigure action.

Unconfiguring the NIM master using SMIT:

Follow this procedure for unconfiguring the NIM master using SMIT.

Enter the **smit nim_unconfig** fast path.

The SMIT screen will prompt you to first back up your NIM database before unconfiguring the NIM master.

Unconfiguring the NIM master from the command line:

Follow this procedure for unconfiguring the NIM master from the command line.

Enter **nim -o unconfig master**.

Performing boot diagnostics on NIM clients

Hardware diagnostics can be performed on all NIM clients using a diagnostic boot image from a NIM server, rather than booting from a diagnostic tape or CD/DVD-ROM.

This is useful for standalone clients, because the diagnostics do not have to be installed on the local disk. Diagnostic support comes from a **SPOT** resource.

Booting diagnostics using the Web-based System Manager:

Follow this procedure for booting diagnostics using the Web-based System Manager.

1. Select the NIM container.
2. In the contents area, select the standalone, diskless, or dataless machine you want to enable for diagnostics boot.
3. From the Selected menu, choose **Troubleshooting** → **Enable Diagnostic Boot**.
4. Use the dialog to select a **SPOT** resource from which to boot.

Booting diagnostics using SMIT:

Follow these procedures for performing the **diag** operation from the master and client using SMIT.

Initiating the diag operation from the client:

Follow this procedure to initiate the **diag** operation from the client.

1. Enter the **smit nim_client_op** fast path.
2. Select the **diag** operation from the displayed list of operations.

Initiating the diag operation from the master:

Follow this procedure to initiate the **diag** operation from the master.

1. Enter the **smit nim_mac_op** fast path.
2. Select the machine object.
3. Select the **diag** operation from the list of operations.

Booting diagnostics from the command line:

Follow this procedure for performing the **diag** operation from the master and client.

To perform the **diag** operation from the client, enter:

```
nimclient -o diag -a spot=SPOTName
```

To perform the **diag** operation from the master, enter:

```
nim -o diag -a spot=SPOTName MachineObjectName
```

Verifying the diag operation:

After you have enabled the client to perform a diagnostic boot, you can verify the success of the operation by querying the client's *control state* (**Cstate**).

On the client, enter:

```
nimclient -l -l ClientMachineObjectName
```

On the master, enter:

```
lsnim -l ClientMachineObjectName
```

If the operation is successful, output similar to the following is displayed:

```
Cstate = Diagnostic boot has been enabled
```

For the client to boot the diagnostics, you need to reboot the client. If it is a diskless or a dataless client, you have already defined a network adapter as the default boot device (BOOTP request), so no additional action is required. For a standalone machine, the boot list for normal boot lists the hard disk as the primary boot device. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.

Loading diagnostics without the diag operation:

In addition to the procedure using the **diag** operation, diskless and dataless clients have another way of loading diagnostics from the network. You can boot a diskless or dataless client from the network the same way you do for normal use, but with the machine's key mode switch in the Service position.

If the client's key mode switch is in the Service position at the end of the boot process, hardware diagnostics from the server's **SPOT** are loaded. If a standalone client boots with the key mode switch in the Service position, the diagnostics (if installed) are loaded from the hard disk.

Booting in maintenance mode

If you need to perform maintenance on a standalone machine that is not part of the NIM environment, the system must be booted from a bootable tape or CD/DVD-ROM.

This may require connecting an external device. If the machine is part of a NIM environment, you can enter maintenance mode directly by enabling the **maint_boot** operation for a NIM standalone machine.

Booting in maintenance mode using the Web-based System Manager:

Follow this procedure for booting in maintenance mode using the Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select a target standalone machine you want to enable for maintenance boot.
3. From the Selected menu, choose **Troubleshooting** → **Enable Maintenance Boot**.
4. Use the dialog to select a **SPOT** resource from which to boot.

Booting in maintenance mode using SMIT:

Follow these procedures for booting in maintenance mode using SMIT.

Initiating the maint_boot operation from the client:

Follow this procedure for initiating the `maint_boot` operation from the client.

1. Enter the **smit nim_client_op** fast path.
2. Select the **maint_boot** operation.
3. Select the **SPOT** to be used for the operation.
4. Press Enter to enable the client for maintenance boot.

Initiating the `maint_boot` operation from the master:

Follow this procedure for initiating the `maint_boot` operation from the master.

1. Enter the **smit nim_mac_op** fast path.
2. Select the client's machine object.
3. Select the **maint_boot** operation.
4. Select the **SPOT** to be used for the operation.
5. Press Enter to enable the client for maintenance boot.

Booting in maintenance mode from the command line:

Follow these procedures for booting in maintenance mode from the command line.

To issue the **maint_boot** operation from the client, enter:

```
nimclient -o maint_boot -a spot=SPOTNAME
```

To issue the **maint_boot** operation from the master, enter:

```
nim -o maint_boot -a spot=SPOTNAME CLIENT
```

To verify that the maintenance boot operation worked:

1. On the client, enter:

```
nimclient -l -l ClientMachineObjectName
```
2. On the master, enter:

```
lsnim -l ClientMachineObjectName
```

If the operation was successful, the client's **Cstate** output will look similar to the following:

```
Cstate = maintenance boot has been enabled
```

For the machine to boot into maintenance mode, follow the procedure for issuing the BOOTP request from the client. If you are booting from a network device, follow the procedures in your hardware documentation to perform the network boot.

Using the maintenance mode

After successfully booting and defining the console, the System Maintenance menu is displayed. The maintenance menu options and their descriptions are described below.

Access a Root Volume Group

This option allows you to activate the root volume group and start the maintenance shell with a full set of commands.

Copy a System Dump to Removable Media

This option allows you to copy a previous system dump to external media.

Access Advanced Maintenance Function

This option allows you to start a maintenance shell with a limited set of commands.

Using secondary adapter support

Previously, during a NIM **rte** BOS installation operation, only the network adapter and interface used during BOS installation were configured. Using NIM secondary adapter definitions, you can have additional network adapters and interfaces configured during a BOS installation or customized installation.

The **nimadapters** command parses a secondary adapter stanza file to build the files required to add NIM secondary adapter definitions to the NIM environment as part of an **adapter_def** resource. The **nimadapters** command does not configure secondary adapters. The configuration takes place during a **nim -o bos_inst** operation or a **nim -o cust** operation that references the **adapter_def** resource.

Secondary adapter support is available for AIX. Before you enable a secondary adapter, you must verify the AIX version the client is running. The secondary adapters will fail to configure, because NIM is unable to find the **/usr/lpp/bos.sysmgt/nim/methods/c_cfgadptrs** client method. The following example shows the outcome if you attempt to enable this support on your NIM master.

```
nim -o cust -a adapter_def=adapter_def1 rspc10
trigger.austin.xyz.com. 0042-001 nim: processing error encountered on "master":
0042-001 m_cust: processing error encountered on "rspc10":
0042-175 c_script: An unexpected result was returned by the
"trigger.austin.xyz.com:/export/nim/scripts/rspc10.script" command:
/tmp/_nim_dir_4714/script[10]: /usr/lpp/bos.sysmgt/nim/methods/c_cfgadptrs: not found.
```

The secondary adapter stanza file is processed by the **nimadapters** command and turned into a file that contains one stanza for each secondary adapter or interface on the NIM client. During a BOS installation, NIM processes this information and configures the secondary adapters.. If a secondary adapter is already configured in the requested manner, NIM does not reconfigure the secondary adapter.

Note: Before using the **nimadapters** command, you must configure the NIM master. For information on configuring the NIM master, see “Configuring the NIM master and creating basic installation resources” on page 230.

Working with secondary adapter file rules

The format of the secondary adapter file must comply with these rules.

- After the stanza header, follow attribute lines of the form: *Attribute = Value*
- If you define the value of an attribute multiple times within the same stanza, only the last definition is used.
- If you use an invalid attribute keyword, that attribute definition is ignored.
- Each line of the file can have only one header or attribute definition.
- More than one stanza can exist in a definition file for each machine host name.
- Each stanza for a machine host name represents a secondary adapter definition on that NIM client. No two secondary adapter definitions for the same machine host name can have the same location or **interface_name**. There should be only one definition per adapter or interface on a given NIM client.
- If the stanza header entry is the **default** keyword, this specifies to use that stanza for the purpose of defining default values.
- You can specify a default value for any secondary adapter attribute. However, the **netaddr** and **secondary_hostname** attributes must be unique. Also, the **location** and **interface_name** attributes must be unique on a NIM client.
- If you do not specify an attribute for a secondary adapter but define a default value, the default value is used.
- You can specify and change default values at any location in the definition file. After a default value is set, it applies to all definitions that follow.
- To turn off a default value for all following machine definitions, do not set the attribute value in a default stanza.
- To turn off a default value for a single machine definition, do not set the attribute value in the machine stanza.

- You can include comments in a client definition file. Comments begin with the number sign (#).
- When parsing the definition file for header and attribute keywords and values, tab characters and spaces are ignored.

Note: During a `nim -o bos_inst` or `nim -o cust` operation, if NIM examines the configuration data on the client and determines that a secondary adapter is already configured with precisely the attributes requested in the `adapter_def` resource, this secondary adapter is not reconfigured.

Using secondary adapter file keywords

The secondary adapter file uses these keywords to specify machine attributes.

Using required adapter attributes:

The following attributes are required for configuring adapters.

machine_type = secondary | etherchannel | install

Specifying the `machine_type` attribute as **secondary** clearly distinguishes the `nimadapters` input from `nimdef` input. If a secondary adapter's file is mistakenly passed to the `nimdef` command, the error can be detected. Stanzas with a `machine_type` of **install** are ignored.

netaddr

Specifies the network address for the secondary adapter.

interface_type = en | et | sn | ml | vi

Specifies the type of network interface. The network interface can be **en** (ethernet interface), **et** (ethernet interface), **sn** (switch network interface), **ml** (multi-link interface), or **vi** (virtual interface). This attribute replaces the deprecated `network_type` attribute.

subnet_mask

Specifies the subnet mask used by the secondary adapter.

Note: Configuring a secondary adapter on the same subnet as another adapter does not provide failover. Packets alternate between adapters when they are configured on the same subnet. If one of the adapters fails, the other adapter will not take over the failed adapter's workload, and the subnet will have connectivity problems. Commands, such as `mount`, might fail if this occurs.

Using optional attributes:

The following attributes are optional for configuring adapters.

adapter_attributes

Blank-separated list of physical adapter attributes and values. For example, `Attribute1=Value1 Attribute2=Value2`. To see the list of attributes that can be set for the requested adapter, run the command `lsattr -E -l AdapterName`.

interface_attributes

Blank-separated list of interface attributes and values. For example, `Attribute1=Value1 Attribute2=Value2`. To see the list of attributes that can be set for the requested interface, run the command `lsattr -E -l InterfaceName`. This attribute replaces the deprecated `attributes` attribute.

cable_type

Specifies the cable type (optional if `network_type` is **en** or **et**).

comments

Specifies a comment to include in the secondary adapter definition. Enclose the comment string in quotation marks.

interface_name

Specifies the name of the network interface for the secondary adapter (for example, **en1**, **sn0**, **ml0**). Do not specify both `location` and `interface_name`.

Note: The value of the **interface_name** attribute must be consistent with the value of the **network_type** attribute.

location

Specifies the physical location of the adapter corresponding to this network interface. Do not specify both the **location** and the **interface_name** attributes.

Note: Except for the multilink pseudo-device, use of the **location** attribute is highly recommended. If the **location** attribute is not specified and the user adds multiple adapters or adds an adapter at the same time that the operating system is reinstalled, the adapter and network interface names might be reassigned by the operating system in unexpected ways.

multiple_physloc

Specifies the physical adapters to associate with an interface when you use an etherchannel or VIPA stanza.

media_speed

Specifies the media speed (optional if the **network_type** attribute's value is either **en** or **et**).

secondary_hostname

Host name to save in the **/etc/hosts** file with the **netaddr** attribute. This host name is not set using the **hostname** command or the **uname -S** command.

Troubleshooting secondary adapter file stanza errors

A secondary adapter stanza causes an error under any of the following conditions.

- The host name that was used in the stanza header for the definition cannot be resolved.
- A required attribute is missing.
- An invalid value was specified for an attribute.
- An attribute mismatch occurs. For example, if the **network_type** attribute's value is not set to either **en** or **et**, you cannot specify **cable_type=bnc** or **media_speed=1000_Full_Duplex**.
- The stanza contains both a **location** attribute and an **interface_name** attribute.
- Secondary adapter definitions occur multiple times for the same adapter location and the same host name.
- Secondary adapter definitions occur multiple times for the same **interface_name** and the same host name.

If a secondary adapter stanza is incorrect, the errors are reported, the stanza is ignored, and the following input is processed without regard to the incorrect stanza.

Secondary adapter files

This is an example a secondary adapter file.

```
# Set default values.
default:
    machine_type = secondary
    subnet_mask  = 255.255.240.0
    network_type = en
    media_speed  = 100_Full_Duplex

# Define the machine "lab1"
# Take all defaults and specify 2 additional attributes.
# Unlike the case of the client definitions that are input to the
# nimdef command, the secondary adapter definition includes at least
# one required field that cannot be defaulted.
lab1:
    netaddr = 9.53.153.233
    location = P2-I1/E1

# Change the default "media_speed" attribute.
```

```

default:
    media_speed    = 100_Half_Duplex

# define the machine "test1"
# Take all defaults and include a comment.
test1:
    comments       = "This machine is a test machine."
# define a machine with a VIPA interface that uses interfaces en2 and en3.
lab2:
    machine_type   = secondary
    interface_type = vi
    interface_name = vi0
    netaddr        = 9.53.153.235
    subnet_mask    = 255.255.255.0
    secondary_hostname = lab3
    interface_attributes = "interface_names=en2,en3"

# define a machine with an etherchannel adapter that uses the adapters at
# the following location codes P1-I4/E1 and P1/E1
lab4:
    machine_type   = etherchannel
    interface_type = en
    interface_name = en2
    netaddr        = 9.53.153.237
    subnet_mask    = 255.255.255.0
    multiple_physloc = P1-I4/E1,P1/E1

# define a machine with an etherchannel adapter that uses the
# ent2 and ent3 adapters and uses mode 8023ad.
lab6:
    machine_type   = etherchannel
    interface_type = en
    interface_name = en2
    netaddr        = 9.53.153.239
    subnet_mask    = 255.255.255.0
    adapter_attributes = "adapter_names=ent2,ent3 mode=8023ad"

```

Working with secondary adapter definitions

Follow these procedures to work with NIM secondary adapter definitions.

1. To preview the **secondary_adapters.defs** client definition file, type:

```
nimadapters -p -f secondary_adapters.defs adapter_def
```
2. To add the NIM secondary adapters described in the **secondary_adapters.defs** secondary adapters definition file, type:

```
nimadapters -d -f secondary_adapters.defs adapter_def
```
3. To define the NIM secondary adapters for the **pilsner** client, type:

```
nimadapters -d \
-a info="en,P2-I1/E1,N/A,1000_Full_Duplex,9.53.153.233,255.255.254.0" \
-a client=pilsner adapter_def
```
4. To remove the NIM secondary adapter definitions for a client called **pilsner** from the **my_adapter_def** resource, type:

```
nimadapters -r -a client=pilsner my_adapter_def
```
5. To remove the NIM secondary adapter definitions for clients defined in the file **secondary_adapters.defs**, type:

```
nimadapters -r -f secondary_adapters.defs my_adapter_def
```
6. To remove all the NIM secondary adapter definitions from the **my_adapter_def** resource, type:

```
nimadapters -r my_adapter_def
```

Enabling NIM alternate master support

Using this procedure, you can set up an alternate NIM master in your environment, synchronize the NIM database between masters, and takeover control of clients between masters.

Preparing to Enable NIM alternate master support:

Before you create an alternate master for your NIM environment, you should already have a primary NIM master configured. Both masters must be at the same level of AIX.

For instructions about configuring a NIM master, see *Configuring the NIM Master and Creating Basic Installation Resources*.

Initializing the alternate master:

You can initialize the alternate master in SMIT or from a command line.

In this scenario, "master A" is already configured as a NIM master, and "master B" will be initialized as an alternate master.

Initializing the alternate master using SMIT:

Follow this procedure for initializing the alternate master using SMIT.

In this scenario, "master A" is already configured as a NIM master, and "master B" will be initialized as an alternate master.

1. Insert the *AIX Volume 1* media into the appropriate drive of the designated alternate master machine (master B).
2. Enter the SMIT **install_latest** fast path, to install the **bos.sysmgmt.nim.master** fileset.
3. Using the LIST option, select **/dev/cd0** for the INPUT device or directory for software.
4. Specify **bos.sysmgmt.nim.master** as the SOFTWARE to install.
5. Accept the default values for all other fields on this screen. After successful completion of this installation, exit SMIT.
6. To initialize the alternate master (master B) with master A, enter the **smit niminit_altmstr** fast path on master B.
7. Type in the name of master B in the field for **This Machine Name**.
8. Using the LIST option, select the Primary Network Interface for master B.
9. Type in the hostname of master A in the field for **Host Name of Master with which to Initialize**.
10. Change any other fields as necessary and press Enter.
11. On master A, repeat the process using the **smit niminit_altmstr** fast path to register master A with master B. You will need to type in the name of master A in the field for "This Machine Name" and the hostname of master B in the field for "Host Name of Master with which to Initialize".

You should consider the following issues when initializing the alternate master from SMIT:

- The **niminit** command creates an **alternate_master** object for the registering machine. In this example, master B is defined as an **alternate_master** object on master A when master B registers with master A.
- The **niminit** command configures the **alternate_master** as a NIM master if it is not already configured as one.
- The **niminit** command gives the master that the machine is registering with remote access permissions either through **rsh** or **nimsh**. In this example, when master B registers, master B gives master A remote access permissions.
- Once an alternate master has been added to the NIM environment, clients should initialize themselves again to recognize the alternate master. Initializing again gives the alternate master remote access to the clients either through **rsh** or **nimsh**. Once clients have initialized themselves again, their **sync_required** attribute is set to **no**, indicating that they recognize the alternate master.

Initializing the alternate master from the command line:

Follow this procedure for initializing the alternate master from the command line.

In this scenario, "master A" is already configured as a NIM master, and "master B" will be initialized as an alternate master.

1. Insert the *AIX Volume 1* media into the appropriate drive of the designated alternate master machine (master B).
2. To install the **bos.sysmgmt.nim.master** fileset from the disk, enter:

```
# installp -agXd /dev/cd0 bos.sysmgmt.nim.master
```

3. To initialize the alternate master (master B) with master A, enter:

```
# niminit -a is_alternate=yes -a attr1=value1 \  
-a attr2=value2 \  
...
```

For example, to initialize alternate master (master B) with existing NIM master (master A):

```
alternate master host name = masterb  
master host name with which to register = mastera  
primary network interface = en0  
cable type = N/A  
platform = chrp
```

Enter the following command sequence:

```
# niminit -a is_alternate=yes -a master=mastera -a pif_name=en0 \  
-a cable_type1=N/A -a platform=chrp -a name=masterb
```

For additional attribute information, see the **niminit** command.

4. Register master A with master B, using the **niminit** command. For example, enter the following on master A:

```
# niminit -a is_alternate=yes -a master=masterb -a pif_name=en0 \  
-a cable_type1=N/A -a platform=chrp -a name=mastera
```

Synchronizing the alternate master's NIM database:

You can synchronize the NIM database for the alternate master using SMIT or from the command line.

In this scenario, master A is configured as a NIM master and has objects, such as clients and resources, defined. Master B is initialized as an alternate master, but its database does not match that of master A. You can use the **sync** operation to synchronize the NIM database on master B with master A's database. The **sync** operation backs up master A's database, restores it onto master B, and then ensures that all the object definitions are consistent.

You should consider the following issues when synchronizing the alternate master's NIM database:

- The resources served by master A are removed from the database when it is restored on master B.
- Object definitions are reset when the database is restored on master B.
- After the database is restored on master B, master B does not control any NIM objects until you perform the **takeover** operation. As a result, master B can not run any NIM operations to any objects in its database.

Synchronizing the alternate master's NIM database using SMIT:

Follow this procedure for synchronizing the alternate master's NIM database using SMIT.

1. On master A, enter the **smit nim_altmstr** fast path.
2. Select **Synchronize an Alternate Master's NIM database**.
3. Type the name of the NIM object for master B.
4. Select **yes** for the force option if master B has been configured as a NIM master.
5. Select **yes** for the replicate option if the resources have to be replicated onto the alternate master.

Synchronizing the alternate master's NIM database from the command line:

Follow this procedure to synchronize the alternate master's NIM database from the command line.

To synchronize master B's database with master A's, enter the following on master A:

```
# nim -o sync masterb
```

To synchronize master B's database with master A's, and also replicate the resources served by master A:

```
# nim -o sync -a replicate=yes masterb
```

Note:

- You must use the force option to overwrite the existing database that was created by the **niminit** command.
- Resources are replicated only if they are not present in the appropriate file system locations of the alternate master.

For example:

```
# nim -Fo sync masterb
```

The replicate option can be used along with the force option. For example:

```
# nim -Fo sync -a replicate=yes masterb
```

Taking control of the NIM environment:

You can take control of the NIM environment using SMIT or from the command line.

In this example, master B is initialized as an alternate master and has had its NIM database synchronized with master A. Master B takes control of the objects in the NIM environment.

You should consider the following issues when taking control of the NIM environment:

- If you perform this operation while master A is running, and master A has a network connection to master B, the database on master A is updated to reflect the change in masters. You should reset the clients on master A before running this operation. This operation prints warnings for any clients on master A that are currently set up to run NIM operations. This operation will not reset those clients to complete successfully.
- If master B is unable to update master A during the takeover operation, master A should have its database synchronized with master B once it is running.
- This operation updates the current master of each client by running a remote command on the clients. Clients that are unavailable to switch masters are displayed. When the client is available, initialize it with master B or perform the takeover operation again from master B.

Taking control of the NIM environment using SMIT:

Follow this procedure for taking control of the NIM environment using SMIT.

1. Enter the **smit nim_altmstr** fast path on master B and select **Takeover control of NIM clients from an Alternate Master**.
2. Type in the name of the NIM object for master A.

Taking control of the NIM environment from the command line:

Follow this procedure for taking control of the NIM environment from the command line.

To have master B take control of the NIM environment, enter the following on master B:

```
# nim -o takeover mastera
```

Master A can retake control of the NIM environment by running the **takeover** command with master B as the target.

Removing an alternate master from the NIM environment:

You can remove an alternate master from the NIM environment using SMIT or from the command line.

In this example, master B is removed from the NIM environment. Master A should be in control of the NIM environment prior to removing master B.

You should consider the following issues when removing an alternate master from the NIM environment:

- Clients re-initialize themselves with master A after removing master B from the environment. Re-initializing updates the **niminfo** files and remote access permissions.
- You can unconfigure Master B by running the **unconfig** operation locally on master B.

Removing an alternate master from the NIM environment using SMIT:

Follow this procedure for removing an alternate master from the NIM environment using SMIT.

1. On master A, enter the **smnit nim_altmstr** fast path and select **Remove an Alternate Master**.
2. Select the NIM name of master B.

Removing an alternate master from the NIM environment from the command line:

Use this command to remove an alternate master from the NIM environment.

To remove master B from the NIM environment, enter the following command on master A:

```
# nim -o remove masterb
```

Using the NIM service handler for client communication

NIM makes use of the remote shell server (rshd) when it performs remote execution on clients. The server provides remote execution facilities with authentication based on privileged port numbers from trusted hosts.

AIX uses NIM Service Handler (NIMSH) to eliminate the need for rsh services during NIM client communication. The NIM client daemon (NIMSH) uses reserved ports 3901 and 3902, and it installs as part of the **bos.sysmgt.nim.client** fileset.

NIMSH allows you to query network machines by hostname. NIMSH processes query requests and returns NIM client configuration parameters used for defining hosts within a NIM environment. Using NIMSH, you can define NIM clients without knowing any system or network-specific information.

While NIMSH eliminates the need for rsh, it does not provide trusted authentication based on key encryption. To use cryptographic authentication with NIMSH, you can configure OpenSSL in the NIM environment. When you install OpenSSL on a NIM clients, SSL socket connections are established during NIMSH service authentication. Enabling OpenSSL provides SSL key generation and includes all cipher suites supported in SSL version 3.

Using NIMSH:

Basic NIMSH functions are explained.

NIMSH service port:

The client daemon has two ports registered with the Internet Assigned Numbers Authority (IANA) for use during network communication. These ports are referred to as the primary and secondary ports.

The primary port listens for service requests on reserved port 3901. When a request is accepted, the primary port is used for **stdin** and **stdout** while **stderr** is redirected to secondary port 3902 (like auxiliary connections in **rcmd()**). This implementation allows the NIM master connection to stay consistent with current support of client connections through rsh. Using a reserved secondary port in NIMSH allows firewall administrators to write firewall rules for accepting incoming connections on privileged ports from the secondary port. These rules can have the requirement that the originating socket address (hostname : secondary port) comes from a trusted source.

NIMSH system resource control:

NIMSH is registered with the System Resource Controller (SRC). The SRC group name is **nimclient** and the subsystem defined is NIMSH.

The client daemon is started by SRC when the configuration routine is run using the **nimclient** command.

NIMSH authentication process:

Service requests from the communicating host (the NIM master) will build packets with the following data for authentication.

- Hostname of NIM client
- CPUID of NIM client
- CPUID of NIM master
- Return port for secondary (**stderr**) connection
- Query flag (used to obtain registration information)

When a connection to the primary port is received, the service handler obtains peer information from the connecting socket. The source port must be in the privileged port space (only root user can bind to privileged ports). Using the privileged port space ensures that the originating user has the root UID. The return port number is retrieved and connected to from the secondary port, which is the reserved port in **/etc/services**.

The following sections describe the phases of the authentication process:

query flag set

When the **query** flag is set to 1, the service handler treats the incoming request as a client discovery for information. The client service handler obtains all relevant information necessary for defining itself as a NIM client and returns the information to the requesting NIM master then terminates the connection. The following data is returned when query flag is set:

- Default hostname (value obtained from **inet0**)
- Default route (value obtained from **inet0**)
- Network address (value obtained from hostname)
- Subnet mask (value obtained from hostname)
- Network interface (value obtained from hostname)

Method request

If the query flag is not set, then a request for service (NIM operation) is pushed by the NIM master. The service handler validates the method request as follows:

1. Verify hostname of NIM master is the client's recognized master hostname.
2. Check the client CPUID passed, it should match the client's machine ID.
3. Check the master CPUID passed, it should match the master's machine id stored in memory.
4. Verify the operation passed is a method in the path **/usr/lpp/bos.sysmgmt/nim/methods**.
5. Check for cryptographic authentication setting.

For additional security, NIMSH supports push disablement. Push disablement disables method requests unless the request is a response to an active NIM client call being processed by the client's NIM master. When push disablement is set, NIMSH does not process any NIM operations controlled by the NIM master. Client control (**nimclient** commands) is the only way to perform NIM operations on the client when push disablement is set.

Logging NIMSH operations:

The NIM client daemon logs data in the **/var/adm/ras/nimsh.log** file during its operation. The log is used only for debug purposes.

Setting up NIMSH:

You can configure existing standalone clients to use NIMSH as the communication protocol. You can also define clients using NIMSH as the service option.

For more information on doing this, see Adding a Standalone NIM Client to the NIM Environment.

Preparing to set up NIMSH:

These prerequisites must be met prior to configuring NIMSH.

- The NIM client must already be configured (see “Adding standalone clients to the NIM environment” on page 232).
- The client must have AIX 5.3 or AIX 6.1 installed.
- The client's NIM master must have AIX 5.3 or AIX 6.1 installed.

Setting up NIMSH using SMIT:

Follow this procedure for configuring existing standalone clients with NIMSH using SMIT.

Complete the following steps:

1. Type the smitty `nim_config_services` fast path on the NIM client.
2. Select **nimsh** as the Communication Protocol used by client.

Setting up NIMSH from the command line:

Use this command for configuring existing standalone clients with NIMSH from the command line.

Type the following command on the NIM client:

```
# nimclient -C
```

Enabling cryptographic authentication:

You can configure existing standalone clients to use the NIMSH communication protocol with SSL enabled.

NIM supports OpenSSL versions 0.9.6e and higher. When OpenSSL is installed, NIMSH uses SSL-encrypted certificates for authenticating the connecting NIM master.

Preparing to enable cryptographic authentication:

These prerequisites must be met to enable cryptographic authentication.

- The NIM master must already be configured for SSL authenticating within the NIM Environment. For more information, see “Using NIM to install clients configured with SSL authentication” on page 306.
- The client must be at AIX 5.3 or AIX 6.1.

- The client's NIM master must be at AIX 5.3 or AIX 6.1.

Enabling cryptographic authentication using SMIT:

Complete these steps to configure existing standalone clients to use NIMSH communication protocol with SSL enabled.

1. Type the **smitty nim_config_services** fast path on the NIM client.
2. Select **nimsh** as the Communication Protocol used by client.
3. Select **enabled** as the option for **Enabling Cryptographic Authentication**.
4. Select **yes** as the option for **Installing Secure Socket Layer Software**, if OpenSSL is not installed on the client.
5. Specify the absolute path for the RPM package or select the **lpp_source** resource that contains the OpenSSL RPM package.

Enabling cryptographic authentication from the command line:

Complete these steps to configure existing standalone clients to use the NIMSH communication protocol with SSL enabled from the command line.

- If OpenSSL is installed on the NIM client, type the following command:

```
# nimclient -c
```

- If OpenSSL is not installed on the NIM client, complete the following steps

1. Locate the Toolbox for Linux Applications media.
2. Install OpenSSL RPM package using **geninstall**. For additional information on using **geninstall**, see *Add Open Source Applications to Your AIX System*.
3. Type the following command on the NIM client after OpenSSL is installed:

```
# nimclient -c
```

Enabling a secondary port:

This procedure describes how to configure existing standalone clients to use the NIMSH communication protocol with a secondary port option enabled.

By default, NIMSH uses a reserved port for returning **stderr** output during command execution. The default setting allows administrators to specify a specific port for opening behind a firewall, but it can cause performance issues when several connections are attempted in a short amount of time.

When TCP connections are closed, the closing sockets enter **TIME_WAIT** state. The length of time for this state may last up to 240 seconds depending on system settings. The secondary port option allows you to specify any specific range of ports to cycle through during NIMSH operation.

For firewalls, administrators might want to open a specific range on the firewall, and then for each machine on the internal network, ensure that the port range on the machine coincides with the open range on the firewall. When changing the NIMSH secondary port, you should choose a range of ports outside of the range used for system services. Try using ports 49152 through 65535.

Preparing to enable a secondary port:

These prerequisites must be met to enable a secondary port.

- The NIM client must already be configured (see *Adding a Standalone NIM Client to the NIM Environment*).
- The client must have AIX 5.3 or AIX 6.1 installed.
- The client's NIM master must have AIX 5.3 or AIX 6.1 installed.

Enabling a secondary port from SMIT:

Complete these steps to configure existing standalone clients to use the NIMSH communication protocol with a secondary port range.

1. Type the **smitty nim_config_services** fast path on the NIM client.
2. Select **nimsh** as the Communication Protocol used by client.
3. Specify a start value for the secondary port number.
4. Specify an increment value for the secondary port range.

Enabling a secondary port from the command line:

Complete these steps to configure existing standalone clients to use the NIMSH communication protocol with a secondary port range from the command line.

1. Edit the **/etc/environment** file.
2. Add the variable **NIM_SECONDARY_PORT=60000:5**, to use ports 60000 - 60005 within NIMSH.
3. Use the desired **nimclient** command option to restart the NIMSH daemon.

Disabling push operations using NIMSH:

NIM clients can prohibit the NIM master from allocating resources or initiating operations by disabling push operations.

Although master control is disabled, the client can still control the allocation of NIM resources and the initiation of NIM operations. To configure existing standalone clients to use NIMSH communication protocol with NIM master control disabled, see “Disabling master push permissions in the NIM environment” on page 291.

Verifying NIMSH startup:

Run this command to verify that the NIMSH daemon is enabled on the client.

```
# lssrc -s nimsh
```

Performing advanced NIM installation tasks

You can perform many advanced NIM installation tasks using the Web-based System Manager NIM interface, the System Management Interface Tool (SMIT), or the command line.

NIM environment control

In the NIM environment, control is held by the NIM master or the standalone client. The system allocating the resources has control.

The allocation of resources is the act of making resources available to clients for NIM operations. Normally, resources are allocated automatically as part of an operation, but they may also be allocated prior to the initiation of an operation. The control status acts like a locking mechanism and remains with the client or the master until the resources are deallocated. Using NIM, if the installation of a standalone client completes successfully, the resources are automatically deallocated.

When there are no resources allocated to the standalone client by the NIM master, the standalone client takes control by allocating resources or disabling the NIM master’s push permissions. The **control** attribute is managed by the master and indicates whether the master or the standalone client has permission to perform operations on the standalone client.

The **control** attribute indicates four control states. You can display the **control** attribute from a NIM client by entering:

```
nimclient -l -l StandAloneClientName
```

The **control** attribute can be displayed from the NIM master by entering:

```
lsnim -l StandaloneClientName
```

The control states are as follows:

control attribute is not set

If the **control** attribute is not displayed when listing the machine object attributes, then neither the master nor the standalone client has control.

control = master

The master has allocated resources to the client and is ready to initiate an operation (or has already initiated an operation).

control = *StandaloneClientName*

The standalone client has allocated resources and can now initiate NIM operations on itself.

control = *StandaloneClientName* push_off

The standalone client has prohibited the NIM master from allocating resources or initiating operations on the client. The client itself can still control the allocation of NIM resources and the initiation of NIM operations.

Disabling master push permissions in the NIM environment

The NIM master must have push permissions to perform push operations on the NIM clients.

You can disable the NIM master's push permissions using Web-based System Manager, SMIT, or the command line.

Disabling master push permissions using Web-based System Manager:

Follow this procedure for disabling master push permissions using Web-based System Manager.

1. From the main Web-based System Manager container, select the **Software** icon.
2. From the Software menu, select **NIM Client** → **Permissions**.
3. Select whether to grant or deny permission for the NIM master to initiate push installations.

Disabling master push permissions using SMIT:

You can use the **smit nim_perms** fast path to disable the master push permissions.

To disable the master's push permissions, enter the **smit nim_perms** fast path from the client machine.

Disabling master push permissions from the command line:

You can disable and re-enabling the master push permissions from the command line.

To set **control** on the client to **push_off**, enter the following on the client machine:

```
nimclient -P
```

To re-enable push permission on the client, enter the following on the client machine:

```
nimclient -p
```

Resetting the NIM state

To return a machine to the **ready** state, use the NIM **reset** operation.

The operations performed using NIM can be very complex. To help ensure that the operations can be completed successfully, NIM requires that a machine be in the **ready** state before operations can be run on it. While an operation is being performed, the state of the machine will reflect the current operation. After the operation completes, the machine returns to the **ready** state.

If an operation on a machine is interrupted, the machine state may continue to reflect the operation. If this occurs, the machine must be reset to the **ready** state before performing any further operations. To return a machine to the **ready** state, use the NIM **reset** operation.

Resetting the NIM state using Web-based System Manager:

Follow this procedure for resetting the NIM state using Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select a target standalone, diskless, or dataless machine to reset.
3. From the Selected menu, choose **Administration** → **Reset NIM State**.
4. Use the dialog to reset the state of the machine.

You can also do this task from Troubleshooting. From the Selected menu, choose **Troubleshooting** → **Clean Up Failed or Interrupted Installation**.

Resetting the NIM state using SMIT:

Follow this procedure for resetting the NIM state using SMIT.

1. To return a machine to the **ready** state, enter the **smit nim_mac_op** fast path.
2. Select the target machine for the operation.
3. Select **reset** as the Operation to Perform.
4. To deallocate resources, change the Deallocate All Resources? field to **yes**.
5. Change the Force field to **yes**.

Resetting the NIM state from the command line:

Follow this procedure for resetting the NIM state from the command line.

1. To return a machine to the **ready** state, enter:

```
nim -Fo reset MachineName
```

2. To deallocate resources, enter:

```
nim -o deallocate -a ResourceType=ResourceName MachineName
```

where *ResourceType* is the type of the resource being deallocated (for example, **lpp_source**, **SPOT**, **Script**, etc.), *ResourceName* is the name of the resource being deallocated, and *MachineName* is the name of the machine that has been allocated the resources.

Note: Resetting a machine will not automatically deallocate all the resources that were allocated for the operation. To deallocate resources, use the NIM **deallocate** operation.

Using client machines as resource servers

Any machine in the NIM environment can be a resource server. In simple environments, the NIM master is usually used to serve all the NIM resources.

Defining resources on client machines can be beneficial for the following reasons:

- Disk space limitations on the NIM master may prohibit the storage of all the resources on a single machine.
- Resource usage may be heavy, and communications and data access bottlenecks could occur if all the resources were served by a single machine.

For example, if you use NIM to install 200 machines on 5 different subnets, you could have a set of resources created and available on each subnet. Each set of resources would be used to install the machines on the same subnet. In addition to distributing the workload among several resource servers, this would also reduce the network traffic across the gateways between the different subnets.

Using client machines as resource servers using Web-based System Manager:

Follow this procedure for using client machines as resource servers using Web-based System Manager.

1. Select the Resources container.
2. From the Resources menu, select **New Resources**.
3. Follow the wizard instructions to create the resource.

Using client machines as resource servers using SMIT:

Follow this procedure for using client machines as resource servers using SMIT.

1. To create a resource on a NIM client, enter the **smit nim_mkres** fast path.
2. Select the Resource Type.
3. In the displayed dialog fields, supply the correct values for the resource options. Be sure to specify the name of the client machine for the Server of the Resource field. Use the help information or the LIST option to help you. All attributes specified when the resource is defined (such as **location** and **source**) must be local to the server machine.

Using client machines as resource servers from the command line:

Follow this procedure for using client machines as resource servers from the command line.

To create a resource on a NIM client, specify the client's NIM name for the **server** attribute when defining the resource.

Example:

To create an **lpp_source** resource named `images2` from a CD on the NIM client machine, `client_mac1`, in the `/resources/images` directory, enter:

```
nim -o define -t lpp_source -a server=client_mac1 \  
-a location=/resources/images -a source=/dev/cd0 images2
```

Defining machine groups

Machine groups can be defined to collect multiple clients in a common target for NIM operations. Groups can be defined for standalone, diskless, or dataless clients; but a group can only contain clients of a single type.

Web-based System Manager supports the following types of machine groups:

- A temporary machine group is created when multiple machines are selected in the NIM container and an action from the Selected menu is performed. The temporary group is removed when the action is completed.
- If you want a more permanent machine group, you can create it using the **New Machine Group** menu option in the NIM menu.

In the Web-based System Manager NIM application, machine groups are not explicitly created and managed, but ad hoc groupings are supported by multi-selecting the icons representing machines in the NIM container. After they are selected, a group of machines can be administered by selecting an action from the Selected menu.

Note: You can perform most operations only on multi-selected machines of the same type.

Defining a machine group using Web-based System Manager:

Follow this procedure for defining a machine group using Web-based System Manager.

1. Select the Groups container.

2. From the Groups menu, select **New** → **Group**.
3. Select the machine type.
4. Select a machine from the list on the right, and click the < button to add the machine to the new group. Repeat this step until all the desired members of the machine group are in the **Members** list on the left.
5. Click **OK**.

Defining a machine group using SMIT:

Follow this procedure for defining a machine group using SMIT.

1. To define a machine group, enter the **smit nim_mkgrp** fast path.
2. Select the type of group you want to define.
3. Enter the name of the group and member information.

Defining a machine group from the command line:

Follow this procedure for defining a machine group from the command line.

To define a machine group, enter:

```
nim -o define -t mac_group -a add_member=MemberName GroupName
```

For example, to create a machine group named MacGrp1 containing previously defined machines Standalone1, Standalone2, and Standalone3, enter:

```
nim -o define -t mac_group -a add_member=Standalone1 \
-a add_member=Standalone2 -a add_member=Standalone3 \
-a comments="Machines for Department d03" MacGrp1
```

Adding new members to machine groups

New members can be added to machine groups, however, the new member must be of the same machine type as existing members. Members can be added to machine groups using the Web-based System Manager NIM application.

Adding new members to machine groups using Web-based System Manager:

Follow this procedure for adding new members to machine groups using Web-based System Manager.

1. Select the Groups container.
2. In the contents area, select a group.
3. From the Selected menu, choose **Add/Remove Members...**
4. Select a machine from the list on the right, and click on the < button to add the machine to the new group. Continue with this step until all the desired members of the machine group are in the list on the left.
5. Click on **OK**.

Adding new members to machine groups using SMIT:

Follow this procedure for adding new members to machine groups using SMIT.

1. To add members to a machine group, enter the **smit nim_chgrp** fast path.
2. Select the machine group to modify.
3. Specify members to add to the group. Use the LIST option to select members to add.

Adding new members to machine groups from the command line:

Follow this procedure for adding new members to machine groups from the command line.

To add a member to a machine group, enter:

```
nim -o change -a add_member=MachineName GroupName
```

For example, to add the diskless client, `diskless5`, to the machine group, `diskless_grp`, enter the following command:

```
nim -o change -a add_member=diskless5 diskless_grp
```

Alternatively, you could have specified group members in both the **define** and **change** operations by using sequenced member attributes, such as `-a member1=Standalone1 -a member2=Standalone2` and so forth.

Removing members from machine groups

Members can be removed from machine groups. Whenever the last member of a machine group is removed, the group definition is also removed.

Removing members from machine groups using Web-based System Manager:

Follow this procedure for removing members from machine groups using Web-based System Manager.

1. Select the Groups container.
2. From the Selected menu, choose **Add/Remove Members**.
3. Select a machine from the list on the left and click on the > button to add the machine to the list on the right. Continue with this step until all the desired members of the machine group have been removed.
4. Click on **OK**.

Removing members from machine groups using SMIT:

Follow this procedure for removing members from machine groups using SMIT.

1. To remove members from a machine group, enter the **smit nim_chgrp** fast path.
2. Select the machine group to modify.
3. Specify members to remove from the group. Use the LIST option to select members to remove.

Removing members from machine groups from the command line:

Follow this procedure for removing members from machine groups from the command line.

To remove a member from a machine group, enter the following command:

```
nim -o change -a rm_member=MachineName GroupName
```

For example, to remove the machine `Standalone2`, and add the machine `Standalone4` to the group `MacGrp1`, enter:

```
nim -o change -a rm_member=Standalone2 \  
-a add_member=Standalone4 MacGrp1
```

Including and excluding group members from operations on the group

Group members may be included or excluded by using the Web-based System Manager NIM application, SMIT, or from the command line.

Use the **select** operation from the command line to indicate that specific members of a machine group should be included or excluded from operations on that group. This capability is useful if an operation needs to be tried again on specific group members that failed during an initial operation on the group. When a group member is marked as being excluded, it remains so until it is included again.

Including and excluding a group member from operations on the group using Web-based System Manager:

Follow this procedure for including and excluding a group member from operations on the group using Web-based System Manager.

1. Select the Groups container.
2. In the contents area, expand a group container to view the members included in that group.
3. Select a machine from those listed in the container.
4. From the Selected menu, choose **Properties**.

Including and excluding a group member from operations on the group using SMIT:

Follow this procedure for including and excluding a group member from operations on the group using SMIT.

1. To include or exclude a group member from operations on the group, enter the **smit nim_grp_select** fast path.
2. Select the name of the group from which you want to include or exclude members.
3. Select the members to include or exclude.

Including and excluding a group member from operations on the group from the command line:

Follow this procedure for including and excluding a group member from operations on the group from the command line.

To include or exclude a group member, enter the following:

```
nim -o select -a include_all=Value -a exclude_all=Value \  
-a include=MemberName -a exclude=MemberName GroupName
```

As an example, to exclude the machine, Standalone2, from further operations on machine group, MacGrp1 and to include a previously excluded machine, Standalone3, enter:

```
nim -o select -a exclude=Standalone2 -a include=Standalone3 MacGrp1
```

The special attributes **include_all** and **exclude_all**, when assigned a value of **yes**, can be used respectively to include or exclude all members in a group. The **select** operation evaluates command line attributes from left to right. The following example shows how to exclude all members except Standalone2 from subsequent operations on the MacGrp1 machine group:

```
nim -o select -a exclude_all=yes -a include=Standalone2 MacGrp1
```

Using the special **-g** option shows the excluded status of the group's members:

```
lsnim -g MacGrp1
```

Group member information similar to the following is displayed:

```
MacGrp1:  
type = mac_group  
member1=Standalone1;ready for a NIM operation,not running;EXCLUDED  
member2=Standalone2;ready for a NIM operation; currently running;  
member3=Standalone3;ready for a NIM operation,not running;EXCLUDED
```

Associating and defining NIM resource groups

NIM resource groups allow association and definition of resources so they can be allocated as a logical unit to machines prior to other NIM operations.

Resource groups can only contain one of each resource type, except for **script** and **installp_bundle** resources, which may occur multiple times in a given resource group.

Defining a resource group:

You can use the following procedures to define a resource group.

Defining a resource group using SMIT:

Follow this procedure to define a resource group using SMIT.

1. To define a resource group, enter the **smit nim_mkgrp_resource** fast path.
2. Enter the name of the group with member information.

Defining a resource group from the command line:

Follow this procedure for defining a resource group from the command line.

To define a resource group, enter:

```
nim -o define -t res_group -a ResourceType=ResourceName GroupName
```

As an example, to create a resource group named ResGrp1 containing previously defined resources, images1, spot1, bosinst_data1, and bundle1, enter:

```
nim -o define -t res_group -a lpp_source=images1 -a spot=spot1 \  
-a bosinst_data=bosinst_data1 -a installp_bundle=bundle1 \  
-a comments="BOS Install Resources" ResGrp1
```

Allocating a resource group:

Use the following procedures to allocate resource groups.

Allocating a resource group using SMIT:

Follow this procedure to allocate a resource group using SMIT.

1. To allocate a resource group, enter the **smit nim_alloc** fast path.
2. Select the machine or machine group from the list of defined machines (for example, Standalone1).
3. A list of resource groups is displayed. Select the resource group you want to allocate.

Allocating a resource group from the command line:

Follow this procedure to allocate a resource group from the command line.

To allocate a resource group, enter:

```
nim -o allocate -a group=ResGroupName TargetName
```

For example, to allocate a resource group named ResGrp1 to a machine named Standalone1, enter:

```
nim -o allocate -a group=ResGrp1 Standalone1
```

Alternatively, the group resource can be specified on the command line to the operation. For example, to allocate the resource group, ddResGrp, while performing the **dkls_init** operation on a group of diskless machines named DklsMacs, enter:

```
nim -o dkls_init -a group=ddResGrp DklsMacs
```

Defining default resource groups:

After a resource group is defined, you may want to specify the group as the set of defaults for all operations that require resources.

Set the **default_res** attribute on the master to the name of the resource group that you want to be the default.

Note: All applicable resources are allocated from the group specified as the default for all operations, except for **installp_bundle** for a **maint** operation.

A resource from the default group will only be allocated if a resource of the same type is not already allocated and if a resource of that type is not specified on the command line for automatic allocation. The exceptions are the **script** and **installp_bundle** resources, of which all occurrences in the resource group and specified on the command line will be allocated.

Default members can be overridden by specifying a null value in the attribute assignment for that resource.

The following **bos_inst** operation allocates all applicable **bos_inst** resources from the resource group specified as the default, except for the **bosinst_data** resource:

```
nim -o bos_inst -a bosinst_data=Standalone1
```

Defining default resource groups using SMIT:

Follow this procedure for defining default resource groups using SMIT.

1. Enter the **smit nim_grp** fast path.
2. Choose Select/Unselect a Default Resource Group.
3. Fill in the name of the group that is to act as the default.

Defining default resource groups from the command line:

Follow this procedure to define default resource groups from the command line.

Enter:

```
nim -o change -a default_res=ResGroupName master
```

For example, if the ResGrp1 resource group should be the set of default resources for all NIM operations, enter:

```
nim -o change -a default_res=ResGrp1 master
```

Managing software on standalone clients and SPOT resources

The commands for managing software on standalone clients and **SPOT** resources are generally the same. Specify the name of the machine, group, or **SPOT** as the target of the option.

Note: If the **SPOT** is currently allocated to a NIM client, NIM prevents the change to the **SPOT**. Use the **Force (-F)** option to force the operation.

Software updates to a **SPOT** cause the **SPOT**'s network boot images to be rebuilt when necessary. If you think the boot images are bad, you can force them to be rebuilt using the NIM **check** operation.

Software updates to a **SPOT** may also cause software updates to occur in the root parts of diskless and dataless clients of the **SPOT**. This will occur automatically. You can force a synchronization of the client root parts using the NIM **sync_roots** operation on the **SPOT**.

For information on how to install additional software on standalone clients and SPOT resources, see "Customizing NIM clients and SPOT resources" on page 244.

Listing software installed on a standalone client or SPOT:

You can list software installed on a standalone client or SPOT using the Web-based System Manager, SMIT, or the command line.

Listing software installed on a standalone client or SPOT using Web-based System Manager:

Follow this procedure for listing software installed on a standalone client or SPOT using Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select a target machine (master or standalone), or in the Resources container, select a target **SPOT** resource.
3. From the Selected menu, choose **List Installed Software** → **All Installed**.

Listing software installed on a standalone client or SPOT using SMIT:

Follow this procedure for listing software installed on a standalone client or SPOT using SMIT.

1. Enter the **smit nim_list_installed** fast path.
2. Select the menu item that describes the list operation you want to perform.
3. Select a target for the operation.
4. In the displayed dialog fields, supply the required values. Use the help information or the LIST option to help you.

Listing software installed on a standalone client or SPOT from the command line:

Follow this procedure for listing software installed on a standalone client or SPOT from the command line.

Enter the following command:

```
nim -o lslpp [-a lslpp_flags=LslppFlags] TargetName
```

where *LslppFlags* are the flags to be passed to the **lslpp** command, and *TargetName* is the name of the client or **SPOT** object.

For example:

```
nim -o lslpp -a lslpp_flags=La spot1
```

Listing software updates, installed on a standalone client or SPOT, by keyword:

You can list software updates, installed on a standalone client or SPOT, by keyword using the Web-based System Manager, SMIT, or the command line.

Listing software updates, installed on a standalone client or SPOT, by keyword using Web-based System Manager:

Follow this procedure for listing software updates, installed on a standalone client or SPOT, by keyword using Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select a target machine (master or standalone), or in the Resources container, select a target **SPOT** resource.
3. From the Selected menu, choose **List Installed Software** → **Fix (APAR) Status**.
4. Use the dialog to list the installation status of specific installed fixes.

Listing software updates, installed on a standalone client or SPOT, by keyword using SMIT:

Follow this procedure for listing software updates, installed on a standalone client or SPOT, by keyword using SMIT.

1. To list fixes installed on a standalone client or **SPOT** by APAR number or keyword, enter the **smit nim_mac_op** fast path for standalone clients, or enter the **smit nim_res_op** fast path for **SPOTs**.
2. Select the standalone client or **SPOT** resource object.
3. Select the **fix_query** operation.

4. Select the desired **fix_query** flags or accept the default settings. Specify the **fix_bundle** object name; or to check the installation status of an APAR, specify the fix APAR numbers. If you leave both blank, all known fixes are displayed.

Listing software updates, installed on a standalone client or SPOT, by keyword from the command line:

Follow this procedure for listing software updates, installed on a standalone client or SPOT, by keyword from the command line.

Enter the following command:

```
nim -o fix_query [ -afixes="FixKeywords" ] \  
[-afix_bundle=FixBundleName ] [ -afix_query_flags=FixQueryFlags ] \  
TargetName
```

where *FixKeywords* are APAR numbers; *FixBundleName* is the object name of the **fix_bundle** resource; *FixQueryFlags* are optional flags to the **fix_query** operation, and *TargetName* is the client, group, or **SPOT** for which to display fix information.

Valid *FixQueryFlags* are as follows:

- a Displays symptom text.
- c Displays output in colon-separated format.
- F Returns failure unless all filesets associated with a fix are installed.
- q Quiet option; if -q is specified, no heading is displayed.
- v Verbose option; gives information about each fileset associated with a fix (keyword).

For example:

- To query the fix database on standalone1 to determine if all fileset updates for fix IX12345 are installed, enter:

```
nim -o fix_query -afixes=IX12345 standalone1
```

- To list fix information for all known fixes installed on spot1, with symptom text, enter:

```
nim -o fix_query -afix_query_flags=a spot1
```

Maintaining software on standalone clients and SPOT resources:

This kind of task is accomplished by performing the NIM **maint** operation on a **SPOT** using the Web-based System Manager NIM application, SMIT, or command line interface.

NIM uses the **installp** command to construct a **SPOT** by installing in the **SPOT** the software products that each **SPOT** needs to support the NIM environment. Because the **installp** command also supports software maintenance tasks, you can perform these tasks on **SPOT** resources as well. For example, you can remove previously installed optional software from a **SPOT** when they are no longer being used. You interact with the **installp** command by supplying the **installp_flags**, and either **filesets** or **installp_bundle** attributes.

Maintaining software on standalone clients and SPOT resources using Web-based System Manager:

Follow this procedure for software maintenance on standalone clients and SPOT resources using Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select a target standalone machine, or in the Resources container, select a target **SPOT** resource.
3. From the Selected menu, choose **Software Utilities** → **Commit Applied Updates, Reject Applied Updates**, or **Remove Software**, depending upon the task you want to perform.

Maintaining software on standalone clients and SPOT resources using SMIT:

Follow this procedure for software maintenance on standalone clients and SPOT resources using SMIT.

1. Enter the **smit nim_task_maint** fast path.
2. Select the menu item that describes the maintenance that you want to perform.
3. Select the target for the operation.
4. In the displayed dialog fields, supply the required values. Use the help information or the LIST option to help you.

Maintaining software on standalone clients and SPOT resources from the command line:

Follow this procedure for maintaining software on standalone clients and SPOT resources from the command line.

Enter the following command:

```
nim -o maint -a installp_flags=InstallpFlags \
[-a filesets=FileSetNames | \
-a installp_bundle=BundleResourceName ] [-F] TargetName
```

where *InstallpFlags* are the flags you want to pass to the **installp** command; *FileSetNames* are the names of the filesets or packages you want to maintain; *BundleResourceName* is the object name of the **installp_bundle** resource; and *TargetName* is the object name of the standalone client, group, or **SPOT**.

For example:

- To remove the bos.adt and bos.INed software packages from standalone1, enter:

```
nim -o maint -a filesets="bos.adt bos.INed" -a \
installp_flags="-u" standalone1
```

- To remove the bos.INed software package from spot1, which is allocated to diskless or dataless clients, without deallocating spot1 first, enter:

```
nim -o maint -F -a filesets=bos.INed -a installp_flags="-u" \
spot1
```

- To remove the packages from spot1 which are listed in the bundle pointed to by the **installp_bundle** resource object, bundle1, enter:

```
nim -o maint -a installp_flags="-u" -a installp_bundle=bundle1 \
spot1
```

- To clean up from an interrupted software installation on spot1, enter:

```
nim -o maint -a installp_flags="-C" spot1
```

Rebuilding network boot images for a SPOT

You can rebuild network boot images for a SPOT using the Web-based System Manager, SMIT, or the command line.

Rebuilding network boot images for a SPOT using the Web-based System Manager:

Follow this procedure for rebuilding network boot images for a SPOT using the Web-based System Manager.

1. Select the Resources container.
2. In the contents area, select a target **SPOT**.
3. From the Selected menu, choose **Check SPOT**.
4. Use the dialog to select the Build debug network boot images and/or the force option, if needed.

You can also perform this task from Troubleshooting. From the Selected menu, choose **Troubleshooting** → **Build Non-Debug Network Boot Images**.

Rebuilding network boot images for a SPOT using SMIT:

Follow this procedure for rebuilding network boot images for a SPOT using SMIT.

1. To rebuild network boot images for a **SPOT**, enter the **smit nim_res_op** fast path.
2. Select the **SPOT**.
3. Select the **check** operation.
4. In the displayed dialog fields, set the Force option to **yes**.

Rebuilding network boot images for a SPOT from the command line:

Follow this procedure to force the rebuild of the boot images for a SPOT from the command line.

Enter:

```
nim -Fo check SPOTName
```

For information on how to install additional software on standalone clients and SPOT resources, see “Customizing NIM clients and SPOT resources” on page 244.

Maintaining software in an lpp_source

To add or remove software in an **lpp_source**, add or remove the installation image from the **lpp_source** directory, and then initiate the NIM **check** operation on the **lpp_source**.

Copying software to an lpp_source:

You can copy software to an **lpp_source** using the Web-based System Manager, SMIT, or the command line.

Copying software to an lpp_source using Web-based System Manager:

Follow this procedure for copying software to an **lpp_source** using Web-based System Manager.

1. Select the Resources container.
2. In the contents area, select an **lpp_source**.
3. From the Selected menu, choose **Properties**. The General page of the properties notebook displays.
4. From the General page, identify the location of the resource. Close the notebook.
5. From the Resources menu, select **Copy Software to Directory**, and specify as the destination directory, the location of the resource identified in the notebook.
6. After the copy is completed, select the **lpp_source** and from the Selected menu, choose **Check NIM State**. This action updates the table of contents (**.toc**) file for the **lpp_source**.

Copying software to an lpp_source using SMIT:

Follow this procedure for copying software to an **lpp_source** using SMIT.

1. To copy software from installation media to an **lpp_source**, insert the installation media in the appropriate drive of the **lpp_source** server.
2. To copy the software to the **lpp_source** directory, enter **smit bffcreate** from the resource server.
3. Enter the INPUT device / directory for software.
4. In the displayed dialog fields, supply the correct values or accept the default values. Be sure to specify the **lpp_source** location for the directory to store the installation images. Use the help information and the LIST option to help you.

Copying software to an lpp_source from the command line:

Follow this procedure for copying software to an **lpp_source** from the command line.

1. Copy the software from the media to the **lpp_source** directory.
2. Perform the NIM check operation on the **lpp_source** by entering the following command:

```
nim -o check Lpp_sourceName
```

Removing software from an lpp_source:

To remove software from an **lpp_source**, delete the installation image from the **lpp_source** directory.

Note: This function is only available from the command line interface.

Removing software from an lpp_source from the command line:

Follow this procedure for removing software from an **lpp_source** from the command line.

1. Remove the installation image from the **lpp_source** directory.
2. Perform the NIM check operation on the **lpp_source** by entering the following command:

```
nim -o check Lpp_sourceName
```

Running the NIM check operation:

After adding or removing software, you must run the NIM **check** operation on the **lpp_source** to update the installation table-of-contents file for the resource. You can run the NIM check operation from the Web-based System Manager, SMIT, or the command line.

In addition to updating the table-of-contents for the **lpp_source**, the **check** operation also updates the **simages** attribute for the **lpp_source**, which indicates whether the **lpp_source** contains the images necessary to install the Base Operating System images on a machine.

Running the NIM check operation using the Web-based System Manager:

Follow this procedure for running the NIM check operation using the Web-based System Manager.

1. Select the Resources container.
2. In the contents area, select a target **lpp_source** resource.
3. From the Selected menu, choose **Check NIM State**.

Running the NIM check operation using SMIT:

Follow this procedure for running the NIM check operation using SMIT.

1. Enter the **smit nim_res_op** fast path.
2. Select the **lpp_source** for the operation.
3. Select **check** for the operation to be performed.

Running the NIM check operation from the command line:

Follow this procedure for running the NIM check operation from the command line.

To initiate the NIM **check** operation on the **lpp_source**, enter:

```
nim -o check Lpp_sourceName
```

If the **lpp_source** is currently allocated to a client, use the **Force** option as follows:

```
nim -F -o check Lpp_sourceName
```

Viewing installation, configuration, and boot logs

After installing a standalone machine, use the **showlog** operation to check the installation results by viewing the installation, boot, and configuration logs. You can view these logs from the Web-based System Manager, SMIT, or the command line.

One of several log types can be viewed by specifying one of the following as the value of the **log_type** attribute to the **showlog** operation:

devinst	Output from the installation of key system and device-driver software
niminst	Output from the installation of user-specified software (including installation of NIM client software during a bos_inst operation)
bosinst	Output from the BOS installation program
boot	The machine's boot log
lppchk	A log of the output from the lppchk operation executed on a standalone NIM client
script	Output from any configuration script resources allocated for a bos_inst operation
nimerr	Errors encountered during execution of the nim command.

By default, the **showlog** operation applied to a standalone machine displays the **niminst** log and shows the output logged when software was last installed on the machine using NIM. The last entry is also shown by default for the **script** and **lppchk** logs. The entire contents of the **niminst**, **script**, and **lppchk** logs can be displayed by assigning the **full_log** attribute a value of yes when executing the **showlog** operation. The entire log is shown for all other log types.

Viewing installation, configuration, and boot logs using the Web-based System Manager:

Follow this procedure for viewing installation, configuration, and boot logs using the Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select a target machine (master, standalone, diskless, or dataless), or in the Resources container, select a target **SPOT**.
3. From the Selected menu, choose **Troubleshooting** → **Show NIM Logs**.
4. Use the dialog to select the log you want to examine.

Viewing installation, configuration, and boot logs using SMIT:

Follow this procedure for viewing installation, configuration, and boot logs using SMIT.

1. Enter the **smit nim_mac_op** fast path to view a machine's log, or enter **smit nim_res_op** to view a **SPOT**'s log.
2. Select the object name of the machine or **SPOT** whose log you want to view.
3. Select **showlog** from the list of operations.
4. Select the log type to be viewed.
5. Specify if the full log should be viewed (only applicable to **script**, **lppchk**, and **niminst** logs).

Viewing installation, configuration, and boot logs from the command line:

Follow this procedure for viewing installation, configuration, and boot logs from the command line.

To view a log on a standalone machine or **SPOT**, enter:

```
nim -o showlog -a LogType=value ObjectName
```

where *LogType* represents the log you want to view, and *ObjectName* is the name of the machine or **SPOT** whose log will be viewed.

Verifying installation with the lppchk operation

When investigating functional problems in software, you can use the **lppchk** operation to check the integrity of installed software. You can perform this operation from the Web-based System Manager, SMIT, or the command line.

Verifying installation with the lppchk operation using the Web-based System Manager:

Follow this procedure for verifying installation with the lppchk operation using the Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select a target standalone machine, or in the Resources container, select a target **SPOT**.
3. From the Selected menu, choose **Troubleshooting** → **Verify Installed Software**.
4. Use the dialog to select whether to verify all or some installed software on the selected machine or **SPOT**.

Verifying installation with the lppchk operation using SMIT:

Follow this procedure for verifying installation with the lppchk operation using SMIT.

1. Enter the **smit nim_mac_op** fast path to check software on a machine, or enter **smit nim_res_op** to check software on a **SPOT**.
2. Select the target of the **lppchk** operation.
3. Select the desired verification mode.

Verifying installation with the lppchk operation from the command line:

Follow this procedure for verifying installation with the lppchk operation from the command line.

Enter the following command:

```
nim -o lppchk -a filesets=FilesetName \  
-a lppchk_flags="lppchkFlags" ObjectName
```

where *FilesetName* is the name of a single fileset (or a name with the * wildcard character), and *ObjectName* is the name of the machine or **SPOT** which is the target of the **lppchk** operation. Valid **lppchk_flags** are defined as follows:

- f Fast check (file existence, file length)
 - c Checksum verification
 - v Fileset version consistency check (default)
 - l File link verification
- Note:** Only one of the flags **-f**, **-c**, **-v**, or **-l** may be specified.
- u Update inventory (only valid with **-c** or **-l**)
 - mn Controls detail of messages. *n* equals 1 to 3, where 3 is the most verbose.

For example, to perform the **lppchk** operation while verifying checksums for all filesets on the machine named Standalone1, enter the following:

```
nim -o lppchk -a lppchk_flags="-c" Standalone1
```

Using NIM to install clients configured with Kerberos authentication

You can install clients configured with Kerberos authentication using NIM.

Normally, NIM relies on Standard AIX authentication to allow the NIM master to remotely execute commands. Standard AIX authentication uses the **.rhosts** file to provide this capability. While NIM functionality depends on its ability to remotely execute commands, some system environments require

stricter authentication controls. Kerberos authentication provides a higher level of authentication for executing remote commands on the system without disabling NIM's capabilities.

Using NIM to install clients configured with Kerberos 4 authentication:

In AIX 4.3.2 and later, NIM can be used to install machines in an RS/6000 SP™ environment configured for Kerberos 4 authentication.

Clients configured for Kerberos 4 authentication will contain a **\$HOME/.klogin** file for the root user. This file will determine what ticket is required to allow remote command execution. The user must obtain the required ticket before attempting to execute remote commands through NIM.

The NIM master and all secure clients must have the IBM Parallel System Support Program for AIX 3.1 (or later) installed and configured.

If secure clients will be reinstalled with BOS (Base Operating System), the authentication methods on the NIM master should be set for both Kerberos 4 and Standard UNIX. Because NIM will not have configured Kerberos 4 on the client after the BOS is installed. NIM will therefore have to rely on a **.rhosts** file to guarantee that it can remotely execute commands on the client until the client can be configured with Kerberos 4 and made into a secure client.

If only software customization and maintenance will be performed, the NIM master must have its authentication methods set to match those of the clients. To manage secure clients, the master will need authentication methods set to include Standard UNIX.

For more information on installing and configuring Kerberos 4, see the *SP Administration Guide* (GC23–3897).

Using NIM to install clients configured with Kerberos 5 authentication:

In AIX 4.3.3 and later, NIM can be used to install machines in an environment configured for Kerberos 5 authentication.

Clients configured for Kerberos 5 authentication will contain a **\$HOME/.k5login** file for the root user. This file will contain an entry that specifies what host token is required to allow remote command execution. This entry uses the following form:

```
hosts/hostname/self@cell
```

The NIM master and all secure clients must have DCE installed and configured at a level greater than or equal to 2.2.1.

If secure clients will be reinstalled with BOS, the authentication methods on the NIM master should be set for both Kerberos 5 and Standard UNIX. Because the client will not have DCE or Kerberos 5 configured and running after the BOS is installed. NIM will therefore have to rely on standard **rhosts** to remotely execute commands on the client until it can be configured with Kerberos 5 and made into a secure client.

If only software customization and maintenance will be performed, the NIM master must have its authentication methods set to match those of the clients. To manage secure clients, the master will need authentication methods set to include Standard UNIX.

Using NIM to install clients configured with SSL authentication

NIM can be used to install machines in an RS/6000 environment configured for SSL authentication.

Clients configured for SSL authentication must use the NIM Service Handler (NIMSH) for handling NIM master push operations. For more information about NIMSH, see “Using the NIM service handler for client communication” on page 286.

You can install and configure the OpenSSL cryptographic software using the NIM command options. Scripts are provided for configuring OpenSSL in the NIM environment, and you can use these without any modifications. The scripts are installed as part of the **bos.sysmgt.nim.client** fileset and located in the **/usr/samples/nim/ssl** directory. The scripts are used to define SSL keys and certificates for NIM SSL usage.

Because NIM masters can support a large system environment, it is necessary to impose a hierarchy on SSL certificate and key storage structure. During NIM setup, the following directory structure is created:

/ssl_nimsh

SSL parent directory for NIM

/ssl_nimsh/configs

Contains scripts used to configure SSL in NIM

/ssl_nimsh/certs

Contains SSL certificates used during host authentication

/ssl_nimsh/keys

Contains SSL keys used during SSL protocol communication

The NIM SSL directory structure is considered static and you should not modify it. To change SSL certificate options, you can modify the following configuration scripts:

SSL_root.cnf

Generates Certificate Authority key for signing certificates

SSL_server.cnf

Generates the NIM master's certificate for distributing to clients

SSL_client.cnf

Generates the NIM master's local certificate for authenticating

Note: You should configure NIM SSL using default settings prior to modifying the configuration scripts. To verify changes, a certificate viewer script called **certview** is located in the **/usr/samples/nim/ssl** directory. For more information about **certview**, see "Using the certificate viewing file" on page 320.

For more information on installing and configuring OpenSSL in NIM, see the **nimconfig** command and **nimclient** command.

Using NIM to install clients configured with SSL authentication using SMIT:

Follow this procedure for using NIM to install clients configured with SSL authentication using SMIT.

To configure the NIM environment for SSL authentication, complete the following steps:

1. Type the fast path `smitty nim_ssl` on the NIM master.
2. Select **enabled** as the option for **Enabling Cryptographic Authentication**.
3. If OpenSSL is not installed on the client, select **yes** as the option for **Installing Secure Socket Layer Software**.
4. If OpenSSL is selected for install, specify the absolute path for the RPM package or select the **lpp_source** resource which contains the OpenSSL RPM package.

Using NIM to install clients configured with SSL authentication from the command line:

Follow this procedure to configure the NIM environment for SSL authentication from the command line.

1. If OpenSSL is installed on the NIM master, type:
`# nimconfig -c`
2. If OpenSSL is not installed on the NIM master, complete the following steps:

- Locate the AIX Toolbox for Linux Applications media.
- Install the OpenSSL RPM package using **geninstall**. For additional information on using **geninstall**, see Add Open Source Applications to Your AIX System.
- After OpenSSL is installed on the NIM master, type:

```
# nimconfig -c
```

Using concurrency control

Users can ease the severity of NIM installations becoming overburdened when they are being performed on a large number of clients at the same time by controlling the number of clients that are installed.

NIM installations can become overburdened when they are being performed on a large number of clients at the same time. This can be caused by network bandwidth or workload on the NIM servers.

The **concurrent** and **time_limit** attributes can be used in conjunction with the **bos_inst**, **cust**, and **alt_disk_install** operations to control the number of client machines being operated on simultaneously from a client group. The **concurrent** attribute controls the number of clients in a group that are processing a particular operation at one time. After a client finishes the operation, another client will initiate the operation one at a time. The **time_limit** attribute prohibits NIM from initiating an operation on any more clients of the group, after the specified time (in hours) has elapsed.

Using concurrency control from the Web-based System Manager:

Follow this procedure for using concurrency control from the Web-based System Manager.

1. Select the Machines container.
2. In the contents area, select multiple targets.
3. From the Selected menu, choose any of the following options:
 - **Install Operating System**
 - **Install/Update Software**
 - **Alternate Disk Install**
4. From any of those dialogs, select the **NIM settings** or **Advanced** button.
5. In those dialogs, a section containing the concurrency controls can be specified.

Note: Web-based System Manager does not provide support for continuing after a failure or if the group of machines were individually selected and the time limit expired. The user must reselect the clients that failed or were not attempted and then reissue the command.

Using concurrency control from SMIT:

You can access concurrency control attributes from all SMIT panels under the Install and Update Software menu and the Alternate Disk Installation menu.

Using concurrency control from the command line:

The **concurrent** and **time_limit** attributes can be used in conjunction with the **bos_inst**, **cust** and **alt_disk_install** operations.

For example, to have the **bos.games** fileset installed on only five machines from the client group **tmp_grp** at one time, enter the following command:

```
nim -o cust -a lpp_source=lpp_source1 -a filesets=bos.games \
-a concurrent=5 tmp_grp
```

In this example, to BOS install only 10 clients from **tmp_grp**, using **lpp_source**, **lpp_source1**, and **SPOT**, **spot1**, with no other installs permitted after three hours have elapsed, enter the following command:

```
nim -o bos_inst -a lpp_source=lpp_source1 -a spot=spot1 \  
-a concurrent=10 -a time_limit=3 tmp_grp
```

Note: The concurrency controlled operation can complete and leave the group in one of the following states:

- All machines install successfully.
- Some machines may fail the installation.
- If the **time_limit** attribute was used, time may have expired before the installation operation was complete.

In the first situation, the group will revert to the state prior to the operation. In the second and third situations, the group will be left in a state that indicates some machines have completed and some have not. Problems with failing machines should be investigated. At this point, the user can continue with the machines that did not complete by rerunning the command on the group. Alternatively, the user can "reset" the group, which will set the group back to its state prior to the concurrency controlled operation.

Performing other NIM operations

Network Installation Management (NIM) operations that are not part of the usual installation procedures is described.

Managing the NIM master

Tasks for managing the NIM master are described.

For additional information on NFS V4, see Network File System in *Networks and communication management*.

Deactivating the NIM master and removing the NIM master fileset:

After the NIM master fileset has been installed, the master activated, and the master object defined in the NIM database, this object, and hence the master fileset itself, cannot be removed. The master must be deactivated before the NIM master fileset can be removed.

To deactivate the master using Web-based System Manager, see "Unconfiguring the NIM master" on page 275.

To use the command line to deactivate the master and remove the NIM master fileset, enter:

```
nim -o unconfig master  
installp -u bos.sysmgt.nim.master
```

Increasing the number of hosts to which NIM can NFS-export a resource:

Follow these instructions to increase the number of hosts to which NIM can NFS-export a resource.

By default, when NIM exports a file or directory through NFS during resource allocation, it creates an entry in the **/etc/exports** file granting the target host both client mount access and root access for root users. As a result, when exporting to numerous clients, the limit on the length of a line in the exports file (32767 characters) may be exceeded, resulting in failure.

NIM provides an option to decrease the line length of an allocation entry in an NFS exports file by approximately one-half, effectively permitting files to be allocated to a greater number of hosts. This action has the side effect of increasing the number of machines permitted in a NIM machine group. NIM achieves this by only granting root access to allocation target hosts. The client mount access list is not created, which allows any machine to mount the resource, but still restricts root access to NIM clients only. NFS permits no more than 256 host names in a root exports file entry.

To enable this mode of operation, set the **restrict_nfs_exports** attribute to **no** on the master's NIM object. Use the **change** operation as follows:

```
nim -o change -a restrict_nfs_exports=no master
```

To restore client mount access restrictions, set **restrict_nfs_exports** to **yes** with the **change** operation.

For information about how to export NIM resources globally, see “Exporting NIM resources globally” on page 315.

Controlling the asynchronous behavior of NIM operations:

Certain NIM operations are asynchronous, meaning that NIM master might initiate the operation on the client, but does not wait for the operation to finish. The reason for this asynchronous behavior is because the NIM operation running on the client is typically time-consuming.

An example of an asynchronous operation is the **bos_inst** operation. Examples of synchronous operations are the **cust**, **maint**, and **lppchk** operations on a single machine target. However, these operations, when applied to members of a machine group, are asynchronous. The **nim** command initiates these operations on each member of the group without waiting for the operation to finish.

If desired, the asynchronous behavior of the **cust**, **maint**, and **lppchk** operations can be controlled by setting the **async** attribute on the command line. For example, to ensure that the execution of a customization script identified by the NIM resource `script1` is executed completely on a given member of the group `MacGrp1` before initiating execution of the script on the next member of the group, enter the following:

```
nim -o cust -a script=script1 -a async=no MacGrp1
```

To force the master to not wait for the customization operation to finish when running the script on machine `Standalone1` that is not part of a machine group, enter:

```
nim -o cust -a script=script1 -a async=yes Standalone1
```

Suppressing output from NIM operations:

Follow these instructions to suppress output from NIM operations.

By default, progress messages are displayed by the **nim** command operating on machine groups to inform the user of how much processing remains. Similarly, the output from the installation and customization programs invoked by the **cust** and **maint** operations on **SPOTs** and machines is also displayed. This output can be suppressed by setting the **show_progress** attribute to **no** on the command line. For example, to indicate to NIM not to display output from the **installp** command when updating the machine `Standalone1` with software from the **lpp_source** named `images1`, enter the following command:

```
nim -o cust -a show_progress=no -a lpp_source=images1 \  
-a fixes=update_all Standalone1
```

Reducing space requirements for NIM resources:

It is not unusual for resources such as the **SPOT** and **lpp_source** to take several hundred megabytes of storage space on a NIM server. You can reduce space consumption significantly on resource servers by creating **/usr SPOTs** and defining CD-ROM file-system directories as **lpp_sources**.

A **/usr SPOT** can be created from the **/usr** file system of the NIM master or any NIM client. The AIX system files for the BOS are already installed, so only software for additional device support will be added to the system. The resulting system ultimately has more software installed on it than it needs to run, but far less disk space is used than otherwise would have been, had a **non-usr SPOT** been created on the same system. For more information on creating **/usr SPOT** resources, see “Using the SPOT (Shared Product Object Tree) resource” on page 201 and “Defining /usr versus non-/usr SPOTs” on page 269.

A directory on the AIX product CD can be mounted and defined as an **lpp_source**, eliminating the need to copy installation images to the hard disk of a resource server. The defined **lpp_source** contains all the images available on the CD, but the CD must remain mounted at the server for the **lpp_source** to be usable in NIM operations. For more information about using a CD-ROM file system as an **lpp_source**, see “Defining an **lpp_source** on CD/DVD-ROM versus hard disk” on page 271.

Obtaining support for multiple mksysb operations in NIM:

During the allocation of NIM **mksysb** images, only the file is exported to the NFS clients. However, during **mksysb** creation, the parent directory is also exported. If you use that filesystem to create a **mksysb** image of a system while another system is restoring a **mksysb** image from that filesystem, you will get NFS errors.

To avoid this problem, use the environment variable `NIM_MKSYSB_SUBDIRS` on the NIM master. When this variable is set to yes, subdirectories are used to separate **mksysb** images. The subdirectories are transparent to the user, but they provide separate child locations for NFS exporting.

Saving system backup information:

When you are defining a **mksysb** NIM resource using the `nim -o define -t mksysb` command, the `-a mksysb_flags=xxx` attribute can be given the `-p` option, which prevents the **mksysb** image from being compressed.

Note: Due to the amount of space that this system backup is likely to occupy, the location into which the **mksysb** file is saved, specified by the `-a location=xxx` attribute, must be large-file enabled. Otherwise, errors can occur.

Resolving host names with NIM

NIM relies on standard AIX library routines to perform name resolution. If a network environment uses multiple sources for name resolution, NIM will resolve host names by querying the sources in whatever order is specified for the system.

For example, if a system is configured to resolve host names by first querying NIS, then BIND/DNS, then a local `/etc/hosts` file, NIM will also follow that order when resolving client host names.

Problems may result if the NIM master and the NIM clients use different orders when querying sources for name resolution. Problems may also arise if a name service is available to one machine but not to another, causing different name resolution sources to be used.

Note: Mixing BIND/DNS, which is not case-sensitive, with NIS, which is case-sensitive, may result in problems.

It is possible to override the default system-wide order that AIX and NIM use when querying sources for host name resolution. This can be done by setting the **NSORDER** environment variable in the environment where NIM commands are being run. For example, to configure the environment to query NIS first, then BIND/DNS, then a local `/etc/hosts` file, type the following on the command line where NIM operations are being run:

```
export NSORDER=nis,bind,local
```

For more information on TCP/IP name resolution, refer to *Networks and communication management*.

Booting over a router on an FDDI interface

Boot over a router on an FDDI interface only if the router supports all-route broadcast.

Booting over a router that does not support all-route broadcast on an FDDI interface may fail due to known limitations of these router types.

Setting default paging space during BOS installation through NIM

In AIX 4.3 or later, default paging space is set by the BOS installation process when installing through NIM.

Default paging space is set by the BOS installation process, if the following conditions are met:

- The method of installation is **overwrite**.
- Neither an **image_data** resource nor an **image.data** file on the diskette is specified for the installation.
- The source of the BOS image is not a **mksysb** image.
- The source of the BOS image is a **SPOT**, and the default **image.data** file contains more than one entry for paging. This file is located at:
(spot_location)/lpp/bosinst/image_template
- The source of the BOS image is a **SPOT**, and the LPs value for the single paging entry is set to the default value of **16**.

The default paging size is calculated from the smaller value of **optimal_ps** and **recommended_ps** where:

- **RAM** = amount of memory on the target system measured in megabytes (MB).
- **optimal_ps** = maximum between **RAM** and (0.2 size of rootvg)
- IF CDE (Common Desktop Environment) is installed, **recommended_ps** =
 - amount of **RAM** is less than 32 MB, then **recommended_ps** = 3 * **RAM**
 - amount of **RAM** is 32 MB or more, then **recommended_ps** = **RAM** + 64 MB
- IF CDE (Common Desktop Environment) is not installed, **recommended_ps** =
 - amount of **RAM** is less than 32 MB, then **recommended_ps** = 2 * **RAM**
 - amount of **RAM** is 32 MB or more, then **recommended_ps** = **RAM** + 32 MB

The default paging space set by this process is never greater than 512 MB.

Migrating diskless and dataless clients and NIM SPOTS

Migration to a new release of AIX is not supported for diskless and dataless clients. Also, migration of a **SPOT** that is not a converted **/usr** file system is not supported.

After migrating a machine that is a **SPOT** server to a new release of AIX, you must remove and redefine the **SPOT** in order to also bring it to the new AIX level.

To remove and redefine the **SPOT**, enter:

```
nim -o remove SPOT_name
nim -o define -t spot -a location=SPOTDirectory \
-a server=SPOTServer -a source=SPOTSource SPOTName
```

A **/usr SPOT** served by a client in the NIM environment can be reinstalled with a new level of AIX using the migration procedure, but the **SPOT** object must be removed and then redefined after the migration completes. Any diskless or dataless clients served by that **SPOT** must be reinitialized. To reinitialize diskless and dataless clients after migrating a **/usr SPOT** server, deallocate, then reallocate the root resources, and then perform the **dtls_init** or **dkls_init** operation accordingly.

To reinitialize diskless and dataless clients, enter:

```
nim -o reset -F ClientName
nim -o deallocate -a root=RootResourceName ClientName
nim -o allocate -a root=RootResourceName ClientName
nim -o dkls_init ClientName
```

Attention: Any customization that was done previously will be erased, because deallocating the root resource will delete all the files in the root directory.

Using the `nimdef` command

The `nimdef` command assists administrators when defining complex NIM environments and adding large numbers of client machines.

The `nimdef` command also solves a common usability problem when defining large NIM environments.

Regardless of how well a NIM environment is understood, it can be a very time-consuming process to execute all the commands necessary to define it. If NIM could process a simple definition file for configuration of the NIM environment, a great deal of time could be saved that would otherwise be spent defining each network and machine manually.

The `nimdef` command reads a definition file for input. The definition file is in a structured stanza format. Each stanza describes a machine that will be added to the NIM environment. Included in the stanza is information about the machine's network adapter and routing configuration. Based on the supplied information, the `nimdef` command can determine the remaining information needed to define both networks and machines in the NIM environment.

For more information, see the `nimdef` command. For a sample definition file for the `nimdef` command, see "Using miscellaneous network installation files" on page 319.

Naming NIM object definitions

The name that you give a NIM object will be used in all future operations involving that object. This name must be unique among NIM objects, and it must adhere to certain restrictions.

- It must have between 1 and 39 characters.
- Valid NIM name characters include the uppercase and lowercase letters of the alphabet, the numbers 0-9, hyphen (-), exclamation mark (!), and the underscore character (_).
- Invalid NIM name characters include the dot character, all shell metacharacters, all file system metacharacters, and all regular expression metacharacters.

Using NIM with Dynamic Host Configuration Protocol (DHCP)

Select your NIM master to be the same system as the Dynamic Host Configuration Protocol (DHCP) server when using NIM in an environment that uses DHCP.

Use host names whenever possible when defining NIM machine objects.

Creating file resources in the root directory

Due to a limitation in NFS, file resources, such as `bosinst_data` and `script` resources cannot be created in the root directory ("/") of a resource server.

Creating resources in the `/tmp` directory or `/tmp` subdirectories

NIM resources should not be created in the `/tmp` directory or `/tmp` subdirectories (including filesystems mounted under `/tmp`).

Restricting NIM client resource allocation

NIM provides client machines with the capability of allocating and using any resource in the NIM environment. In some tightly controlled NIM environments, administrators may not want clients to be able to access all resources at all times.

To control client-resource allocation, a NIM administrator can use the `client_alloc` attribute. The restrictions placed by the `client_alloc` attribute will prevent clients from allocating and using resources, but the NIM master will continue to have the full capability of performing operations on clients.

Note: This task is not supported by the Web-based System Manager.

Restricting NIM client resource allocation using SMIT:

Use this procedure to change NIM client-allocation restrictions from the SMIT interface.

Type the SMIT fast path:

```
smit nim_control_alloc
```

Restricting NIM client resource allocation from the command line:

Use these procedures to restrict NIM client resource allocation from the command line.

To restrict all clients from being able to use any resources, set the attribute **client_alloc=no** on the NIM master:

```
nim -o change -a client_alloc=no master
```

To restrict a particular client from being able to use any resources, set the attribute **client_alloc=no** on the client:

```
nim -o change -a client_alloc=no clientname
```

To restrict all clients from being able to use a particular resource, set the attribute **client_alloc=no** on the resource:

```
nim -o change -a client_alloc=no resourcename
```

To lift the restrictions on client-resource allocation, remove the **client_alloc** attribute by setting it to yes for the applicable object:

```
nim -o change -a client_alloc=yes master
nim -o change -a client_alloc=yes clientname
nim -o change -a client_alloc=yes resourcename
```

Preventing machines from adding themselves as clients

Machines may add themselves as clients in NIM environments by using the **niminit** command and specifying the hostname of a NIM master. In some environments, administrators may want total control over which machines are added as clients of their masters.

To prevent clients from adding themselves to a NIM environment, an administrator can use the **client_reg** attribute.

Note: This task is not supported by the Web-based System Manager.

Preventing machines from adding themselves as clients using SMIT:

Use this information to change the option to allow machines to add themselves to a NIM environment as clients.

Type the SMIT fast path:

```
smit nim_client_reg
```

Preventing machines from adding themselves as clients from the command line:

Use this information to set from the command line whether machines can add themselves as clients in a NIM environment.

To prevent machines from adding themselves as clients in a NIM environment, set the attribute **client_reg=no** on the NIM master:

```
nim -o change -a client_reg=no master
```

To allow machines to add themselves as clients of a NIM master, remove the **client_reg** attribute by setting it to yes on the master:

```
nim -o change -a client_reg=yes master
```

Managing client CPU ID validation

The CPU ID of a NIM client is stored in the NIM database so that the master can perform verification that NIM client commands are coming from the machines that were originally registered as clients.

A NIM administrator would not want this CPU ID validation to be performed in the following situations:

- When the hardware of a client machine is changed, giving the client a new CPU ID.
- When a single client definition is used to install different machines, as on a preinstall assembly line.

Managing client CPU ID validation using the Web-based System Manager:

Use this information to enable or disable the NIM client CPU ID validation from the NIM application.

To enable or disable NIM client CPU ID validation from the NIM application:

1. From the NIM menu, select **Advanced Configuration** → **Control Client CPU ID Validation**.
2. Use the dialog to complete the task.

Managing client CPU ID validation using SMIT:

Use this information to enable or disable client CPU ID validation from the SMIT interface.

Type the SMIT fast path:

```
smit nim_cpuid_validate
```

Managing client CPU ID validation from the command line:

Client CPU ID validation can be managed on the NIM master by using the **validate_cpuid** attribute.

To disable client CPU ID validation, set the attribute **validate_cpuid=no** on the NIM master:

```
nim -o change -a validate_cpuid=no master
```

To perform client CPU ID validation, remove the **validate_cpuid** attribute from the master by setting it to "yes":

```
nim -o change -a validate_cpuid=yes master
```

Attention: The value of the **validate_cpuid** attribute should not be changed while operations are being performed on NIM clients because it could potentially disrupt client communications for active machines.

Exporting NIM resources globally

NIM resources can be exported globally using the Web-based System Manager, SMIT, or the command line interface.

When resources are allocated for use during NIM operations, they are NFS-exported to the client machines where the operations will be performed. If operations are performed simultaneously on many different clients, the **/etc/exports** and **/etc/xtab** files may become very large on the resource servers. This may cause size limits to be exceeded in the files, and it may also negatively affect NIM performance as the files are locked and modified for each resource allocation or deallocation.

In environments where administrators are not concerned about who has access to the NIM resources, they may set an option to globally export the resources and thereby eliminate the repeated updates to the **/etc/exports** and **/etc/xtab** files. The only resources that may not be globally exported are those that are used exclusively by diskless and dataless clients. The global export of a NIM resource will make it

readable by any machine in the network, not just those in the NIM environment. The resource will be globally exported as long as it is allocated to any client. When the resource is deallocated from all clients, it is unexported.

Exporting NIM resources globally using the Web-based System Manager:

Use this information to export NIM resources globally using the Web-based System Manager.

To enable or disable global export of NIM resources from the NIM application:

1. From the NIM menu, select **Advanced Configuration** → **Export NIM Resources Globally**.
2. Use the dialog to complete the task.

Exporting NIM resources globally using SMIT:

Use this information to export NIM resources globally using SMIT.

To manage global exporting of NIM resources from the SMIT interface, type the SMIT fast path:

```
smit nim_global_export
```

Exporting NIM resources globally from the command line:

Global exporting of NIM resources for use by clients can be managed with the **global_export** attribute.

To enable global exporting of NIM resources, set the attribute **global_export=yes** on the NIM master:

```
nim -o change -a global_export=yes master
```

To disable global exporting of NIM resources, remove the **global_export** attribute from the master by setting it to no:

```
nim -o change -a global_export=no master
```

Do not change the enablement and disablement of global exports when there are resources allocated to clients because this could lead to situations where resources are exported with incorrect permissions. All NIM operations should be completed and resources deallocated before any attempts are made to change the **global_export** value. If resources are currently allocated to clients, the **nim** command will fail to change the **global_export** value.

Creating network boot images to support only the defined clients and networks

You can create network boot images in the **/ftppboot** directory using the Web-based System Manager, SMIT, or the command line interface.

When a SPOT resource is created, network boot images are created in the **/ftppboot** directory to support certain NIM operations.

NIM only creates network boot images to support clients and networks that are defined. If a new client is defined and there is no network boot image already created for it in the environment, then the boot image will not be created until either the SPOT is allocated to the client or a check operation is performed on the SPOT to rebuild the boot images.

When clients are removed from the NIM environment, boot images are not automatically removed. To remove boot images that are no longer necessary for a NIM environment, the list of required machine-network combinations in the environment must be rebuilt. The boot images must then be rebuilt for each SPOT.

Creating network boot images to support defined clients and networks using Web-based System Manager:

Follow this procedure to limit or enable boot image creation according to whether the interface is defined.

1. From the NIM menu, select **Advanced Configuration** → **Control Network Boot Image Creation**.
2. Use the dialog to complete the task.

Creating network boot images to support defined clients and networks using SMIT:

Use this method to manage the creation of boot images from the SMIT interface.

Type the SMIT fast path:

```
smit nim_control_boot
```

Creating network boot images to support defined clients and networks from the command line:

Use this information to manage network boot images to support only the defined clients and networks.

To rebuild the list of machine types and networks that must be supported by network boot images in the NIM environment, perform a **change** operation on the NIM master with the **if_discover=yes** attribute:

```
nim -o change -a if_discover=yes master
```

To rebuild network boot images from a SPOT, perform a **check** operation on the SPOT with the **force** option:

```
nim -Fo check spot_name
```

If an administrator prefers to have NIM always create all possible boot images from the SPOT resources, the **if_prebuild=yes** attribute can be specified on the master:

```
nim -o change -a if_prebuild=yes master
```

To return NIM to the behavior of creating only the boot images that are required for the environment, remove the **if_prebuild** attribute from the master by setting it to "no":

```
nim -o change -a if_prebuild=no master
```

Updating a SPOT with new device support for a new level of AIX

A NIM SPOT may be updated from one level of AIX to another using the **update_all** option of the NIM **cust** operation.

This process will update all current SPOTs with the latest level of code on the installation media. However, this process will not automatically install new software packages or device drivers from the installation media.

Machines in the NIM environment that are being upgraded to a new level of AIX require that new applicable device support be updated for any existing NIM SPOTs intended to support network boot and installation. This must be done after the SPOT is updated to the new level of AIX.

The new device support can be installed in the SPOT using NIM's **cust** operation, specifying the desired device-specific filesets in an **installp_bundle** resource or by using the **filesets** attribute. Alternatively, a fileset name of **devices** can be specified as the value of the **filesets** attribute to install all devices on the installation media. For further details about the **cust** operation, see "Using the NIM cust operation" on page 213.

Tuning client-request processing

For large installation environments, NIM can be scaled to support anywhere from 20 to 150 client requests simultaneously. NIM scaling is done by enabling the multithreaded option on the **nimesis** daemon.

The multithreaded option provides better handling of the volume of client information change requests and client state changes. Without the use of the multithreaded option, the NIM master can become overloaded

by activity on the NIM database and the number of active processes, resulting in simultaneous failures during the installation of a large number of client machines.

The multithreaded **nimesis** daemon will serialize and buffer NIM client requests to protect the NIM master from process overload, without causing significant performance degradation. The user must understand that many of the client information changes will not be reflected in the NIM database. The most recent information changes for any client, however, are eventually processed. Debugging of failed or hung clients will not be adversely affected.

The number of threads assigned to this daemon determines how many simultaneous NIM client requests can be handled in the NIM environment. Because most of the NIM client requests are processed rapidly, it is not necessary to have one thread for every client installing. The number of threads needed to support the activities in a NIM environment is dependent upon several items. The following should be considered when determining the number of threads:

- Number of clients that will be operated on at the same time
- Processing capacity of the NIM master machine
- What type of operations are planned

In general, one thread can support two to four clients that are installing BOS at the same time. For example, when installing 150 machines, 50 to 75 threads is sufficient. The number of threads is highly dependent on the processing power of the NIM master machine, and slower master machines may require more threads.

For smaller NIM environments, enabling the multithreaded daemon can monopolize system resources on the master that will not be used. For example, when installing 50 machines simultaneously, 20 to 25 threads or even the single-threaded daemon would suffice.

Note: The multithreaded option alone will not allow more machines to be installed simultaneously. The multithreaded option should be used in conjunction with global export of NIM resources, distribution of NIM resources throughout the NIM environment, and a network environment capable of handling a large volume of throughput.

Tuning client-request processing using SMIT:

You can tune client-request processing from the SMIT interface.

Type the SMIT fast path:

```
smit nim_tune_nimesis
```

Tuning client-request processing using the Web-based System Manager:

You can tune client-request processing using the Web-based System Manager.

To tune client-request processing from the NIM application:

1. From the NIM menu, select **Advanced Configuration** → **Tune Client Request Processing**.
2. Use the dialog to complete the task.

Tuning client-request processing from the command line:

You can tune client-request processing from the command line.

The **max_nimesis_threads** attribute can be used to tune client-request processing. To enable the multithreaded **nimesis** daemon, set a value to the **max_nimesis_threads** attribute on the NIM master using the following command:

```
nim -o change -a max_nimesis_threads=value master
```

Note: The range for the *value* attribute above is 20 to 150.

To disable the multithreaded **nimesis** daemon, set a null value to the **max_nimesis_threads** attribute on the NIM master:

```
nim -o change -a max_nimesis_threads="" master
```

Performing a network installation of an IBM eServer p5 over a virtual I/O Ethernet adapter

To perform a network installation on a IBM eServer p5 partition over a virtual I/O Ethernet adapter, the NIM master must be configured to receive packets from the partition adapter's default virtual local area network (VLAN).

One of the following configurations must exist:

- The master has a virtual I/O Ethernet adapter configured to receive packets from the partition's default VLAN, if the master is also a partition.
- A gateway exists that can route packets between the master's interface and the partition's default VLAN.
- The master has a VLAN interface associated with a physical Ethernet adapter that is configured to receive packets from the partition's default VLAN through the I/O Server, if the IBM eServer p5 has an I/O Server partition.

If you are performing a broadcast bootp install, then either you must have either the first or the third configuration. For additional information on configuring and using VLANs, see TCP/IP local area network adapter cards.

Using miscellaneous network installation files

The use of miscellaneous files pertinent to network installation is described.

Using the customizing script

This customizing script configures the target's TCP/IP domain name resolution and routing.

The **resolv_conf** resource should be used when installing clients running the latest version of AIX.

```
#!/bin/ksh CUSTOMIZING SCRIPT to set the hostname,
#           establish the nameserver and DNS domain name,
#           and configure the routing table for the
#           target standalone client

# Truncate the host name
# if the host name is set to the fully qualified host name
#
#NOTE: This procedure will NOT result in a truncated host name if
#the bos installation operation is installing a mksysb image
#(ie. -a source=mksysb) unless the bos_inst operation is
#instructed not to configure the target as a NIM client upon
#completion (ie. unless -a no_nim_client=yes is specified)
#
chdev -l inet0 -a hostname=$(/usr/bin/hostname | cut -d. -f1)
# Set Name server and Domain Name

if [[ -f /etc/resolv.conf ]]
then
  /usr/sbin/namerslv -E '/etc/resolv.conf.sv'
fi
/usr/sbin/namerslv -a -i '9.101.1.70'
/usr/sbin/namerslv -c 'enterprise.ca'

# Flush routing table and add default route
```

```
/etc/route -n -f
odmdelete -o CuAt -q "name=inet0 and attribute=route"
chdev -l inet0 -a route=net,, '0', '9.101.1.70'
```

Sample definition file for the nimdef command

This example shows a definition file for the **nimdef** command.

```
# Set default values.
```

```
default:
```

```
    machine_type = standalone
    subnet_mask  = 255.255.240.0
    gateway      = gateway1
    network_type = tok
    ring_speed   = 16
    platform     = rs6k
    machine_group = all_machines
```

```
# Define the machine "lab1"
# Take all defaults.
```

```
lab1:
```

```
# Define the machine "lab2"
# Take all defaults and specify 2 additional attributes.
# The machine "lab2" uses IPL ROM emulation, and will be added to
# the machine groups "all_machines" (by default) and "lab_machines".
```

```
lab2:
```

```
    ipl_rom_emulation = /dev/fd0
    machine_group     = lab_machines
```

```
# Define the machine "lab3"
# Take all defaults, but do not add the machine to the
# default group.
```

```
lab3:
```

```
    machine_group=
```

```
# Define the machine "lab4"
# Take all defaults, but do not add "lab4" to the default group
# "all_machines".
# Instead add it to the groups "lab_machines" and "new_machines".
```

```
lab4:
```

```
    machine_group =
    machine_group = lab_machines
    machine_group = new_machines
```

```
# Change the default "platform" attribute.
```

```
default:
```

```
    platform = rspc
```

```
# define the machine "test1"
# Take all defaults and include a comment.
```

```
test1:
```

```
    comments = "This machine is a test machine."
```

Using the certificate viewing file

These examples are from a certificate viewing script for OpenSSL certificates.

The script is located in the **/usr/samples/nim/ssl** directory.

The script is provided for helping users view hash, issuer, subject, and other certificate information available using the **openssl** command. The script can be modified based on user need or preference.

To print out all readable values for certificate(s):

```
# certview certificate_names
```

To print out the hash value for certificate(s):

```
# certview -h certificate_names
```

To print out the issuer value for certificate(s):

```
# certview -i certificate_name
```

To print out the subject value for certificate(s):

```
# certview -s certificate_name
```

To print out the subject, issuer, and enddate values for certificate(s):

```
# certview -I certificate_name
```

Using the certificate password loading file

The following are examples from a certificate password loading file for NIM OpenSSL certificates.

The file is located in the **/usr/samples/nim/ssl** directory. The file is provided for helping users store a desired password for decrypting the NIM master's client key. The password provided must match the password used to encrypt the NIM master's client key during NIM SSL configuration.

To load the encrypted key's password in the NIM environment:

```
# certpasswd
```

To unload the encrypted key's password from the NIM environment:

```
# certpasswd -u
```

Only the NIM master's client key may be password encrypted. To password encrypt the NIM master's client key, complete the following steps:

1. On the NIM master, edit the **/ssl_nimsh/configs/client.cnf** config file.
2. Locate the *encrypt_key* variable and change the value to **yes**.
3. Add the *output_password* variable underneath **encrypt_key** and specify the password. If you do not specify *output_password*, you will be prompted for the password during key generation.
4. Type the following command:

```
# make -f /usr/samples/nim/ssl/SSL_Makefile.mk client
```
5. On each SSL client, copy the new **server.pem** file using the **nimclient -c** command.
6. Load the password into the NIM environment using **certpasswd**.

When you use password encrypted keys, NIM commands may fail with the following error if the correct password is not loaded:

```
0042-157 nconn: unable to access the "clientkey.pem" file
```

After the password is loaded, it will be used for client key decrypting until you unload the password.

Sample KDC server definition file

Using a sample script, you can create and configure a Key Distribution Center (KDC) server on the same system as a NFS V4 server.

The script is located in the `/usr/samples/nim/krb5` directory. The script helps you create a simple KDC environment that can be modified based on your needs or preference.

Note: Before you begin, review the `config_rpcsec_server` script.

The `config_rpcsec_server` script handles the following operations:

- Creates a system user; the default is `nim`
- Creates principals for the administrator and system user
- Creates an NFS host key for the server
- Creates realm-to-domain mapping
- Creates a tar image of `krb5` files for use by KDC slim clients
- Refines the exports list
- Recycles the NFS services
- Re-exports NFS file systems and directories

Examples

To create a simple KDC environment using default values, type the following command:

```
config_rpcsec_server
```

To create a KDC environment using system user `nimadmin` as the user principal and password `login1` for the `kadmin` principal, type the following command:

```
config_rpcsec_server -p login1 -u nimadmin
```

Sample slim client definition file

Using a sample script, you can create and configure a NIM client as a Kerberos slim client.

The script is located in the `/usr/samples/nim/krb5` directory. The script helps you create a simple Kerberos slim client using values defined in the `config_rpcsec_server` script. The script can be modified based on user need or preference.

Note: Before you begin, review the `config_rpcsec_client` script prior to use.

The `config_rpcsec_client` script handles the following operations:

- Creates a system user; the default is `nim`
The user must match an existing user principal on the KDC server.
- `tftp` the slim image from the NIM master
The tar image must exist on the NIM server.
- Enables the user principal using the `kinit` command
The password must match the user principal on the KDC server.
- Recycles the NFS services

Examples

To create a simple KDC slim client using default values, type the following command:

```
config_rpcsec_client
```

To create a simple KDC slim client using system user `nimadmin` as the user principal, type the following command:

```
config_rpcsec_client -u nimadmin
```

NIM error and warning messages

Information about Network Installation Management (NIM) error and warning messages is provided, with suggestions for resolving specific problems.

Note: You can access the complete set of NIM error messages information (message number and message text only) through the Message Center located on the Information Center on the Internet at the following Web address:

Message Center

(<http://publib.boulder.ibm.com/infocenter/pseries/v5r3/topic/com.ibm.aix.messagecenter/messagecenter.htm>)

If an error condition is detected when a NIM command is executed, the command returns an error message. If a NIM command returns a warning message, this indicates that either a less severe problem was encountered by NIM, or a problem was encountered in a command called by NIM, and the severity of the problem cannot be readily determined by NIM. In the latter case, additional messages or output from the command often reveal the nature of the problem.

All NIM error messages begin with 0042 and are followed by a three-digit error code.

Note:

1. If you require usage information for a NIM command, type the command without any parameters or with a question mark as a parameter (for example, `nim -?`). Additional information can be obtained from the **lsnim** command, which provides several options to display NIM help and usage information. For more information, refer to the **-q**, **-O**, and **-P** options of the **lsnim** command. You can also use the **lsnim -p -a** command to display information for all NIM classes, subclasses, types, and attributes. For example, to determine the list of valid values for an attribute, enter:

```
lsnim -p -a AttributeName
```
2. In some cases, a **nim** or **nimclient** operation that is being blocked because an object is in a particular state may be permitted with the use of the **force** option (the **-F** flag). However, by using the **force** option, you may adversely affect part of the NIM environment by forcing an operation that should only proceed after other actions are complete. Use error messages that are displayed without using the **force** option to determine if the **force** operation is a reasonable action.
3. If you believe that your problem is the result of a software defect, or if the User Actions provided here do not provide adequate resolution to a problem, contact your point of sale.

Information about each message listed in this chapter is organized in the following manner:

Message	Indicates the warning or error message ID number returned by the command
Explanation	Describes what is likely to have caused the message to be displayed
User Action	Suggests a possible resolution to the problem

Note: If a User Action for a given error or warning specifies using the **lsnim** command for recovery hints, and if you are operating from a NIM client, use **nimclient -I IsnimOperations**, substituting the suggested **lsnim** options as appropriate.

Message	0042-001
Explanation	An error was detected by an underlying NIM method (a subcommand). This message describes where the error occurred with respect to the NIM client or master and may be useful in troubleshooting the problem. The messages that are displayed subsequent to this error are normally the true source of the problem.

User Action	Read the additional information and error messages, and refer to their explanation and recovery hints as appropriate.
Message	0042-002
Explanation	An interrupt signal has been received, perhaps because the user entered Ctrl-C or used the kill command on a NIM process.
User Action	The NIM operation that was active has been interrupted. Perform the operation again. Note: This error is expected if it occurs after the nimclient -o bos_inst operation is performed on a client.
Message	0042-003 and 0042-004
Explanation	An error has been returned from a system call.
User Action	Fix the condition that caused the system call to fail and perform the operation again.
Message	0042-005
Explanation	The Object Data Manager (ODM) has returned an error.
User Action	Refer to the Message Database located on the Information Center Web page for specific details of the error. Fix the ODM problem and perform the NIM operation again.
Message	0042-006
Explanation	Generic error message used for rarely occurring NIM errors.
User Action	Phrases contained in this error message are constructed from debug information and from messages returned by commands called by NIM. If the content of the message does not give insight into the true cause of failure, contact your point of sale.
Message	0042-007
Explanation	An internal NIM error has occurred.
User Action	Try the operation again.
Message	0042-008
Explanation	NIM has attempted to establish socket communications with a remote machine, and it has refused the connection.
User Action	If the failing operation occurred on the master, verify that the master has rsh permissions on the client and that inetd is active on the client; otherwise, verify that the nimesis daemon is active on the master. If the failing operation was the niminit command on the client, a possible cause of failure is that the master does not have a network object that corresponds to the client's network. A network object that represents the client's network needs to be added to the database on the master; then a route needs to be added from the master's network to the client's network. If the failure occurs during operations initiated from a client, using the nimclient command, or during a NIM installation of the base operating system, the cpuid attribute on the client's machine definition may be obsolete (for example, if the machine's system planar was recently replaced). To guarantee that this is not the case, erase the cpuid from the machine definition by issuing the following from the master: <code>nim -Fo change -a cpuid= <i>ClientName</i></code>
Message	0042-011
Explanation	The /etc/niminfo file is not accessible.

User Action	<p>The niminfo file is required by all NIM commands and methods. This file is created when the bos.sysmgt.nim.master and bos.sysmgt.nim.client packages are configured. If this file is not available, this indicates that the NIM package has not been initialized or that this file has been deleted. To create the niminfo file, execute the nimconfig command on the master or the niminit command on the client. To recreate a deleted or corrupted niminfo file, enter from the master:</p> <pre>nimconfig -r</pre> <p>OR enter from the client:</p> <pre>niminit -aname=ClientName -amaster=MasterHostName -amaster_port=MasterPortValue</pre>
Message	0042-012
Explanation	The specified command may only be executed on the master.
User Action	Execute the desired operation on the NIM master.
Message	0042-013
Explanation	The global lock used for synchronized access to the NIM database could not be obtained.
User Action	Try the operation again. If the same error is returned, verify that there are no active NIM commands. If this is true, remove the /var/adm/nim/glock file and try the operation again. If the file does not exist and the error persists, contact your point of sale.
Message	0042-014
Explanation	An internal NIM error has occurred.
User Action	Perform the remove operation on the NIM object followed by the appropriate define operation.
Message	0042-015
Explanation	A syntax error has been detected.
User Action	Refer to the appropriate man page for the NIM command and try again using valid syntax.
Message	0042-016
Explanation	An invalid option has been specified.
User Action	Refer to the appropriate man page for the NIM command and try again using valid syntax.
Message	0042-017
Explanation	An invalid value was specified for an option argument.
User Action	Refer to the appropriate man page for the NIM command and try again using valid syntax.
Message	0042-018
Explanation	A required option was not supplied.
User Action	Refer to the appropriate man page for the NIM command and try again using valid syntax.
Message	0042-019
Explanation	An option that requires an argument was specified without its argument.
User Action	Refer to the appropriate man page for the NIM command and try again, specifying the missing argument.
Message	0042-20
Explanation	An operand was required but not supplied. Usually, the operand is the NIM object to which a given operation is being applied (that is, a NIM name for a network, machine or resource object that is the target of the NIM operation).

User Action	<p>Refer to the appropriate man page for the NIM command and try again using valid syntax. If you do not know the name of an operand, and if the failing operation was targeted toward an existing NIM object, enter:</p> <pre>lsnim -l -t <i>ObjectType</i></pre> <p>OR</p> <pre>lsnim -l</pre> <p>to determine the operand name.</p>
Message	0042-021
Explanation	A NIM attribute was required for the operation.
User Action	<p>Specify the missing attribute. If the failing command is the nim or nimclient command, to obtain a list of attributes, enter from the master:</p> <pre>lsnim -q <i>ObjectName</i></pre> <p>OR</p> <pre>lsnim -q -t <i>ObjectType</i></pre> <p>OR enter from the clients:</p> <pre>nimclient -l <i>lsnimOptions</i></pre> <p>For the other NIM commands, see the appropriate NIM man page.</p>
Message	0042-022
Explanation	A value was specified that exceeds the bounds of acceptable values.
User Action	Supply a value within the acceptable bounds.
Message	0042-023
Explanation	The specified value is not valid.
User Action	<p>Try the command again with a valid value. To determine the valid values for classes of objects and operations as they pertain to those objects, enter:</p> <pre>lsnim -Pc <i>ObjectClass</i></pre> <p>AND</p> <pre>lsnim -P0c <i>ObjectClass</i></pre> <p>where <i>ObjectClass</i> is one of machines, networks, or resources.</p>
Message	0042-024
Explanation	An invalid NIM object type was specified.
User Action	Specify a valid NIM object type. See user actions for error 023 for lsnim options to determine a valid object type.
Message	0042-025
Explanation	The specified operation cannot be supplied to the specified NIM object.
User Action	Specify an operation that can be applied to the object. Enter <code>lsnim -0 <i>ObjectName</i></code> for a list of valid operations that can be applied to the object.
Message	0042-027
Explanation	The specified object is missing an attribute that is required to complete the specified operation.
User Action	Redefine the object that is missing an attribute by performing the remove operation followed by the define operation.
Message	0042-028 and 0042-029
Explanation	The specified information cannot be supplied in the current context.
User Action	Try the operation again without supplying the offending attribute.

Message	0042-030
Explanation	A sequence number was opened to an attribute that doesn't allow sequence numbers.
User Action	Try the operation again without a sequence number on the offending attribute.
Message	0042-031
Explanation	An internal NIM error has occurred. NIM is unable to generate a unique object ID.
User Action	Try the operation again.
Message	0042-032
Explanation	The specified value for the attribute is not unique and it must be.
User Action	Supply a unique value for the attribute.
Message	0042-033
Explanation	The specified value is not unique and it must be. An attribute with a sequence number requires a unique value.
User Action	Supply a unique value.
Message	0042-034
Explanation	The specified value is not unique and it must be.
User Action	Supply a unique value.
Message	0042-035
Explanation	NIM was attempting to access an attribute that had the specified characteristics, but the attribute doesn't exist.
User Action	Make sure the attribute exists and retry the operation.
Message	0042-036
Explanation	The define operation failed for a resource because the specified server does not have a standalone configuration.
User Action	Try the operation again using a NIM client that is a standalone machine.
Message	0042-037
Explanation	The NIM state of the specified object prevents the operation from succeeding.
User Action	NIM states are used to synchronize activity among NIM objects. To perform the desired operation, the state of the specified object must be changed. If the specified object is in an unexpected state, check the system to make sure another user or process is not manipulating the object. Use the reset operation to set the object to a known state and try the operation again.
Message	0042-038
Explanation	An object that NIM would operate on is already locked and thus cannot be operated on.
User Action	NIM object locks are used to synchronize activity among NIM objects. These locks are temporary, so try the operation again after some delay. The value of the lock is the process ID of a NIM process that is using the lock. If the lock persists and no NIM commands are active, reset all NIM locks by stopping the nimesis daemon, then restarting it.
Message	0042-039
Explanation	The operating system version or release level of the specified object is unacceptable.
User Action	Perform the desired operation on objects that have the appropriate operating system version and release levels.
Message	0042-040
Explanation	A NIM object could not be removed because it is being used by some other NIM object.

User Action	Remove all references to the object to be removed before the remove operation is specified. If NIM states are such that you cannot remove references to the object and you want to remove the object anyway, provide the -F flag to the remove operation.
Message	0042-041
Explanation	A specified value has already been defined to NIM.
User Action	Specify a value that isn't already known to NIM. Note: If /etc/niminfo is the value and the NIM command producing this error is niminit , this means that niminit has already been performed. If you want to reinitialize your NIM master or client, deinstall the appropriate fileset, and then reinstall and reconfigure the NIM master or client fileset.
Message	0042-042
Explanation	The specified machine could not be reached with the ping command from the master.
User Action	If the operation you were attempting to perform requires that the target machine be running and that it can be reached, then verify that the machine is currently running. If not, turn it on; otherwise, perform network diagnostic procedures to determine why the master could not reach the target machine.
Message	0042-043
Explanation	The remove operation cannot be performed, because the target machine currently serves a NIM resource that has been allocated for use. Performing the operation at this time could lead to processing failures on clients that are attempting to use the served resources.
User Action	You need to deallocate all resources that the target serves before you can remove the machine.
Message	0042-044
Explanation	You have specified a NIM attribute without an accompanying value. Most NIM attributes can only be specified with a value assigned to them in the form of <i>attr=value</i> .
User Action	Retry the operation with a value assigned to the specified attribute.
Message	0042-045
Explanation	Some NIM attributes can be added to an object's definition more than once. In these cases, a sequence number is used to uniquely identify each attribute of that type. In this case, you have specified an attribute of this type without its required sequence number and, therefore, NIM is unable to determine which attribute you are attempting to specify.
User Action	Verify the sequence number and try the operation again.
Message	0042-046
Explanation	NIM was unable to perform an operation on the specified file. This may be due to the permissions on the file. The file usually needs read, write, and, in some cases, execute permissions for root.
User Action	Change the permissions of the specified file and try the operation again.
Message	0042-047
Explanation	Some types of NIM resources may only be used by specific machine types. In this case, you attempted to allocate a NIM resource to a type of machine that is not allowed to use that type of resource.
User Action	Specify a resource type that the machine is allowed to use when performing allocation for the target machine. To determine the valid resource types, enter: <pre>l snim -p -s ResourceSubclassForMachineType</pre> To view the subclasses that are available, enter: <code>l snim -p -S</code>
Message	0042-048

Explanation	When resource allocation is requested, NIM verifies that the designated client has the potential to communicate with the server of the resource. NIM does this by checking the NIM routing between the network that the client's primary interface connects to and all the networks that the server connects to. In this case, a NIM route is missing between the client and the server.
User Action	Either establish a NIM route between the client and the server or choose a different resource to allocate.
Message	0042-049
Explanation	Only one resource of this type may be allocated to the client and one has already been allocated.
User Action	Choose the resource that you want to use and deallocate the currently allocated resource of this type if you want to use the new one.
Message	0042-051
Explanation	NIM was unable to resolve a host name to an IP address or the other way around.
User Action	All host names that are used in the NIM environment must be resolvable. Perform the appropriate network administration tasks to ensure that the specified host name is resolvable and try the operation again.
Message	0042-052
Explanation	One or more NIM resources are still allocated to the machine that you have requested to be removed from the NIM environment. To remove a machine, it cannot have any resources allocated to it.
User Action	Deallocate all resources that have been allocated to the target machine and try the operation again.
Message	0042-053
Explanation	You have specified the name of a NIM object that does not currently exist in the NIM environment. NIM can only operate on objects that have been defined to NIM.
User Action	Verify that you have spelled the name of the object correctly and that it has already been defined. The name of a target machine for a NIM operation must be the NIM name, not the host name. Enter: <pre>l snim -l -t <i>ObjectType</i></pre> <p>OR</p> <pre>l snim -l</pre> <p>to obtain listings of currently defined objects in the NIM environment. If you need to define the object, use the define operation.</p>
Message	0042-055
Explanation	Many NIM operations require a source for installable images. You have specified a source that cannot be used for this operation. Examples of valid sources for NIM operations are: <ul style="list-style-type: none"> • /dev/rmt0, /dev/cd1 for lpp_source definition • rte, spot, mksysb for bos_inst operation
User Action	Try the operation again using a source that the operation can use.
Message	0042-056
Explanation	You have specified the same attribute assignment more than once.
User Action	Try the operation again using only one instance of the attribute assignment.
Message	0042-058
Explanation	You have attempted to allocate a SPOT to a client whose primary network interface type or platform is not supported by the SPOT . For a client to use a SPOT , the SPOT must support the network interface type and platform of the client's primary interface.

User Action	Install the appropriate device support into the SPOT , which will allow the SPOT to support the client's primary interface type and platform, or choose a different SPOT that supports the client's primary interface type and platform.
Message Explanation	0042-059 In an attribute assignment (in the form of <i>attr=value</i>), the <i>value</i> you have specified represents a NIM object whose type conflicts with the object type of the specified <i>attr</i> .
User Action	Try the operation again using the <i>attr</i> that corresponds to the type of object that <i>value</i> represents.
Message Explanation	0042-060 You have specified multiple attribute assignments for an attribute that may only be specified once.
User Action	Try the operation again, using only one instance of the attribute.
Message Explanation	0042-061 You have requested an operation to be performed on a NIM resource object that is currently allocated for client use. NIM is not allowing this operation to be performed because it may interrupt the client's use of the resource.
User Action	Try the operation again when the resource is not allocated for client use. If necessary, try the force option (-F flag) to disregard the preventive check by NIM. In some cases, NIM will allow the operation to be performed.
Message Explanation	0042-062 The NIM object that was operated on is missing something that is required for its definition to be complete.
User Action	List information about the object using the lsnim command. Each item that is missing from the object's definition will be represented by a missing attribute. Perform the appropriate NIM operation that will add the missing item to the object's definition. For a SPOT , if network boot images are missing, apply the check operation to the SPOT . If software filesets are missing from a SPOT , allocate an lpp_source that contains the required filesets and apply the cust operation to the SPOT .
Message Explanation	0042-063 Some NIM operations require access to one or more NIM resources to complete successfully. This access is granted through the allocate operation. In this case, you have not allocated all the resources that are required for this operation.
User Action	Allocate all the required resources and try the operation again. For a list of required and optional resources for a given operation, enter: <pre>lsnim -q Operation ObjectName</pre> OR <pre>lsnim -q Operation -t ObjectType</pre>
Message Explanation	0042-064 The machine that is the target of the requested operation currently serves a NIM resource that is allocated for client use. The requested operation cannot be performed until all resources that the target serves have been deallocated for use.
User Action	Deallocate all resources that the target serves and try the operation again.
Message Explanation	0042-065 You have specified a name that is reserved for NIM internal use only.
User Action	Try the operation again using a different name. To determine what names are reserved, enter: <pre>lsnim -a reserved</pre>
Message	0042-066

Explanation	You have specified one or more characters that are not allowed in NIM object names. NIM uses regular expressions to perform many of its operations, so any character that has special meaning for regular expressions cannot be used (for example, ^). Also, any character that has special meaning to the shell cannot be used (for example, /).
User Action	Try the operation again using valid characters.
Message	0042-067
Explanation	You have requested an operation to be performed on a NIM object that has been reserved for NIM internal use only.
User Action	Try the operation again, using a NIM object that is not reserved. To determine what objects are reserved, enter: lsnim -a reserved
Message	0042-069
Explanation	The requested operation cannot be performed at this time because it conflicts with the current NIM state of the target. NIM uses states to synchronize NIM activity so that operations don't interfere with each other.
User Action	Try the operation again when the state changes or, if necessary, try using the force option (-F flag). In some cases, NIM will allow you to override this state checking. If you encounter this error as a result of trying to remove, using the reset operation, the boot resource from a client that incorrectly has a state of "ready for a NIM operation", you can remove the boot resource from the NIM master by entering: <code>/usr/lpp/bos.sysmgmt/nim/methods/m_dealloc_boot <i>client_name</i></code> where <i>client_name</i> is the name of the NIM object for the client.
Message	0042-073
Explanation	To perform customization on a machine, NIM constructs a shell script that is executed on the target. To construct this script, some type of resource that can be used for customization must be used. In this case, NIM could not create the customization script because no resources have been allocated to the target that could be used for customization purposes.
User Action	Allocate one or more resources that can be used for customization and try the operation again. To display the subclass of resources that can be used for customization, enter: lsnim -p -s cust_res
Message	0042-074
Explanation	You have specified an attribute assignment in which the value represents a relative path name. NIM only allows absolute path names (that is, path names that begin with /) to be used.
User Action	Try the operation again, using an absolute path name.
Message	0042-075
Explanation	The requested operation requires that a NIM resource be exported for a machine's use. In this case, NIM attempted to export the resource but an error was returned by an NFS utility.
User Action	Fix the error condition that the NFS utility reported and try the operation again.
Message	0042-076
Explanation	You have specified a port number that is already in use.
User Action	Try the operation again, using a port number that is currently not being used. Check the /etc/services file. Note: NIM uses both the specified port number and its successor. Therefore, ensure that the port number after the specified port number is also free.
Message	0042-077

Explanation	The niminit command is used to join the NIM environment. When executed, this command attempts to add routing information that the NIM master has determined the client needs to participate in the NIM environment. In this case, one or more of the required routes could not be added.
User Action	Perform the appropriate network diagnostic task to determine why the route could not be added.
Message	0042-078
Explanation	You have specified a change to a NIM routing attribute in which the destination network is different from its current value. This is not allowed because only the gateway field of the routing attribute may be changed.
User Action	If you are trying to change the connectivity between NIM networks, then you must remove the current NIM route by supplying a NULL value for the appropriate routing attribute. Otherwise, specify the same destination network when attempting to change the gateway field of the routing attribute.
Message	0042-079
Explanation	In the NIM environment, one resource may depend on another for information. In this case, an allocated resource has a dependency on the resource you have specified for deallocation.
User Action	Deallocate the resource that is dependent on the resource causing the error.
Message	0042-081
Explanation	NIM uses NFS to make remote resources available for client use. To avoid NFS export errors, NIM enforces some restrictions on where a resource can be defined. In general, a NIM resource cannot be defined within a directory that is already a NIM resource. Conversely, a NIM resource cannot be defined for a directory that already contains an existing NIM resource.
User Action	Move the resource to a location that adheres to NIM export rules and try the operation again.
Message	0042-083
Explanation	Each network communications adapter has an associated network hardware address that is unique. In this case, you attempted to define a NIM network interface using a network hardware address already being used by a NIM machine object.
User Action	Only one NIM interface attribute may be defined for each network communications adapter a client might have. If you are attempting to add another interface definition, then verify that the hardware address is correct. If so, then you must first change the interface attribute that is currently using that address. If not, try the operation again with the correct hardware address.
Message	0042-084
Explanation	The machine has already been configured to be a NIM master.
User Action	If you want to reconfigure the machine as a NIM master, enter <code>nim -o unconfig master</code> , then <code>deinstall</code> and <code>reinstall</code> the master fileset. You may then run the nimconfig command.
Message	0042-086
Explanation	You have attempted to add a NIM route between two NIM networks that already have a NIM route between them. Only one NIM route can be specified between any two NIM networks.
User Action	If you are attempting to change NIM routing, delete the existing NIM route and try the operation again.
Message	0042-093
Explanation	NIM attempted to create a directory, and the mkdir command returned an error.
User Action	Fix the error reported by the mkdir command and try the operation again.
Message	0042-109
Explanation	To complete the requested operation, NIM requires information about one or more file systems about which it was unable to obtain information.

User Action	Verify that the file systems exist. If not, either specify the correct path name when performing the NIM operation or redefine the NIM environment so that all the participating file systems exist.
Message	0042-111
Explanation	When a sequence number is specified for a NIM attribute, it must be within a specific range. You have specified a sequence number that falls outside of the acceptable bounds.
User Action	Try the operation again using a sequence number that is within the acceptable bounds.
Message	0042-113
Explanation	To complete the requested operation, NIM requires information about the size of one or more objects, which NIM was unable to determine.
User Action	If the object is a file or directory that does not exist, then create the file or directory and try the operation again.
Message	0042-118
Explanation	You have requested to change characteristics of a NIM network on which there is currently one or more active NIM operations. NIM is not allowing the change because changing the network characteristics at this time could result in failures in the active operations.
User Action	Wait until the NIM resources allocated to machines that use the network being changed have been deallocated and try the operation again.
Message	0042-121
Explanation	An invalid value has been specified.
User Action	Try the operation again, using a valid value.
Message	0042-124
Explanation	An NFS option was specified that is not supported.
User Action	Try the operation again using valid NFS options. Refer to NFS Problem Determination in <i>Networks and communication management</i> .
Message	0042-129
Explanation	An invalid resource type was specified for this operation.
User Action	Use the lsnim -q Operation -t TargetType command to view a list of required and optional resources for <i>Operation</i> when applied to <i>TargetType</i> .
Message	0042-130
Explanation	You have specified an attribute that cannot be used for this requested operation.
User Action	Try the operation again, without using the attribute you specified.
Message	0042-131
Explanation	You have specified two or more attributes that conflict with each other.
User Action	Try the operation again, using only one of the attributes.
Message	0042-132
Explanation	You have specified a value for an attribute assignment that is invalid in the context in which the operation is being performed.
User Action	Try the operation again, using a different value for the attribute assignment.
Message	0042-133
Explanation	The physical entity that is represented by the NIM resource object you have requested to be deleted could not be deleted.
User Action	Delete the file or directory, using the rm command.
Message	0042-134

Explanation	The operation you requested requires the designated target to reboot using a network boot image. NIM has automatically initialized the environment to enable the target to do this; however, NIM was unable to force the target to load the network boot image.
User Action	Intervention at the target is required. Follow the procedures for initiating a BOOTP request.
Message	0042-135
Explanation	To synchronize NIM operations that can be initiated from a client or on the master, NIM keeps track of which machine (the client or the master) is used to allocate the first resource to the client; this machine is said to be in control. For example, if the first resource allocation occurs from the client, then the client is in control. Once a machine has control, it remains in control until all resources for that client have been deallocated. You have requested an operation to be performed from a machine that is currently not in control of the specified target.
User Action	Perform the desired operation from the machine that is in control of the target, or from the controlling machine deallocate the resources (to remove the control), or override this behavior by using the force (-F flag) option when performing the operation from the master.
Message	0042-136
Explanation	The requested operation cannot be performed because a NIM route does not exist between two machines that participate in this operation.
User Action	Establish a NIM route between the networks.
Message	0042-137
Explanation	The /etc/niminfo file contains information about the NIM environment that all NIM commands require. In this case, the /etc/niminfo file is missing some information that is required to continue, which indicates that the file has been corrupted.
User Action	Reinitialize the NIM environment.
Message	0042-138
Explanation	Unable to update the rhost file.
User Action	Edit the \$HOME/.rhosts file for root on the client machine to add an entry for the host name of the NIM master.
Message	0042-139
Explanation	The process of installing a machine prevents any attached disks from being used as the source for installable images. You have allocated a resource to the target of the install operation that is served by the target itself.
User Action	Deallocate the resource, allocate another resource of this type that is served by another machine, and try the operation again.
Message	0042-140
Explanation	You have requested that a machine object be removed from the NIM environment and this has been done; however, NIM was unable to remove the /etc/niminfo file on the machine that has been removed from the NIM environment.
User Action	Remove the /etc/niminfo file from the machine that was removed from the NIM environment. Note: Verify that the .rhost permissions for the master have been removed from the client.
Message	0042-141
Explanation	By specifying an attribute assignment with a NULL value, you have requested NIM to remove the specified <i>attr</i> . However, in this case, the specified <i>attr</i> is not currently part of the specified object's definition.
User Action	Try the operation again, using an attribute that is part of the object's definition.
Message	0042-142
Explanation	All attribute values must be unique. You have specified a <i>value</i> in an attribute assignment that already exists.
User Action	Try the operation again, using a unique <i>value</i> for the attribute.

Message	0042-143
Explanation	Some NIM attributes can only be added to an object's definition once. In this case, you have specified an attribute of this type when one already exists for the specified object.
User Action	Only one attribute of this type can be used in the object's definition. Perform the change operation on the object if you want to replace the current value with a new one.
Message	0042-144
Explanation	Some NIM attributes require a unique sequence number so that NIM can distinguish between multiple attributes of that type. In this case, you have specified a sequence number that is already being used.
User Action	Try the operation again, using a sequence number that is not currently being used. To display the sequence number that are being used, enter: <code>lsmim -a AttributeName ObjectName</code>
Message	0042-145
Explanation	You have specified an attribute that does not exist in the NIM environment.
User Action	Try the operation again, using a valid NIM attribute. To display a list of valid attribute names, enter: <code>lsmim -p -s info_subclass</code>
Message	0042-146
Explanation	You have specified an object type that does not exist in the NIM environment.
User Action	Try the operation again, using a valid NIM object type. On the NIM master, the lsmim command can be used to display the valid NIM object types.
Message	0042-147
Explanation	You have attempted to execute a NIM command on the NIM master that can only be executed on NIM clients.
User Action	Execute the command on a NIM client.
Message	0042-148
Explanation	The information contained in the specified attribute is no longer valid.
User Action	Change the information in the attribute to reflect valid information and try the operation again.
Message	0042-150
Explanation	Any directory used to store NIM resources must be local to the machine that serves those resources. This is required because NIM can only NFS export local directories. In this case, you have specified a directory that is not local to the designated server of the directory. NIM has obtained this information from the file system of the designated server and the vfstype listed corresponds to values in the /usr/include/sys/vmount.h file.
User Action	Either copy the desired resources onto the designated server and perform the operation again, or specify the correct server when performing the operation.
Message	0042-151
Explanation	For NIM to use a file, it must be of a specific type. In this case, you have specified a file whose type cannot be used by NIM. NIM has obtained this information from the file system of the designated server of the file and the file type corresponds to values in the /usr/include/sys/mode.h file.
User Action	Change the file type of the file and try the operation again.
Message	0042-152
Explanation	When an installp operation is performed on a SPOT , the root directories of all diskless and dataless clients that use that SPOT must be synchronized with the changes made within the SPOT . In this case, one or more errors occurred when performing the root sync operation on a root directory.
User Action	Investigate why some of the root syncs failed and perform the operation again. The nim.installp log for the client root is located in <i>RootResrcParentDir/ClientName/var/adm/ras</i> .

Message	0042-153
Explanation	For NIM to use a file, it must have specific file permissions. In this case, you have specified a file whose permissions conflict with those required by NIM. NIM has obtained this information from the file system of the designated server of the file, and the value of the file permissions comes from the <code>/usr/include/sys/mode.h</code> file.
User Action	Change the file permissions of the file and try the operation again.
Message	0042-154
Explanation	For NIM to use a file, it must exist. You have specified a file that does not exist.
User Action	Create the file and try the operation again.
Message	0042-155
Explanation	For NIM to keep diskless and dataless root directories in sync with their corresponding SPOTs , NIM requires that the client's root directory be served from the same machine as its SPOT . In this case, you have requested a resource to be allocated that violates that requirement.
User Action	Try the operation again using resources that do not violate the NIM requirement.
Message	0042-156
Explanation	You have requested an operation to be performed that involves a directory that does not exist.
User Action	Create the missing directory and try the operation again.
Message	0042-157
Explanation	The operation you have requested could not be performed because a required file could not be accessed.
User Action	Create the missing file and try the operation again. For example: <ul style="list-style-type: none"> • If the missing file is a boot image with a name whose format is <i>SpotName.NetworkInterface.Platform</i> (for example, <code>mypot.tok.up</code>), recreate the boot image by performing the check operation on the SPOT. • If the missing files are directories with which root or paging resources are associated, delete the resource definition with the remove operation, create the directories, and then redefine the resource. • If a SPOT's image.template file is missing, this indicates that the SPOT has been corrupted or was not constructed successfully. To recover, you may need to remove and rebuild the SPOT with the remove and define operations.
Message	0042-158
Explanation	The operation you have requested requires NIM to modify a file that it was unable to modify successfully.
User Action	Check the file permissions on the file and try the operation again.
Message	0042-159
Explanation	Required software is missing which prevents the target machine from acting as a SPOT server.
User Action	Install the missing software and retry the operation.
Message	0042-160
Explanation	The operation you requested requires the construction of network boot images and NIM was unable to do that.
User Action	Fix the problem that prevented the network boot images from being constructed and try the operation again.
Message	0042-161
Explanation	There is insufficient free disk space to complete the requested operation.
User Action	Increase the amount of available space, as detailed in the error message.
Message	0042-162

Explanation	To perform the requested operation, NIM requires an lpp_source type resource object that has the simages attribute as part of its definition. This attribute is used to designate that an lpp_source contains the total set of optional packages that are required to support NIM install operations. In this case, you have not supplied an lpp_source that fulfills this requirement.
User Action	Try the operation again using an lpp_source that has the simages attribute in its definition.
Message	0042-163
Explanation	NIM coordinates access between a client and the server of the resource. To do this, NIM must identify a network interface that can be used by the client. This becomes a complex problem when the server has more than one network interface. NIM uses a connectivity algorithm to establish which network interface to use. This error message occurred because the connectivity algorithm detected a problem with the client's routing and the interface the algorithm has selected to use. NIM does not allow the interface on the server that the client uses as a gateway to be used to serve resources because the operation requiring the resource could fail.
User Action	If the server has other network interfaces that are not known to NIM, change the server machine object to add the interfaces. Define a NIM route between the client's primary network and one of the other networks to which the server connects.
Message	0042-164
Explanation	Some NIM operations do not allow the source of installable images to be a CD-ROM. NIM is not always able to construct an environment that supports the use of a CD-ROM for the operation being performed. This is true for the operation you tried to perform.
User Action	Try the operation again using a different source for installable images.
Message	0042-165
Explanation	Some attributes can only be specified together; others are mutually exclusive. In this case, you specified one or more attributes that conflict.
User Action	Try the operation again, omitting the attribute that was in conflict. For example, the ring_speed and cable_type attributes cannot be used with the same if attribute; the one you should use depends on the type of network interface referenced by the corresponding if attribute.
Message	0042-166
Explanation	The if attribute specifies network interface information, which includes a reference to the network object that the interface connects to. In this case, you have omitted a required attribute which is associated with the if attribute.
User Action	Try the operation again, including the required attribute. For example, the ring_speed attribute corresponds with the Token-Ring network interface, and the cable_type attribute corresponds with the Ethernet network interface.
Message	0042-167
Explanation	The device which you have specified as the source for the IPL ROM emulation, does not contain a valid, bootable image of the IPL ROM emulation.
User Action	If the specified device has media in it, this media either does not contain the IPL ROM emulation, or the media has been corrupted. Remake the IPL ROM emulation, and try the operation again. If the specified device has no media in it, make the IPL ROM emulation, put it in the device, and try the operation again.
Message	0042-168
Explanation	You have specified that the originating and destination network are the same. Machines that are on the same network do not need routing to communicate; therefore, adding a route from a network to itself is not allowed.
User Action	Specify a different originating and destination network when adding a NIM route.
Message	0042-169
Explanation	You have allocated an lpp_source , but you have not specified which filesets are to be installed using that lpp_source .

User Action	Specify the filesets to install using the filesets attribute in the command, or by allocating an installp_bundle that contains a list of the filesets to install.
Message	0042-170
Explanation	You entered a platform type that is not known to NIM.
User Action	The valid platform types are rs6k , rs6ksmp , and rspc . Correct the platform type attribute and try the operation again.
Message	0042-171
Explanation	Not all platform types are supported on all configuration types. For example, the diskless configuration type is not supported on the platform type rs6ksmp .
User Action	Use the correct platform type and try the operation again.
Message	0042-172
Explanation	You have specified the incorrect name of the machine object for the NIM client machine. When the niminit command is used to rebuild the niminfo file, the master registration process checks the CPU ID of the machine with the value stored in the NIM database for the named machine. If the stored value does not match the value passed by niminit , this message is issued.
User Action	Use the correct name and try the command again.
Message	0042-173
Explanation	You specified that the installp command should expand file systems (using the -X flag) while specifying that NIM should not auto expand (using the auto_expand attribute). This is not an allowable combination for the command invoked.
User Action	Use either the -X flag or the auto_expand attribute, but not both.
Message	0042-174
Explanation	You specified an invalid value for an attribute whose only valid values are yes and no .
User Action	Retry the operation with a value of yes or no for the attribute indicated.
Message	0042-175
Explanation	An unexpected result has been returned from a command that NIM tried to execute.
User Action	Fix the problem that caused the executed command to fail and try the operation again.
	If the command failed due to a shortage of space, its error messages indicating this should be displayed. Expand the indicated file system, (for most NIM operations use the auto_expand attribute) and retry the operation. If a space failure occurred during SPOT creation, and if the bosboot command failed to make boot images as a result, increase the free space and run the check operation.
	If the command listed by NIM in this message is the installp command, check the nim.installp log for failure and recovery information. (For standalone client operations, this is located in the /var/adm/ras directory of the client. For SPOT cust and maint operations, this is located in SPOTParentDir/SPOTName/usr/lpp/bos/inst_root/var/adm/ras on the SPOT . For diskless and dataless clients, this is located in RootResrcParentDir/ClientName/var/adm/ras .)
Message	0042-176
Explanation	The resource cannot serve as a support image (simages) lpp_source . When an lpp_source serves as a support image resource, it contains a minimal set of software packages for facilitating installation and the use of the base operating system.
User Action	No action is necessary if this resource does not need to serve as a support images lpp_source . If the resource needs to be a support images lpp_source , add the missing software to the lpp_source . If the lpp_source is a directory, you can do this by copying the missing packages to the location of the lpp_source and running the check operation.
Message	0042-177
Explanation	The operation you requested could not be completed due to insufficient free space in one or more file systems.

User Action	Make more space available if possible, by extending the file system displayed. For most NIM operations, the auto_expand attribute is available to automatically expand file systems.
Message	0042-178
Explanation	The if attribute is made up of four fields. The fourth field is optional in most cases. In this case, the network object that you specified (in field <i>one</i>) has more than one type of network. In this case, NIM requires that the fourth field has a value that specifies the logical device name of the network adapter.
User Action	Add the appropriate value to the if attribute, and try the operation again.
Message	0042-179
Explanation	You are attempting to remove an if or other_net_type attribute on which one or more NIM clients have a dependency.
User Action	If this is not a mistake, remove the NIM clients that are dependent on the network, or remove the if attribute from the NIM client object definition.
Message	0042-180
Explanation	The address of the machine that is being defined is not connected to the network that is represented by the specified network object.
User Action	Define a network object that represents the physical network to which the machine is connected. Use this network object when defining the machine.
Message	0042-181
Explanation	The fix_query_flags attribute has an illegal value. Use lsnim -Pa fix_query_flags for a list of legal values.
User Action	Determine the correct flags and retry the operation.
Message	0042-182
Explanation	A resource of one type cannot be allocated for the current operation at the same time as a resource of another type. Allocate one or the other, but not both.
User Action	The resources specified are mutually exclusive. Determine which one is needed for the operation, and omit the other.
Message	0042-183
Explanation	An attribute cannot be specified for the current operation when a type of resource is allocated. Use one or the other, but not both.
User Action	The attribute and the resource specified are mutually exclusive. Determine which one is needed for the operation, and omit the other.
Message	0042-184
Explanation	The network address (net_addr) or subnet mask (snm) cannot be changed for the network, because NIM clients are currently defined as being connected to that network. Remove the client definitions before changing the network.
User Action	The nimdef command can be used to quickly redefine NIM clients after they have been removed to update the network definition.
Message	0042-185
Explanation	Failed to link or copy files. Check permissions and file system space.
User Action	Verify that space and inodes are available for the files and links specified in the error message.
Message	0042-186
Explanation	Failed to copy setup programs. Either start NFS on the client or free 1000 512-byte blocks in the file system.
User Action	Programs required to set up the operation could not be copied to the client system. Either start NFS on the client, or increase space in the file system specified in the error message.
Message	0042-187

Explanation	Failed to expand file system.
User Action	Attempt to manually expand the file system specified in the error message, then retry the operation.
Message	0042-188
Explanation	Failed to NFS mount.
User Action	Verify that NFS is running on both the resource server and the client specified in the error message. Retry the operation when the NFS problems have been resolved.
Message	0042-189
Explanation	Failed saving existing boot image. Check space in the file system.
User Action	Increase space in the file system specified by the error message, and retry the operation.
Message	0042-190
Explanation	The key is <i>not</i> in the NORMAL position. Unattended installation cannot complete unless the key is in the NORMAL position.
User Action	Turn the key on the client machine to the NORMAL position and retry the operation.
Message	0042-191
Explanation	Unable to write the IPLROM emulation.
User Action	The mkboot command failed to write the IPLROM emulation on the client. Boot the client manually over the network to begin the BOS installation.
Message	0042-192
Explanation	Unable to find boot logical volume.
User Action	Verify that a boot logical volume is defined for the machine. NIM attempts to use the lslv -l hd5 command to determine the boot logical volume.
Message	0042-193
Explanation	The client does not have an .rhosts entry for the master, or the client host ID is not resolvable.
User Action	Verify that the client host name is resolvable by the master. Then verify that an entry exists for the master in the \$HOME/.rhosts file for root on the client machine.
Message	0042-194
Explanation	The client does not allow NIM push operations. Remove /etc/nimstop on %s if push operation is necessary.
User Action	On the client machine, run the nimclient -p command to re-enable master push permissions.
Message	0042-195
Explanation	Unable to order boot device list.
User Action	An error was returned by the bootlist command on the client. If a network boot must be performed for a bos_inst , diag , or maint_boot operation, manually set the boot list and reboot the client, or follow the normal procedure to boot the client over the network.
Message	0042-196
Explanation	The set_bootlist attribute is only valid when used in combination with the no_client_boot or boot_client attributes.
User Action	Only specify the set_bootlist attribute to the nim command when changing the default behavior with the no_client_boot or boot_client attributes.
Message	0042-197
Explanation	If the target machine has more than one interface for a given network type, the network adapter's logical device name must be specified in the if1 attribute of the target machine's NIM definition when using the force_push attribute.
User Action	Modify the client's if1 attribute using the NIM change operation. Change the if1 attribute to include one of the client's network adapter logical device names listed in the error message.

Message	0042-198
Explanation	When converting a machine's /usr file system to a SPOT , the bos image on the media (lpp_source) being used to create the SPOT must match the bos image that was used to install the machine.
User Action	When defining the /usr SPOT , use the same installation media that was used to install the machine originally.
Message	0042-199
Explanation	The no_client_boot and boot_client attributes may not be specified together.
User Action	To avoid the possibility of giving conflicting instructions to the NIM command, do not supply both the no_client_boot and boot_client attributes in the same NIM operation.
Message	0042-204
Explanation	The mk_image and source attributes are only valid when specified together.
User Action	When creating a mksysb resource from a running client machine, use the mk_image=yes attribute to indicate that a mksysb should be created, and use the source=ClientName attribute to specify the name of the client that is to be backed up.
Message	0042-205
Explanation	The bos.sysmgmt.sysbr fileset must be installed on the client to perform the system backup. You may install this fileset with the NIM cust operation.
User Action	Install the bos.sysmgmt.sysbr fileset on the client machine before retrying the operation.
Message	0042-206
Explanation	There is already a resource allocated.
User Action	Only one resource of the type specified can be allocated to the client. Deallocate the first resource before attempting to allocate the other.
Message	0042-207
Explanation	Unable to allocate a resource to a client.
User Action	Look for other NIM error messages that may accompany this error and which may provide more information about the problem. Verify that the resource specified is NFS-exportable to the client.
Message	0042-208
Explanation	Unable to lock a client. This could mean that the client is already locked, or the name given does not refer to a valid NIM client.
User Action	If another NIM operation is being performed on the same client, wait for the process to complete before retrying the operation. If no other NIM operations are being performed, stop and restart the nimesis daemon to remove locks.
Message	0042-209
Explanation	The mksysb_flags attribute contains an illegal value. Use the lsnim -Pa mksysb_flags command to get a list of legal values.
User Action	Specify the correct values for the mksysb_flags attribute, and retry the operation.
Message	0042-210
Explanation	The maximum space required for the backup is greater than the amount of free space in the target file system. To ignore space requirements, use the -F flag when defining the mksysb resource.
User Action	Either increase the space of the target file system where the mksysb is to be created, or use the -F flag as specified in the error message.
Message	0042-211
Explanation	The member already exists in group.
User Action	No additional action is required, since the member is already added to the group.

Message	0042-212
Explanation	The member was not added to the group, because it is not a valid NIM name.
User Action	The name of a member to add to a group was invalid. Verify that the member was specified correctly.
Message	0042-213
Explanation	The group was not created, because it did not contain any valid members.
User Action	A group must contain at least one member. Redefine the group with valid members to add it to the NIM environment.
Message	0042-214
Explanation	Unable to add a member to a group.
User Action	Look for other NIM error messages that may accompany this error and which may provide more information about the problem.
Message	0042-215
Explanation	An invalid log type for the showlog operation was specified.
User Action	Specify one of the valid log types listed in the error message.
Message	0042-216
Explanation	An invalid log type for the showlog operation was specified for a SPOT .
User Action	Specify one of the valid log types listed in the error message.
Message	0042-217
Explanation	An invalid log type for the showlog operation was specified for a diskless or dataless machine.
User Action	Specify one of the valid log types listed in the error message.
Message	0042-218
Explanation	The log file is either empty or does not exist.
User Action	No information is available in the log file for the machine or SPOT specified.
Message	0042-219
Explanation	The object is incompatible with the group.
User Action	The object cannot be added to the group, because its type is not allowed in the group. Machine groups can only contain one type of NIM client, and that type is determined by the first member added. Resource groups can only contain members whose types are resources.
Message	0042-220
Explanation	You cannot have more than one resource of the specified type in a resource group.
User Action	You must remove the current member with the specified type from the resource group before the new member with the same type can be added.
Message	0042-221
Explanation	The group <i>GroupName</i> is being removed, because its single remaining member was removed during this operation.
User Action	A group cannot be empty. Redefine the group with at least one member if it should remain in the NIM environment.
Message	0042-222
Explanation	An unknown error occurred allocating resources to the machine.
User Action	Look for other NIM error messages that may accompany this error and which may provide more information about the problem. Verify that the resource specified is NFS-exportable to the client.
Message	0042-223
Explanation	Invalid input file. The file either cannot be read, is empty, or contains no valid entries.

User Action	Verify that the file specified in the error message is the correct file for the operation.
Message	0042-224
Explanation	The limit on the length of a line in an NFS exports file was exceeded. The export operation cannot be performed.
User Action	Manually edit the /etc/exports and /etc/xtab files to remove any obsolete entries. The number of hosts to which NIM can NFS-export a resource can also be increased by setting the restrict_nfs_exports attribute to no on the master by running the nim -o change -a restrict_nfs_exports=no master command.
Message	0042-225
Explanation	An error occurred while updating the exports file. Check for corruption in the file.
User Action	Manually edit the /etc/exports and /etc/xtab files to fix any file corruption problems. Attempt to determine why NIM was unable to successfully update the files. Check file and directory permissions, and verify that file systems are not full.
Message	0042-226
Explanation	A timeout occurred while attempting to initiate the operation on the client. The operation may not have started successfully.
User Action	If the operation that was performed was bos_inst , the client only needs to be rebooted manually over the network to begin the installation. For all other operations, the problem is most likely due to network communication problems between the master and the client. Verify that the client is reachable by the master and that rsh permission is still granted by the client to the master.
Message	0042-227
Explanation	The state of the machine indicates that it may not be ready for certain NIM operations.
User Action	Check to see if any NIM operations are still being performed on the machine. If not, reset the state of the machine with the nim -Fo reset MachineName command. This returns the machine to the ready state so NIM operations can be performed on it. The reset operation does not deallocate resources, so deallocate resources if necessary using the nim deallocate operation.
Message	0042-228
Explanation	Invalid release level.
User Action	The release level of the resource is incomplete, or incorrectly specified. The level of the resource can be obtained by running the lsnim -l ResourceName command and viewing the version , release , and mod attributes. To correct the problem, either recreate the resource, or modify the NIM database to contain the correct level using the command on the NIM master: usr/lpp/bos.sysmgmt/nim/methods/m_chattr -a Attribute = Value ResourceName , where <i>Attribute</i> is version , release , or mod ; <i>Value</i> is the correct value; and <i>ResourceName</i> is the name of the resource with the incorrect level specification.
Message	0042-229
Explanation	When installing a system using a mksysb as the source for the installation, the level of the SPOT used for the installation must match the level of the mksysb image being installed. The release levels of the SPOT and the mksysb do not match.
User Action	Create a SPOT that matches the level of the mksysb being installed, and use that SPOT when performing a mksysb BOS installation. The level of mksysb and SPOT resources can be obtained by running the lsnim -l ResourceName command and viewing the version , release , and mod attributes.
Message	0042-230
Explanation	When installing a system using a mksysb as the source for the installation, the level of the SPOT used for the installation should match the level of the mksysb image being installed. If this convention is not followed, the installation may not complete successfully.

User Action	Create a SPOT that matches the level of the mksysb being installed, and use that SPOT when performing a mksysb BOS installation. The level of mksysb and SPOT resources can be obtained by running the lsnim -l ResourceName command and viewing the version , release , and mod attributes.
Message	0042-231
Explanation	A temporary list of software that should be installed is created and used for this operation. The list could not be created.
User Action	Check previous error messages to understand why the error occurred. Correct the problem and try the operation again.
Message	0042-232
Explanation	A temporary installp_bundle resource is created and used for this operation. The temporary resource could not be created.
User Action	Check previous error messages to understand why the creation of the resource failed. Correct the problem and try the operation again.
Message	0042-233
Explanation	The operation cannot be performed because the NIM Master is already initialized.
User Action	Unconfigure the NIM Master and try the operation again.
Message	0042-234
Explanation	You cannot restore a NIM database backup onto a machine that has an earlier level of the NIM master fileset installed. For example, a NIM database backup of a system with level 4.2.0.0 of the NIM master cannot be restored to a system that has a level of the NIM master lower than 4.2.0.0.
User Action	Install a level of the NIM master fileset that is at the same level or a later level than that from which the backup was created. Then attempt to restore the NIM database backup.
Message	0042-235
Explanation	An image source was not specified for creating the SPOT .
User Action	Specify a device containing installation images or specify an lpp_source with the simages attribute for creating the SPOT .
Message	0042-236
Explanation	A name for the lpp_source and/or a directory to contain the lpp_source was not specified for the lpp_source that will be created.
User Action	Specify a name and a directory for the lpp_source and try the operation again.
Message	0042-237
Explanation	A name for the SPOT and/or a directory to contain the SPOT was not specified for the SPOT that will be created.
User Action	Specify a name and a directory for the SPOT and try the operation again.
Message	0042-238
Explanation	A parent directory was not specified for the diskless and dataless machine resources that will be created.
User Action	Specify a directory for the diskless/dataless machine resources and try the operation again.
Message	0042-239
Explanation	A name for the resource and/or directory to contain the resource was not specified for the resource that will be created.
User Action	Specify a name and a directory for the resource and try the operation again.
Message	0042-240
Explanation	A parent directory was not specified for the diskless and dataless machine resources that will be created.

User Action	Specify a directory for the diskless/dataless machine resources and try the operation again.
Message	0042-241
Explanation	The size and/or volume group was not specified for the creation of a new file system to contain a NIM resource.
User Action	Specify both the size and volume group for the file system and try the operation again.
Message	0042-242
Explanation	The size and/or volume group was not specified for the creation of a new file system to contain diskless and dataless machine resources.
User Action	Specify both the size and volume group for the file system and try the operation again.
Message	0042-243
Explanation	An attempt was made to create the same file system twice: once for an lpp_source and once for a SPOT .
User Action	Specify a different directory for either the lpp_source or the SPOT . This will cause different file systems to be created for the resources. If a new file system really should be created to contain both resources, then only specify that the file system should be created for one of the resources, but specify the same directory for both resources.
Message	0042-244
Explanation	An attempt was made to create the same file system twice: once for an lpp_source and once for diskless/dataless machine resources.
User Action	Specify a different directory for either the lpp_source or the diskless/dataless resources. This will cause different file systems to be created for the resources. If a new file system really should be created to contain both sets of resources, then only specify that the file system should be created for one of the resources, but specify the same directory for both resources.
Message	0042-245
Explanation	An attempt was made to create the same file system twice: once for a SPOT and once for diskless/dataless machine resources.
User Action	Specify a different directory for either the SPOT or the diskless/dataless resources. This will cause different file systems to be created for the resources. If a new file system really should be created to contain both sets of resources, then only specify that the file system should be created for one of the resources, but specify the same directory for both resources.
Message	0042-246
Explanation	Not enough space on the volume group to create the specified file system.
User Action	Specify a different volume group for the file system to be created and try the operation again.
Message	0042-247
Explanation	Creation of the file system failed.
User Action	Check the previous output for error messages to understand what caused the file system creation to fail. Correct the error and try the operation again.
Message	0042-248
Explanation	An error occurred during file system creation.
User Action	Check the previous output for error messages to understand what caused the file system creation to fail. Correct the error and try the operation again.
Message	0042-249
Explanation	NIM master initialization failed.

User Action	Check the previous output for error messages to understand what caused the configuration of the NIM master to fail. Correct the error and attempt to reinitialize the master. The most frequent cause of this failure is that the master is already initialized. The master can be unconfigured with the nim -o unconfig master command and reinitialized. However, this should be done with extreme caution, since unconfiguring the master will remove all definitions from the NIM database.
Message	0042-250
Explanation	Unable to continue with configuration.
User Action	Check the previous output for error messages to understand what caused the configuration to fail. Correct the error and attempt to configure the system again from the point of failure.
Message	0042-251
Explanation	A route cannot be added to the network, because a required default route is missing. Add a default route to the network, and try this operation again.
User Action	Add a default route to the network specified in the error message, and retry the operation.
Message	0042-252
Explanation	Unable to locate a matching network.
User Action	The find_net keyword was used in the if attribute of the machine. However, no matching network was found. Either define the network prior to defining the machine interface, or use the net_definition attribute in conjunction with the find_net keyword to define the network while the interface is being defined.
Message	0042-253
Explanation	You cannot use the net_definition attribute when the find_net keyword is not specified as the first field of the if attribute.
User Action	The net_definition attribute is invalid when using a known network in the if attribute. Specify the find_net keyword in the if attribute, or omit the net_definition attribute, and retry the operation.
Message	0042-254
Explanation	Invalid format for the specified value of net_definition . The value of the attribute should be as follows:
	<i>NetType</i> Network type (for example, tok, ent, fddi, etc.).
	<i>snmName</i> Dotted decimal subnet mask for the network.
	<i>Client_gwName</i> Optional default gateway IP address or host name used by the machine being defined to communicate with the master.
	<i>Master_gwName</i> Optional default gateway IP address or host name used by the master to communicate with clients on other subnets.
	<i>NetName</i> Optional name given to the NIM definition created for the network. (Otherwise, a unique default name is used.)
	If you want to specify <i>NetName</i> and if <i>Client_gwName</i> or <i>Master_gwName</i> are not applicable, specify 0 in their place. If <i>Client_gwName</i> is 0 , <i>Master_gwName</i> cannot be nonzero.
User Action	Correct the syntax error, and retry the operation.
Message	0042-255
Explanation	The master already has a default route, and the gateway you specified as being the default for the master is different from that which is already defined. Use the change operation if you want to modify the master's default gateway.

User Action	To change the default gateway for a network, use the following command: <pre>nim -o change -a routingX="default GtName" NetName</pre> <p>where <i>X</i> is the sequence number for the routing attribute; <i>GtName</i> is the default gateway to use; and <i>NetName</i> is the name of the master's network.</p>
Message	0042-256
Explanation	A default route already exists for the network. You can modify the default gateway, but you cannot define more than one default route.
User Action	To change the default gateway for a network, use the following command: <pre>nim -o change -a routingX="default GtName" NetName</pre> <p>where <i>X</i> is the sequence number for the routing attribute; <i>GtName</i> is the default gateway to use; and <i>NetName</i> is the name of the network to modify.</p>
Message	0042-257
Explanation	You cannot specify the net_definition attribute without specifying the if attribute when changing a machine definition.
User Action	The net_definition must reference a machine interface, so specify an if attribute when using the net_definition attribute.
Message	0042-258
Explanation	You cannot specify the net_definition attribute when creating or modifying more than one if attribute in the same change operation. Use two separate operations.
User Action	To avoid ambiguity, manipulate only one machine interface (if attribute) at a time when using the net_definition attribute.
Message	0042-259
Explanation	The value of default_res specified on the master's database definition is not a valid NIM resource group.
User Action	Specify a valid NIM resource group as the default resource. Obtain a list of resource groups by running the lsnim -t res_group command.
Message	0042-260
Explanation	The default attribute is only applicable when manipulating a resource group.
User Action	Setting the default=yes/no attribute on a resource group makes it the default set of resources to use in NIM operations. The default attribute is invalid when used as an attribute in other NIM operations.
Message	0042-261
Explanation	Illegal use of the async attribute. This attribute can only be specified for the lppchk operation when the target is a standalone machine or a group of standalone machines.
User Action	Omit the async attribute when performing the lppchk operation, unless the target is a standalone machine or a group of standalone machines.
Message	0042-262
Explanation	The file name of the client definition file is missing for this operation.
User Action	Specify the client definition file that should be used to add machines to the NIM environment. For more information, see "NIM Commands" on page 256.
Message	0042-263
Explanation	The netboot_kernel attribute can only be assigned a value of up or mp .
User Action	Correct the value specified for the netboot_kernel attribute.
Message	0042-264
Explanation	The image source that was used to define the lpp_source is missing one or more requested packages.

User Action	Installation images were not copied into the lpp_source directory. The source for installation images may not contain all of the filesets specified to populate the lpp_source . Copy the missing installation images to the lpp_source directory, and then perform the NIM check operation on the lpp_source .
Message	0042-265
Explanation	The image source that was used to define the lpp_source is missing one or more items from the list of default packages.
User Action	Installation images were not copied into the lpp_source directory. The source for installation images may not contain all of the default filesets used to populate the lpp_source . Copy the missing installation images to the lpp_source directory, and then perform the NIM check operation on the lpp_source .
Message	0042-266
Explanation	Requested packages are missing from the defined lpp_source .
User Action	Installation images were not copied into the lpp_source directory. The fileset names may have been specified incorrectly, or the source for installation images may not contain all of the specified filesets. Copy the missing installation images to the lpp_source directory, and then perform the NIM check operation on the lpp_source .
Message	0042-267
Explanation	The defined lpp_source does not have the simages attribute, because one or more packages are missing.
User Action	Copy the missing installation images to the lpp_source directory, and perform the NIM check operation on the lpp_source to add the simages attribute.
Message	0042-268
Explanation	The operation cannot be performed, because all members of the target group specified are currently excluded from operations on the group. You must unmark (or include) excluded group members before proceeding.
User Action	Perform the NIM select operation on the group to include members in further operations.
Message	0042-269
Explanation	Only one type of verification can be performed at a time when verifying installed filesets on a NIM client.
User Action	Disable or deselect all but one verification option and try the operation again.
Message	0042-270
Explanation	The operation is only supported on SPOTs and NIM clients installed with a version and release level of AIX 4.2 or greater.
User Action	The NIM client fileset on the target is at an earlier level and does not support the attempted operation. The client software on the target must be upgraded before the operation can be performed.
Message	0042-271
Explanation	A resource matching the type is already allocated. You cannot allocate more than one resource of this type to a machine.
User Action	Deallocate the first resource before attempting to allocate the second. It may be necessary to reset the machine before the resource can be deallocated.
Message	0042-272
Explanation	A value specified is not a valid value for default_re because it is not a valid NIM resource group.
User Action	Specify a different resource group for the default_res attribute, or correct the resource group in question.
Message	0042-273

Explanation	A value specified cannot be used as the location for the mksysb image because it is a directory. You must specify the filename where the mksysb image currently resides or will reside after creation.
User Action	Specify a file name instead of a directory for the location of the mksysb resource.
Message	0042-274
Explanation	The -e flag in the mksysb_flags attribute and the exclude_files attribute cannot be specified together. Specify the -e flag with the mksysb_flags attribute to exclude the files in /etc/exclude.rootvg from the backup, or specify an exclude_files attribute.
User Action	Do not specify both the -e mksysb flag and an exclude_files resource when performing this operation.
Message	0042-275
Explanation	Unable to obtain possession of a lock file. If no NIM operations are currently in progress, remove the file and repeat the operation.
User Action	Use the ps -ef grep nim command to list the running NIM processes on the system. If any NIM processes other than the nimesis daemon are running, wait for them to finish and then remove the file specified by the error message.
Message	0042-276
Explanation	A fileset must be installed before this operation can be performed.
User Action	Install the fileset listed in the error message before retrying the operation. Generally, the fileset needs to be installed on the client system. However, depending on the operation being performed, the NIM master may also need to have the fileset installed before the operation will succeed.
Message	0042-277
Explanation	Diskless and dataless machines cannot be defined with a primary network install interface residing on a generic NIM network. It is presumed that a network adapter defined on a generic NIM network does not support network boot.
User Action	To define the systems as diskless or dataless clients, they must first be connected to a NIM network that is known to support network boot, such as ethernet, token-ring, or FDDI.
Message	0042-278
Explanation	The interface specified does not correspond to a network adapter that is known to support network boot. As a result, the NIM master has been defined on a generic NIM network. Network boot-dependent operations, such as base operating system installation, will not be possible on any NIM client whose primary network install interface is defined on the same network as the NIM master.
User Action	Operations that rely on network boot capability cannot be performed on clients on generic NIM networks. Such operations must be performed using local media on the system.
Message	0042-279
Explanation	The interface specified maps to a subnet which has been defined as a generic NIM network. It will not be possible to perform network boot-dependent operations, such as base operating system installation, on the machine definition created by this operation.
User Action	Operations that rely on network boot capability cannot be performed on clients on generic NIM networks. Such operations must be performed using local media on the system.
Message	0042-280
Explanation	Specify a complete date and time for the scheduled operation in the form: YYMMDDhhmm.
User Action	Use the format described in the error message to correctly schedule a date and time for the operation.
Message	0042-281

Explanation	The /usr file system on the specified server cannot be converted to a NIM SPOT . Either the RM_INST_ROOTS variable was set to yes in a bosinst.data file during initial installation of the machine or inurid -r was subsequently invoked. The only way to create a SPOT on this machine is to specify the location to be something other than /usr or reinstall the machine and then create a SPOT in /usr .
User Action	The system is unable to support the creation of a /usr SPOT . A non-usr SPOT may be created on the system by specifying a different value for the location attribute.
Message	0042-282
Explanation	The BOS installation has been enabled but could not be initiated, because the following file was not found on the target. To start the installation, do one of the following: <ol style="list-style-type: none"> 1. Initiate a network boot operation from the target. 2. Correct the state of the target with NIM's reset operation and invoke the bos_inst operation again using one of the following: <ol style="list-style-type: none"> a. The Force Push option (-a force_push=yes) b. After installing and configuring the bos.sysmgmt.nim.client fileset on the target.
User Action	The NIM client fileset is not properly installed and configured on the target system. Follow the directions specified in the error message to correct the problem.
Message	0042-283
Explanation	The existence of a file on the server indicates that a NIM SPOT may still be mounted in a subdirectory which will be removed by this operation. Before attempting the operation again, unmount the SPOT 's directory along with any other directories that may be mounted beneath the directory being removed.
User Action	Failure to do so will result in loss of data on the SPOT server. A SPOT operation failed, and NIM was unable to unmount all the directories mounted into the SPOT . Manually unmount the directories specified in the error message before retrying the operation. The mount command can be used to list the directories mounted on the system, and the unmount command can be used to unmount directories. Use the -f option with the unmount command if necessary to force the unmount.

Troubleshooting NIM

Solutions for network boot problems and procedures for producing debug output for NIM BOS installations is described.

Refer to “NIM error and warning messages” on page 323 for information about error messages.

Debugging a network boot problem

If a client machine is unable to network boot from its boot server, there may be a problem in one or more of the network boot stages.

The network boot stages are listed in the following tasks:

Verifying network communication between the client and server:

Before initiating the network boot on the client, perform these steps to verify network communication between the client and the server.

1. Perform a ping test from the client **bootp** menus.
2. If the ping test fails, verify that the client, server, and gateway addresses are specified correctly.
3. If the addresses are correct, try to ping the server from a different machine in the client's subnet.

If the server can be pinged from another machine, the network adapter on the boot client may be faulty.

4. If the server cannot be pinged from another machine in the client's subnet, there may be routing problems between the client and the server, or network communications on the server may be faulty. For information on network-debugging procedures, refer to TCP/IP troubleshooting in the *Networks and communication management*.

Obtaining the boot image from the server:

Follow this procedure to obtain the boot image from the server.

1. If the ping test is successful, perform a network boot of the client. When a network boot is initiated on a client, a **bootp** request packet is sent from the client to the server. The server then replies with a packet to the client. The client machine displays the number of packets sent and received for the **bootp** request. If a packet is sent from the client, but none is received, another packet will be sent. If **bootp** packets continue to be sent but not received, the boot server may not be responding to the request.
2. From the **bootp** server, view the **/etc/bootptab** file on the server. It should contain an entry for the client machine with the following information:

```
hostname_of_client
bf=boot_file
ip=client_ip_address
ht=network_type
sa=boot_server_address
sm=client_subnet_mask
ha=network_adapter_hardware_address (required only if bootp requests are sent by broadcasting)
```

If an entry does not exist, either the NIM command used to set up the current operation failed, or the machine was reset before the boot operation could occur. Rerun the NIM **bos_inst**, **diag**, or **maint_boot** operation to prepare the server for the client boot request.

If the entry exists in **/etc/bootptab**, verify that the specified data is correct. If a field contains incorrect data, the information that was used to define the machine or network in the NIM database was probably incorrect. Correct this problem by resetting the client machine, correcting the invalid data in the client or network definition, retrying the NIM operation, and rebooting the client.

3. If the **/etc/bootptab** file is correct, verify that the **inetd** daemon is running. If it is not running, start it and retry the network boot from the client. If the **inetd** daemon is running, it should automatically start the **bootpd** daemon when the **bootp** request is received at the server.
4. If the **bootpd** daemon is not started, verify that the **bootps** entry in the **/etc/inetd.conf** file is not commented out. If it is commented out, uncomment it and restart **inetd** with the **refresh -s inetd** command. Retry the network boot from the client.
5. If a **bootp** reply is still not received at the client, manually start the **bootpd** daemon in debug mode:
 - a. Comment out the **bootps** entry from the **/etc/inetd.conf** file on the server.
 - b. Stop all running **bootpd** processes.
 - c. Restart **inetd** using the **refresh -s inetd** command.
 - d. Start **bootpd** from the command line, using the **/usr/sbin/bootpd -s -d -d -d** command.
6. Retry the network boot from the client. If no output is displayed from the running **bootpd** command, the client **bootp** request is not reaching the server. Verify that the addresses specified in the **bootp** menus are correct. If they are correct, perform network debugging procedures to determine why the packet is not reaching the server.

If the server receives the client **bootp** request, the running **bootpd** command displays output matching the client data in the **/etc/bootptab** file. Verify that the specified addresses are correct. This information is sent back to the client in the **bootp** reply.
7. If the client is still not receiving the **bootp** reply, perform network-debugging procedures to determine why the reply packet is not reaching the client.

After the client receives the **bootp** reply, it will **tftp** the boot image from the server.

The number of **tftp** packets transferred to the client will be displayed at the client machine.

The boot image has been successfully retrieved at the client machine when the LED shows 299 on **rs6k**-platform machines or when the bottom third of the screen turns gray on other platform machines.

8. If the **tftp** of the boot image does not complete successfully, the client may be trying to get the wrong boot image. Verify that the client definition in the NIM database shows the correct platform and kernel type. If the data is incorrect, correct it, reset the client machine, rerun the NIM operation, and reboot the client over the network.
9. Verify that the **/tftpboot** directory on the boot server contains a link with the client name to the correct boot image. If the link does not exist, reset the client machine, rerun the NIM operation, and reboot the client over the network.
10. If the link with the client name is pointing to the correct boot image and the **tftp** of the boot image does not complete successfully, the boot image may be corrupted. Re-create the boot image by performing a NIM **check** operation with the **force** flag on the **SPOT**. If the client is not an **rs6k**-platform machine, also make sure the client has the latest version of the firmware installed.

Running the boot image on the client:

After the client machine has successfully received the boot image from the server, the most common errors encountered are hangs with the LED showing 608, 611, or 613. Some machines may not have LED displays. Debugging such problems on these machines will require using debug-enabled boot images.

For information on building debug boot images, see “Producing debug output from the BOS installation program” on page 354.

608

Explanation

tftp retrieve of client info file failure.

Action

If a 608 hang is encountered, verify that the *ClientName.info* file exists in the **/tftpboot** directory. If it does not exist, retry the NIM operation to create it. If it does exist, verify that **tftp** access to the **/tftpboot** directory is not restricted in the **/etc/tftpaccess.ctl** file. It is also possible that the network adapter was not configured properly in the boot environment. Use debug-enabled network boot images to look for errors in the boot environment. If the client is not an **rs6k**-platform machine, make sure that it has the latest version of firmware installed.

611

Explanation

Remote mount of NFS file system failure.

Action

611 hangs occur when the client machine is unable to mount a resource from a server. Ensure that NFS is running on the resource server. Verify that the resources specified for the operation are exported properly by checking the **/etc/exports** and **/etc/xtab** files on the server. Also, confirm that the resources have permissions set correctly for reading. Debug-enabled network boot images can also be used to determine exactly which **mount** command is failing on the client.

613

Explanation

Failure setting up route tables.

Action

613 hangs usually occur because a route is incorrectly defined for a network in the NIM database. Verify that the correct gateways are specified between networks, and all gateways are functional. Use debug-enabled network boot images to determine which routes could not be defined.

Obtaining debug output for NIM BOS installations

Due to problems in the network or in the NIM configuration, clients may fail to boot or install properly. When this happens, it may be necessary to obtain debug information in order to determine the cause of the problem.

If a client machine fails to configure properly from the network boot image, debug output from the boot image can be obtained by building the debug-enabled image and attaching a tty to the client system. This will display the commands and output that are run while the client is configured before further processing is done by AIX.

If the system has been booted from the network boot image, but failures are still occurring during a BOS installation, it may be necessary to collect debug information from the BOS installation program. The commands and output from the BOS installation program will automatically be displayed on the tty if the boot image was built debug-enabled. If the boot image was not built for debugging, output can be obtained by either setting a value in a **bosinst.data** file or by entering special codes at the installation menus.

When problems arise during a NIM BOS installation, you will most likely get system hangs. Viewing the debug output can be useful, because you will be able to see the commands that failed. The problem may be a misconfiguration of the network adapter or an inability to perform an operation from the client to the server. By examining the debug output, you can determine what failed and make corrections to avoid the error in the future.

You will see the **showled** command running in the debug output. This command displays status values on the LEDs on the front of the machine. Frequently, known problems and solutions are referenced by the LED value that is displayed when a problem occurs. Some machines do not have LEDs for displaying such information. Therefore, when debugging problems on such machines, give special attention to observing the values that the **showled** commands are displaying.

Obtaining debug information from a network installation can save you time in determining the root cause of a problem. Usually, the problem will be an incorrect definition in the NIM environment that can be found without the debug information. However, with the debug information, you can significantly reduce the scope of the investigation.

Producing debug output from a network boot image

Use these commands to create debug versions of the network boot images.

1. Use the Web-based System Manager or SMIT interfaces or run the following command:

```
nim -Fo check -a debug=yes SPOTName
```

where *SPOTName* is the name of your **SPOT**.

2. Obtain the address for entering the debugger by doing the following:

From Web-based System Manager:

- a. From the NIM Resources container, double-click the **SPOT** resource to open the properties notebook.
- b. Click the Boot Image Information tab in the properties notebook to obtain the address.

Alternatively, you can use the following command to get the address:

```
lsnim -a enter_dbg SPOTName
```

where *SPOTName* is the name of your **SPOT**. The displayed output will be similar to the following:

```
spot1:  
  enter_dbg = "chrp.mp 0x001840d4"  
  enter_dbg = "chrp.up 0x00160b7c"  
  enter_dbg = "rs6k.mp 0x001840d4"  
  enter_dbg = "rs6k.up 0x00160b7c"  
  enter_dbg = "rspc.mp 0x001840d4"  
  enter_dbg = "rspc.up 0x00160b7c"
```

Write down the **enter_dbg** address for the client you are going to boot. For example, if your client is an **chrp**-uniprocessor machine, you would write down the address 160b7c.

3. Attach a tty device to your client system (port 1).

4. Set up and perform the NIM operation that will require the client to boot over the network. Boot the client over the network.
5. After the client gets the boot image from the **SPOT** server, the debug screen will appear on the tty. At the > prompt, enter:

```
st Enter_dbg_Value 2
```

 where *Enter_dbg_Value* is the number you wrote down in step 2 as your machine type's **enter_dbg** value. Specifying a 2 at the address of the **enter_dbg** value prints the output to your tty.
6. Type g (for go) and press Enter to start the boot process.
7. Use Ctrl-s to temporarily stop the process as you watch the output on the tty. Use Ctrl-q to resume the process.
8. To rebuild your boot images in non-debug mode, use the following command:

```
nim - Fo check SPOTName
```

where *SPOTName* is the name of your **SPOT**.

If the boot image is left in debug mode, every time a client is booted from these boot images, the machine will stop and wait for a command at the debugger ">" prompt. If you attempt to use these debug-enabled boot images and there is not a tty attached to the client, the machine will appear to be hanging for no reason.

Producing debug output from the BOS installation program

Method A involves entering a special value at one of the installation menus and Method B uses a **bosinst_data** resource to tell the installation program to display debug output.

Both methods are described as follows:

Producing debug output without using a bosinst_data resource (Method A):

Use this procedure to produce debug output without using a **bosinst_data** resource.

1. To enable debugging for the BOS installation program, start by performing all the processing you would normally do to install a client.
 Because you are not using a **bosinst_data** resource, you will be prompted to supply information about the installation to the BOS installation program.
2. Select your console.
3. Select your language.
4. The **Welcome to Base Operating System Installation and Maintenance** menu is displayed. Instead of selecting one of the options, type 911 at the prompt and press Enter.
5. Continue the normal procedure for selecting options and specifying data until the installation begins. Debug output will be sent to the client's display while the installation proceeds.

Producing debug output when using a bosinst_data resource (Method B):

Use this procedure to produce debug output when using a **bosinst_data** resource.

1. To enable debugging for the BOS installation program, set the value **BOSINST_DEBUG = yes** in the **control_flow** stanza of the **bosinst.data** file that you are using for your **bosinst_data** resource.

A minimum **bosinst.data** file for debugging purposes would contain the following lines:

```
control_flow:
  BOSINST_DEBUG = yes
```

2. In addition to the processing you would normally do to install a client, include the modified **bosinst_data** resource as a resource for the operation.

After the client boots over the network, it will use the **bosinst_data** resource to obtain settings for the installation. If the only data specified in your **bosinst.data** file is **BOSINST_DEBUG = yes**, you will be prompted for the remaining required information before the installation will continue. Debug output will be sent to the client's display while the installation continues.

Debugging when port number conflicts with NIM and other applications

Follow this procedure if the **nimesis** daemon will not run.

When the NIM Master is configured, two port numbers are selected to be used by the **nimesis** daemon for client communications. The default port numbers are 1058 and 1059. If either port is taken by another application, the **nimesis** daemon will not run and nimclient commands will fail with an error similar to the following:

0042-006 nimclient: (To master) rcmd connection refused

If the **nimesis** daemon cannot be started, it may be necessary to stop the other applicants on the system to free the port.

Rebooting the system will usually eliminate the problem, because when a machine is booted, the **nimesis** daemon is started very early by **init** and the likelihood that the ports are taken will be very small.

Partitioning

Partitioning your system is similar to partitioning a hard drive. When you partition a hard drive, you divide a single physical hard drive so that the operating system recognizes it as a number of separate logical hard drives.

You have the option of dividing the system's resources by using the Hardware Management Console (HMC) to partition your system. On each of these divisions, called *partitions*, you can install an operating system and use each partition as you would a separate physical system.

For additional information on managing partitions with the HMC, see Partitioning for AIX with an HMC.

Logical partitions

A *logical partition* (LPAR) is the division of a computer's processors, memory, and hardware resources into multiple environments so that each environment can be operated independently with its own operating system and applications.

The number of logical partitions that can be created depends on the system's processor model and resources available. Typically, partitions are used for different purposes, such as database operation, client/server operations, Web server operations, test environments, and production environments. Each partition can communicate with the other partitions as if each partition is a separate machine.

The AIX operating system supports partitioned environments. Although the AIX installation concepts are the same, the configuration and management of a partitioned environment with the AIX operating system are new.

A logical partition must contain a minimum set of resources, as follows:

- 1 GB of available system memory
- One available system processor
- One boot device on an assigned I/O slot
- One available network adapter (for error reporting)
- Any other adapters you might need on an assigned I/O slot

Processors, memory, and I/O slots can be allocated to any partition, regardless of their location. However, if you attempt to activate a partition, but the resources you specified are not available at the time, partition activation fails. It is important to keep track of your system's resources to avoid activation failures. PCI slots are assigned individually to partitions, and memory can be allocated in 256 MB increments. The granularity of the resources that can be assigned to partitions is very fine, providing flexibility to create

systems with just the desired amount of resources. Each partition runs its own copy of the AIX operating system and is isolated from any activity in other partitions. Software failures do not propagate through the system, and the hardware facilities and microcode isolate the resources.

Managed system

A managed system is a system that is physically attached to and managed by the Hardware Management Console (HMC).

You can use the HMC to perform tasks that affect the entire managed system, such as powering the system on and off. You can also create partitions and partition profiles within each managed system. These partitions and partition profiles define the way that you configure and operate your partitioned system.

Dynamic logical partitioning

Dynamic logical partitioning provides the ability to logically attach and detach a managed system's resources to and from a logical partition's operating system without rebooting.

For more information on dynamic logical partitioning, see the following:

- Dynamic logical partitioning in *Performance management*
- Dynamic logical partitioning in *AIX Version 6.1 General Programming Concepts: Writing and Debugging Programs*

Affinity logical partitions

An *affinity logical partition* is a special type of logical partition that uses system resources that are in close physical proximity to each other.

Some systems have the ability to create affinity logical partitions. Check your hardware specifications to see if your managed system is capable of using affinity logical partitions. When creating an affinity logical partition, the HMC automatically determines which system resources are to be used, based on their physical location to each other. The system resources that are automatically managed by the HMC are processors and memory. The user determines the I/O requirements for each of these partitions. The HMC then creates a profile for each affinity logical partition and a system profile for the managed system.

Full system partition

A special partition called the *Full System Partition* assigns all of your managed system's resources to one large partition.

The Full System Partition is similar to the traditional, non-partitioned method of operating a system. Because all resources are assigned to this partition, you cannot start any other partitions when the Full System Partition is running. You also cannot start the Full System Partition when other partitions are running. You should choose to use either the Full System Partition or create other partitions. Your I/O usage might be affected if you switch between these two options frequently.

Running AIX on a logical partition

There are several differences between how AIX runs on a logical partition and how it runs on a standalone server.

The following list describes some of these differences:

- The logical partition resource allocation provides the ability to select individual components to be added to a partition without dependencies between these resources. The slots can be freely allocated in any I/O drawer on the system. Other devices may be required for specific application requirements. It is a good idea to configure more PCI slots in the partition than are required for the number of adapters. This provides flexibility by allowing additional adapters to be hot-plugged into the empty slots that are part of

an active partition. Because each partition requires its own separate boot device, the system must have at least one boot device and associated adapter per partition.

- In order for AIX to run inside a logical partition, AIX calls the Hypervisor in place of its traditional direct access to the hardware and address-mapping facilities.
- Some direct-access calls are presented for diagnostic purposes, and alternate return codes for Run-Time Abstraction Services (RTAS) calls are used whenever an illegal operation is issued.
- No physical console exists on the partition. While the physical serial ports on the system can be assigned to the partitions, they can only be in one partition at a time. To provide an output for console messages and also for diagnostic purposes, the firmware implements a virtual tty that is seen by AIX as a standard tty device. Its output is sent to the HMC. The AIX diagnostics subsystems use the virtual tty as the system console.
- Certain platform operations are constrained in LPARs. For example, in non-LPAR systems, platform firmware updates can be performed from AIX by a root user. Because firmware updates can affect all partitions in an LPAR system, the LPAR administrator can specify that a particular partition (or no partition) has this authority. Within that partition, firmware updates work in the same way as they do for non-LPAR systems.

Apart from these considerations, AIX runs within a partition the same way it runs on a standalone server. No differences are observed either from the application or the administrator's point of view. Third-party applications need only be certified for a level of AIX that runs in a partition, and *not* for the LPAR environment itself.

Implementations of logical partitions

A logically partitioned environment adds to a portfolio of solutions that can provide better management, improved availability, and more efficient use of resources. You can implement logical partitions in multiple ways.

Server consolidation

If you have a server with sufficient processing capacity, you can logically subdivide the server into a number of separate smaller systems to enable server consolidation. Using partitioning for sever consolidation allows you to isolate applications, with the additional benefits of reduced floor space, a single point of management, and easier redistribution of resources as workloads change.

Mixed production and test environments

Usually, production and test environments should be isolated from each other. Partitioning enables separate partitions to be allocated for the production and test systems, eliminating the need to purchase additional hardware and software.

When testing has been completed, the resources allocated to the test partition can be returned to the production partition or elsewhere as required. You can also add extra resources to a partition if you want to move the partition from a test environment to a production environment. As new projects are developed, they can be built and tested on the same hardware where they will be deployed.

Consolidation of multiple versions of the same operating system

Different versions of AIX can exist on different logical partitions (LPARs) on the same system.

Consolidating multiple versions of AIX on a single system allows you to accommodate multiple application requirements without multiple systems. You can also create an LPAR to test applications under new versions of the operating system before you upgrade the production environments. Instead of having a separate server for this function, a minimum set of resources can be temporarily used to create a new LPAR where you test the application. When you no longer need the partition, you can incorporate its resources back into the other LPARs.

Remote management

You can use the Hardware Management Console (HMC) to manage your partitions remotely with Web-based System Manager or with the command line.

Each of the following system-management methods can be performed using the HMC interface or the command line.

- Use the HMC client to remotely manage any AIX partition or system. All AIX plug-ins on the AIX system can be managed remotely from the HMC client, provided that the Web-based System Manager framework version is compatible. The operating system checks each plug-in for compatibility with the Web-based System Manager framework. If it is not compatible for that plug-in, a message displays, indicating that the plug-in cannot be managed by the client.
- Use an AIX partition or system to remotely manage an HMC. All HMC plug-ins on the HMC server may be managed remotely from the AIX system, provided that the AIX system is at a compatible Web-based System Manager framework version. Otherwise, an error message displays indicating that the AIX system cannot manage the HMC server.
- Use Web-based System Manager Remote Client to remotely manage an HMC server. For instructions on how to install the Remote Client, refer to the *AIX Version 6.1 Web-based System Manager Administration Guide*. All HMC plug-ins on the HMC server may be managed remotely from the Remote Client, provided that the Remote Client is at a compatible Web-based System Manager framework version. Otherwise, an error message displays, indicating that the Remote Client cannot manage the HMC server. The only plug-in that is an exception is the Service Agent plug-in.
- Use an HMC client to remotely manage another HMC client. All HMC plug-ins on the HMC server may be managed remotely from the HMC client. The only plug-in that is an exception is the Service Agent plug-in.

For information on remotely managing partitions with the command line on the HMC, see *Using the HMC remote command line*.

For more information on remotely managing partitions with Web-based System Manager, see *Web-based System Manager Remote Client*. You can also view the following readme files:

- `/usr/websm/readme.html`
- `/usr/websm/readme.txt`

Partition security

System administrators can install a server with the Controlled Access Protection Profile (CAPP) and Evaluation Assurance Level 4+ (EAL4+) option during a base operating system (BOS) installation. If you select this option, there are restrictions on the software that is installed during BOS installation and network access restrictions.

Starting with AIX 5L Version 5.2 with the 5200-01 Recommended Maintenance package, the CAPP/EAL4+ technology runs on POWER4 processor hardware platforms that support logical partition configuration. The following peripherals are supported on CAPP/EAL4+ servers:

- Storage devices
 - Terminals
 - Printers
 - Hard disks
 - CD-ROM drives
- Backup devices
 - Streamers
 - Floppy disk drives
- Network devices

- Ethernet
- Token ring

Network adapter communication between partitions and the HMC

After a partition has been started, it uses the network adapter to communicate with the Hardware Management Console (HMC).

Both the HMC and the partition must be configured so they can use the network adapters to communicate with each other. The partition must be configured to identify the HMC (or HMCs) on the network. It is recommended that the network be configured using a Domain Name Service (DNS) server.

You can use either fully qualified host names or short host names to identify partitions and HMCs. However, it is recommended that each partition and HMC be identified using a fully qualified host name, as this identification ensures unique naming of all the partitions and the HMC in the network. Fully qualified host names cannot be more than 100 bytes in length.

The HMC and partitions can also be configured using a short host name, where the domain name is not defined. This is typically done in a private or test network. If the HMC is defined using a short host name, you must perform extra network configuration steps to ensure correct communications between the partitions and the HMC. If you use short host names rather than fully qualified host names, make sure that the short host names are unique and that the mappings to IP addresses are properly specified.

The search order between the local **/etc/hosts** file and the DNS can be specified using the **/etc/netsvc.conf** file or **/etc/irs.conf** file.

The following examples illustrate the scenarios supported:

- If you are using DNS and your partition and the HMC are using fully qualified host names, then no additional network configuration is required.
- If you are using DNS and your partition is using a short host name, such as *partition_1* and the HMC is also using a short host name, such as *hmc123*, both must be added to the local **/etc/hosts** file, as shown in the following:

```
root@partition_1
-> cat /etc/hosts

127.0.0.1 loopback localhost

9.3.3.151 partition_1.mydomain.mycompany.com partition_1
9.3.3.152 hmc123.mydomain.mycompany.com hmc123
```

Note: You must include the fully qualified host name in addition to the short name when a DNS is present.

- If you are not using DNS and your partition is using a fully qualified host name, such as *partition_1.mydomain.mycompany.com*, and the HMC is also using a fully qualified host name, such as *hmc123.mydomain.mycompany.com*, both must be added to the local **/etc/hosts** file, as shown in the following:

```
root@partition_1.mydomain.mycompany.com
-> cat /etc/hosts

127.0.0.1 loopback localhost
9.3.3.151 partition_1.mydomain.mycompany.com
9.3.3.152 hmc123.mydomain.mycompany.com
```

- If you are not using DNS and your partition is using a short host name, such as *partition_1* and the HMC is also using a short host name, such as *hmc123*, both must be added to the local **/etc/hosts** file, as shown in the following:

```
root@partition_1
-> cat /etc/hosts
```

```
127.0.0.1 loopback localhost
```

```
9.3.3.151 partition_1
9.3.3.152 hmc123
```

- Your HMC is using a short host name, such as *hmc123*, and you would like to use both a fully qualified host name and a short host name for the HMC. In order for your partition to correctly communicate with the HMC, you must specify the short host name before the fully qualified host name in the partition's **/etc/hosts** file, as shown in the following:

```
root@partition_1.mydomain.mycompany.com
-> cat /etc/hosts
```

```
127.0.0.1 loopback localhost
```

```
9.3.3.151 partition_1.mydomain.mycompany.com
9.3.3.152 hmc123 hmc123.mydomain.mycompany.com
```

Installing AIX in a partitioned environment

There are multiple procedures for installing AIX in a partitioned environment.

For the installation method that you choose, ensure that you follow the sequence of steps as shown. Within each procedure, you must use AIX to complete some installation steps, while other steps are completed using the HMC interface.

Installing AIX using the media device to install a partition with an HMC

In this procedure, you will perform a new and complete base operating system installation on a logical partition using the partition's media device. This procedure assumes that there is an HMC attached to the managed system.

Prerequisites

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

Note: For the installation method that you choose, ensure that you follow the sequence of steps as shown. Within each procedure, you must use AIX to complete some installation steps, while other steps are completed using the HMC interface.

Before you begin this procedure, you should have already used the HMC to create a partition and partition profile for the client. Assign the SCSI bus controller attached to the media device, a network adapter, and enough disk space for the AIX operating system to the partition. Set the boot mode for this partition to be SMS mode. After you have successfully created the partition and partition profile, leave the partition in the *Ready* state. For instructions about how to create a logical partition and partition profile, refer to the *Creating logical partitions and partition profiles* article in the IBM eServer Hardware Information Center.

Step 1. Activate and install the partition (perform these steps in the HMC interface)

1. Activate the partition, as follows:
 - a. Insert the *AIX Volume 1* media into the media device of the managed system.
 - b. Right-click on the partition to open the menu.
 - c. Select **Activate**. The Activate Partition menu opens with a selection of partition profiles. Be sure the correct profile is highlighted.

- d. Select **Open a terminal window or console session** at the bottom of the menu to open a virtual terminal (vterm) window.
 - e. Select **Advanced** to open the Advanced options menu.
 - f. For the Boot mode, select **SMS**.
 - g. Select **OK** to close the Advanced options menu.
 - h. Select **OK**. A vterm window opens for the partition.
2. In the SMS menu on the vterm, do the following:
 - a. Press the 5 key and press Enter to select **5. Select Boot Options**.

```

PowerPC Firmware
Version SF220_001
SMS 1.5 (c) Copyright IBM Corp. 2000, 2003 All rights reserved.
-----
Main Menu

1. Select Language
2. Setup Remote IPL (Initial Program Load)
3. Change SCSI Settings
4. Select Console
5. Select Boot Options

-----
Navigation Keys:

                X = eXit System Management Services
-----
Type the number of the menu item and press Enter or select Navigation Key: 5

```

- b. Press the 2 key and press Enter to select **2. Select Boot Devices**.
 - c. Press the 1 key and press Enter to select **1. Select 1st Boot Device**.
 - d. Press the 3 key and press Enter to select **3. CD/DVD**.
 - e. Select the media type that corresponds to the media device and press Enter.
 - f. Select the device number that corresponds to the media device and press Enter. The media device is now the first device in the Current Boot Sequence list.
 - g. Press the ESC key until you return to the Configure Boot Device Order menu.
 - h. Press the 2 key to select **2. Select 2nd Boot Device**.
 - i. Press the 5 key and press Enter to select **5. Hard Drive**.
 - j. If you have more than one hard disk in your partition, determine which hard disk you will use to perform the AIX installation. Select the media type that corresponds to the hard disk and press Enter.
 - k. Select the device number that corresponds to the hard disk and press Enter.
 - l. Press the x key to exit the SMS menu. Confirm that you want to exit SMS.
3. Boot from the *AIX Volume 1*, as follows:
 - a. Select console and press Enter.
 - b. Select language for BOS Installation menus, and press Enter to open the Welcome to Base Operating System Installation and Maintenance menu.
 - c. Type 2 to select **Change/Show Installation Settings and Install** in the **Choice** field and press Enter.

```

Welcome to Base Operating System
Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

 1 Start Install Now with Default Settings
 2 Change/Show Installation Settings and Install
 3 Start Maintenance Mode for System Recovery
 4 Configure Network Disks (iSCSI)

88 Help ?
99 Previous Menu
>>> Choice [1]: 2

```

4. Verify or Change BOS Installation Settings, as follows:

- a. Type 1 in the **Choice** field to select the **System Settings** option.
- b. Type 1 for New and Complete Overwrite in the **Choice** field and press Enter.

Note: The installation methods available depend on whether your disk has a previous version of AIX installed.

- c. When the Change Disk(s) screen opens, you can change the destination disk for the installation. If the default shown is correct, type 0 in the **Choice** field and press Enter. To change the destination disk, do the following:
 - 1) Type the number for each disk you choose in the **Choice** field and press Enter. *Do not* press Enter a final time until you have finished selecting all disks. If you must deselect a disk, type its number a second time and press Enter.
 - 2) When you have finished selecting the disks, type 0 in the **Choice** field and press Enter. The Installation and Settings screen opens with the selected disks listed under **System Settings**.
- d. If needed, change the primary language environment. Use the following steps to change the primary language used by this installation to select the language and cultural convention you want to use.

Note: Changes to the primary language environment do not take effect until after the Base Operating System Installation has completed and your system is rebooted.

- 1) Type 2 in the **Choice** field on the Installation and Settings screen to select the **Primary Language Environment Settings** option.
- 2) Select the appropriate set of cultural convention, language, and keyboard options. Most of the options are a predefined combination, however, you can define your own combination of options.
 - To choose a predefined Primary Language Environment, type that number in the **Choice** field and press Enter.
 - To configure your own primary language environment, do the following:
 - a) Select **MORE CHOICES**.
 - b) Select **Create Your Own Combination**.
 - c) When the Set Primary Cultural Convention screen opens, type the number in the **Choice** field that corresponds to the cultural convention of your choice and press Enter.
 - d) When the Set Primary Language screen opens, type the number in the **Choice** field that corresponds to your choice for the primary language and press Enter.
 - e) When the Set Keyboard screen opens, type the number in the **Choice** field that corresponds to the keyboard attached to the system and press Enter.

- e. After you have made all of your selections, verify that the selections are correct. Press Enter to confirm your selections and to begin the BOS Installation. The system automatically reboots after installation is complete.
5. Switch the partition to Normal Mode, as follows:
 - a. Right-click on the partition profile to open the menu. Be sure the correct partition profile is highlighted.
 - b. Select **Properties**.
 - c. Select the **Settings** tab.
 - d. For the Boot Mode, select Normal.
 - e. Select **OK** to close the Properties menu.
 - f. Right-click on the partition to open the menu.
 - g. Select **Restart Partition**.
 - h. Select **Immediate** for the Restart Options.
 - i. Confirm that you want to restart the partition.
 - j. When the partition has restarted, right-click on the partition to open the menu.
 - k. Select **Open terminal window** to open a virtual terminal (vterm) window.
 6. Complete the BOS Installation, as follows:
 - a. Type vt100 as the terminal type.

```

                                Set Terminal Type
The terminal is not properly initialized. Please enter a terminal type
and press Enter. Some terminal types are not supported in
non-English languages.

    ibm3101          tvi912          vt330
    ibm3151          tvi920          vt340
    ibm3161          tvi925          wyse30
    ibm3162          tvi950          wyse50
    ibm3163          vs100          wyse60
    ibm3164          vt100          wyse100
    ibmpc            vt320          wyse350
    1ft              sun

+-----Messages-----+
| If the next screen is unreadable, press Break (Ctrl-c)
| to return to this screen.
88 Help ?
99 Exit

>>> Choice []: vt100

```

- b. In the License Agreement menu, select **Accept License Agreements**.
- c. Select **yes** to ACCEPT Installed License Agreements.
- d. Press F10 (or Esc+0) to exit the License Agreement menu.
- e. In the Installation Assistant main menu, select **Set Date and Time**.

```

                                Installation Assistant

Move cursor to desired item and press Enter.

    Set Date and Time
    Set root Password
    Configure Network Communications
    Install Software Applications
    Using SMIT (information only)

F1=Help          F2=Refresh          F3=Cancel          F8=Image
F9=Shell         F10=Exit            Enter=Do

```

- f. Set the correct date, time, and time zone. Press the F3 (or Esc+3) key to return to the Installation Assistant main menu.
- g. Select **Set root Password**. Set a root password for the partition.
- h. Select **Configure Network Communications**. Select **TCP/IP Startup**. Select from the Available Network Interfaces and press Enter. Enter the appropriate network information in the Minimum Configuration and Startup menu and press Enter. Use the F3 (or Esc+3) key to return to the Installation Assistant main menu.
- i. Exit the Installation Assistant by pressing F10 (or Esc+0).
- j. The vterm window displays a login prompt.

Step 2. Manage your partition (perform this step in the AIX environment)

When the installation has completed and the system has rebooted, the vterm window displays a login prompt.

At this point, you may want to perform several common system-administration procedures. The following table lists where to find information about performing these procedures.

Table 16. Common System Administration Procedures

Procedure	Location
Backing up and recovering system backups	"Creating and installing system backups" in <i>Installation and migration</i>
Managing users and groups	"Users, Roles, and Passwords" in <i>Security</i>
Installing software	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Installing fixes/updates	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Tuning the system for performance	"Performance tuning" in <i>Performance management</i>
Configuring printers	<i>Printers and printing</i>

Installing AIX using the media device to install a partition without an HMC

In this procedure, you will use the system's built-in media device to perform a new and complete Base Operating System Installation on the standalone system.

Things to consider

The information in this how-to scenario was tested using specific versions of AIX. The results you obtain might vary significantly depending on your version and level of AIX.

This information contains procedures to install the AIX operating system. For more information on concepts and considerations involved when performing a base operating system installation of AIX, or concepts and requirements involved when using the Network Installation Manager (NIM) to install and maintain AIX, refer to *Installation and migration*.

At this point, the BOS Installation is complete, and the initial configuration of the system is complete.

Step 1. Prepare your system for installation

- There must be adequate disk space and memory available. AIX requires 256–512 MB of memory and 2.2 GB of physical disk space. For additional release information, see the *AIX 6.1 Release Notes*.
- Make sure your hardware installation is complete, including all external devices. See the documentation provided with your system unit for installation instructions.
- If your system needs to communicate with other systems and access their resources, make sure you have the information in the following worksheet before proceeding with installation:

Table 17. Network Configuration Information Worksheet

Network Attribute	Value
Network Interface	(For example: en0, et0)
Host Name	
IP Address	_____._____._____._____
Network Mask	_____._____._____._____
Nameserver	_____._____._____._____
Domain Name	
Gateway	_____._____._____._____

Step 2. Boot from the AIX product media

1. Insert the *AIX Volume 1* media into the media device.
2. Make sure all external devices attached to the system (such as CD-ROM drives, tape drives, DVD drives, and terminals) are turned on. Only the media drive from which you will install AIX should contain the installation media.
3. Follow whatever procedure is needed to power on the system to cause it to boot from an AIX product media. Consult your hardware documentation for instructions if necessary.

Note: Most older MicroChannel systems require the keylock to be set in the service position before powering on the system. Some older PCI systems require you to type 5 or press the F5 key (depending on whether you have an ASCII terminal or color graphics display console) when the system beeps and begins repeating IBM or RS/6000 on the console several seconds after being powered on. Most current PCI systems only require that you repetitively type the 5 key (regardless of what type of console you have) at these system prompts. Also, most current systems can be set to boot from alternate media before they are powered on using the service processor menu. Consult your hardware documentation for more information.

4. Select the system console when prompted by typing the key indicated by the prompt (1, 2, F1, F2, and so on).
5. Select the English language for the base operating system (BOS) Installation menus by typing a 1 in the **Choice** field. Press Enter to open the Welcome to Base Operating System Installation and Maintenance screen.
6. Type 2 to select **2 Change/Show Installation Settings and Install** in the **Choice** field and press Enter.

```

Welcome to Base Operating System
Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

 1 Start Install Now with Default Settings
 2 Change/Show Installation Settings and Install
 3 Start Maintenance Mode for System Recovery
 4 Configure Network Disks (iSCSI)

88 Help ?
99 Previous Menu
>>> Choice [1]: 2

```

Step 3. Set and verify BOS installation settings

1. In the Installation and Settings screen, verify the installation settings are correct by checking the method of installation (new and complete overwrite), the disk or disks you want to install, the primary language environment settings, and the advanced options.
2. To change the System Settings, which includes the method of installation and disk where you want to install, type 1 in the **Choice** field and press Enter.

```
Installation and Settings

Either type 0 and press Enter to install with current settings, or type the
number of the setting you want to change and press Enter.

 1 System Settings:
   Method of Installation.....New and Complete Overwrite
   Disk Where You Want to Install.....hdisk0

>>> Choice [0]: 1
```

3. Type 1 for New and Complete Overwrite in the **Choice** field and press Enter. The Change Disk(s) Where You Want to Install screen now displays.

```
Change Disk(s) Where You Want to Install

Type one or more numbers for the disk(s) to be used for installation and press
Enter. To cancel a choice, type the corresponding number and Press Enter.
At least one bootable disk must be selected. The current choice is indicated
by >>>.

      Name      Location Code  Size(MB)  VG Status  Bootable
-----
 1  hdisk0  04-B0-00-2,0    4296  none      Yes
 2  hdisk1  04-B0-00-5,0    4296  none      Yes
 3  hdisk2  04-B0-00-6,0   12288  none      Yes

>>> 0  Continue with choices indicated above

66 Disks not known to Base Operating System Installation
77 Display More Disk Information
88 Help ?
99 Previous Menu

>>> Choice [0]:
```

4. In the Change Disk(s) Where You Want to Install screen:
 - a. Select **hdisk0** by typing a 1 in the **Choice** field and press Enter. The disk will now be selected as indicated by >>>. To unselect the destination disk, type the number again and press Enter.
 - b. To finish selecting disks, type a 0 in the **Choice** field and press Enter. The Installation and Settings screen displays with the selected disks listed under **System Settings**.
5. Change the Primary Language Environment Settings to English (United States). Use the following steps to change the Cultural Convention, Language, and Keyboard to English.
 - a. Type 2 in the **Choice** field on the Installation and Settings screen to select the **Primary Language Environment Settings** option.
 - b. Type the number corresponding to English (United States) as the Cultural Convention in the **Choice** field and press Enter.
 - c. Select the appropriate keyboard and language options.
6. Verify that the selections are correct in the Overwrite Installation Summary screen, as follows:

```

Overwrite Installation Summary

Disks: hdisk0
Cultural Convention: en_US
Language: en_US
Keyboard: en_US
Desktop: CDE
Enable System Backups to install any system: Yes

Optional Software being installed:

>>> 1 Continue with Install
      88 Help ?
      99 Previous Menu

>>> Choice [1]:

```

7. Press Enter to begin the BOS installation. The system automatically reboots after installation is complete.

Step 4. Configure the system after installation

1. On systems with a graphics display, after a new and complete overwrite installation, the Configuration Assistant opens. On systems with an ASCII display, after a new and complete overwrite installation, the Installation Assistant opens.
2. Select the **Accept Licenses** option to accept the electronic licenses for the operating system.
3. Set the date and time, set the password for the administrator (root user), and configure network communications (TCP/IP).
Use any other options at this time. You can return to the Configuration Assistant or the Installation Assistant by typing `configassist` or `smitty assist` at the command line.
4. Select **Exit the Configuration Assistant** and select **Next**. Or, press F10 (or ESC+0) to exit the Installation Assistant.
5. If you are in the Configuration Assistant, select **Finish now, and do not start Configuration Assistant when restarting AIX** and select **Finish**.

Step 5. Manage your system

At this point, you may want to perform several common system-administration procedures. The following table lists where to find information about performing these procedures.

Table 18. Common System Administration Procedures

Procedure	Location
Backing up and recovering system backups	"Creating and installing system backups" in <i>Installation and migration</i>
Managing users and groups	"Users, Roles, and Passwords" in <i>Security</i>
Installing software	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Installing fixes/updates	"Optional Software Products and Service Updates" in <i>Installation and migration</i>
Tuning the system for performance	"Performance tuning" in <i>Performance management</i>
Configuring printers	<i>Printers and printing</i>

Installing a partition using alternate disk installation

You can clone an existing disk image to another disk or disks without using NIM.

You might want to use an alternate disk installation if your network is not fully set up, or if you are not sure about your network configuration. Using an alternate disk installation will not prevent you from using NIM in the future.

You can use the **alt_disk_install** command to clone a system image to another disk, but you must use the **-O** option to remove references in the object data manager (ODM) and device (**/dev**) entries to the existing system. The **-O** flag specifies that the **alt_disk_install** command should call the **devreset** command to reset the device database. The cloned disk can now be booted as if it were a new system.

For a full description of alternate disk installation, see **alt_disk_install**.

1. Boot the managed system as a Full System Partition so you have access to all the disks in the managed system.
2. Configure the system and install the necessary applications.
3. Run the **alt_disk_install** command to begin cloning the **rootvg** on **hdisk0** to **hdisk1**, as follows:

```
# /usr/sbin/alt_disk_install -O -B -C hdisk1
```

The cloned disk (**hdisk1**) will be named **altinst_rootvg** by default.

4. Rename the cloned disk (**hdisk1**) to **alt1** as follows:

```
# /usr/sbin/alt_disk_install -v alt1 hdisk1
```

Renaming the cloned disk allows you to repeat the operation with another disk.

5. Run the **alt_disk_install** command again to clone to another disk and rename the cloned disk, as follows:

```
# /usr/sbin/alt_disk_install -O -B -C hdisk2  
# /usr/sbin/alt_disk_install -v alt2 hdisk2
```

6. Repeat steps 3 through 5 for all of the disks that you want to clone.
7. Use the HMC to partition the managed system with the newly cloned disks. Each partition you create will now have a **rootvg** with a boot image.
8. Boot the partition into SMS mode. Use the SMS **MultiBoot** menu to configure the first boot device to be the newly installed disk.
9. Exit the SMS menus and boot the system.

Configuring an initial partition as a NIM Master to use NIM to install the remaining partitions

You can set up an initial logical partition as a NIM master and server. The NIM environment allows you to manage installations for your other partitions.

Before you begin this procedure, you should perform the following tasks:

- Use the HMC to create the **Master_LPAR** partition profile. Leave the partition in the *Ready* state.
- Verify that the **Master_LPAR** partition has a network adapter, enough hard-disk space for the NIM resources, and an assigned CD device.
- Set the boot mode for the **Master_LPAR** partition to be Normal mode.
- Use the HMC to create logical partitions and partition profiles for each NIM client.
- Verify that each NIM client partition has a network adapter assigned. Set the boot mode for each partition to be SMS mode. After you have successfully created the partitions and partition profiles, leave the partitions in the *Ready*
- If AIX is not currently installed on any of the disks in the system, you must install it. For more information, see “Installing AIX using the media device to install a partition with an HMC” on page 23.
- Configure AIX for network communication on the **Master_LPAR**.
- Activate the **Master_LPAR** partition profile on the HMC. For more information on activating partition profiles, see *Activating a partition profile*.

You should consider the following aspects of the installation when you configure an initial partition as a NIM Master and using NIM to install the remaining partitions has the following advantages:

- NIM environment offers the most flexibility and customization options for installation and management.

- NIM environment allows for multiple installations at the same time.
- The **nim_master_setup** and **nim_clients_setup** scripts provide a way to set up the NIM environment.
- Requires one LPAR with approximately 1.5 GB of disk space dedicated as the NIM master partition.

In this procedure, you will set up an initial logical partition as a NIM master and server. This procedure refers to this initial logical partition as the *Master_LPAR*.

1. Run the **oslevel** command on the Master_LPAR. Output similar to the following displays:

```
5200
```

If the output from the **oslevel** command does not show the expected OS level, see “Migrating AIX” on page 144 for information about migrating the AIX operating system to the correct OS level.

2. Verify your network connection by running the **netstat** command. You can run this command with the **-C** flag to show routing table information. You can also use the **-D** flag to show the number of packets received, transmitted, and dropped in the communications subsystem.
3. Insert the AIX installation media.
4. Run the **nim_master_setup** command. For additional information on options for running this command, see **nim_master_setup**.
5. Run the following command to open the **/export/nim/client.defs** file with the vi editor:


```
# vi /export/nim/client.defs
```
6. Edit the **client.defs** file according to your environment. For more information on this file, see the instructions and examples in the **client.defs** file. When you are finished editing the **client.defs** file, save it and exit the vi editor.
7. Run the **nim_clients_setup -c** command. For additional information on options for running this command, see **nim_clients_setup**.

Note: If you are adding new client machines that cannot be resolved on the name server, edit the **/etc/hosts** file to add the IP addresses and client host names.

After you have defined the client machines, you should activate and install the partitions. For more information on activating partitions, see *Activating a partition profile*.

After you activate and install the client partitions, you can perform any system management tasks.

Using a separate AIX system as a NIM Master to use NIM to install each partition

You can use a separate system running AIX as a NIM master and server. The NIM environment allows you to manage installations for your other partitions.

Before you begin this procedure, you should perform the following tasks:

- Use the HMC to create partitions and partition profiles for each NIM client partition that you want to install. Leave the partitions in the *Ready* state.
- Verify each partition has a network adapter assigned.
- Set the boot mode for each partition to SMS mode.

You should consider the following aspects of the installation when you use a separate AIX system as a NIM Master to use NIM to install each partition has the following advantages:

- You need not dedicate an LPAR as the NIM master.
 - NIM environment offers the most flexibility and customization options for installation and management.
 - NIM environment allows for multiple installations at the same time.
 - The **nim_master_setup** and **nim_clients_setup** scripts provide a way to set up the NIM environment.
 - Requires an available server running AIX that can be used as the NIM master.
1. Run the **oslevel** command on the Master_LPAR. Output similar to the following displays:

If the output from the **oslevel** command does not show the expected OS level, see “Migrating AIX” on page 144 for information about migrating the AIX operating system to the correct OS level.

2. Verify your network connection by running the **netstat** command. You can run this command with the **-C** flag to show routing table information. You can also use the **-D** flag to show the number of packets received, transmitted, and dropped in the communications subsystem.
3. Insert the AIX installation media.
4. Run the **nim_master_setup** command. For additional information on options for running this command, see **nim_master_setup**.
5. Run the following command to open the **/export/nim/client.defs** file with the vi editor:


```
# vi /export/nim/client.defs
```
6. Edit the **client.defs** file according to your environment. For more information on this file, see the instructions and examples in the **client.defs** file. When you are finished editing the **client.defs** file, save it and exit the vi editor.
7. Run the **nim_clients_setup -c** command. For additional information on options for running this command, see **nim_clients_setup**.

Note: If you are adding new client machines that cannot be resolved on the name server, edit the **/etc/hosts** file to add the IP addresses and client host names.

After you have defined the client machines, you should activate and install the partitions. For more information on activating partitions, see *Activating a partition profile*.

After you activate and install the client partitions, you can perform any system management tasks.

Updating your NIM environment to the latest technology level

The **nim_update_all** command provides a one-step method to update an existing NIM environment and any resources created with the **nim_master_setup** command to the latest technology level.

1. Insert the latest AIX update media into the media drive.
2. Update the **bos.rte.install** fileset by running the **geninstall** command as follows:


```
# geninstall -d /dev/cd0 bos.rte.install
```
3. Run the **install_all_updates** command as follows:


```
# install_all_updates -d /dev/cd0
```

The output from the **install_all_updates** command is shown in the **/var/adm/ras/install_all_updates.log** log file. The **install_all_updates** command checks whether your system is at the latest known technology level. If your system is not at the latest known technology level, your server is updated to the latest technology level of AIX.

4. After the update is complete, reboot the system by using the **shutdown -Fr** command.
5. Run the **nim_update_all** command to update any NIM resources created by the **nim_master_setup** command. The **nim_update_all** command uses the device **/dev/cd0** by default. The output from the **nim_update_all** command is shown in the **/var/adm/ras/nim.update** log file. Output similar to the following displays:

```
##### NIM update all #####
#
# During script execution, NIM client and resource updating times      #
# may vary. To view the install log at any time during nim_update_all,  #
# run the command: tail -f /var/adm/ras/nim.update in a separate screen. #
#                                                                           #
#####
```

```
NSORDER=local,bind
Adding updates to lpp_res lpp_source...done
```

```

Updating spot_res using updated lpp_source lpp_res....done

Attempting to replace mksysb resource generic_sysb...
Removing old mksysb resource generic_sysb....done
Creating image.data file....done
Checking /export/nim space requirement...

Generating list of client objects in NIM environment...

```

A new **mksysb** is created that replaces the existing **mksysb**, unless you specify the **-B** flag. All clients in the environment are updated, unless you specify the **-u** flag.

Advanced installation options

Advanced installation options are described in the `/usr/lpp/bos/README.PARTITION_INSTALL` file.

Some examples of advanced installation options are the following:

- Preparing an existing root volume group (**rootvg**) to move to a managed system
- Using the **devreset** command to rebuild the device ODM database and reset all devices to default configurations

Creating and changing a dedicate dump device

You can create a dedicated device where system crash data is dumped.

To create and change to a dedicated dump device, do the following:

1. Determine the size of the hd6 paging space (in logical partitions) by running the **lsvg** command as follows:

```
# lsvg -l rootvg
```

The output will be similar to the following:

```

rootvg:
LV NAME      TYPE      LPs  PPs  PVs  LV STATE    MOUNT POINT
hd5          boot      2    2    1    closed/syncd  N/A
hd6          paging    53   53   1    open/syncd    N/A
hd8          jfslog    1    1    1    open/syncd    N/A
hd4          jfs       9    9    1    open/syncd    /
hd2          jfs      130  130  1    open/syncd    /usr
hd9var       jfs       2    2    1    open/syncd    /var
hd3          jfs       8    8    1    open/syncd    /tmp
hd1          jfs       1    1    1    open/syncd    /home
hd10opt     jfs       5    5    1    open/syncd    /opt

```

In this example, the paging space is 53 LPs (logical partitions) in size.

2. Create a dump logical volume by running the **smitty mklv**. When you are prompted for the volume group, type **rootvg**.
3. In the **Add a Logical Volume** menu, fill in the **Logical volume NAME** and the **Number of LOGICAL PARTITIONS** fields.
4. Change the primary dump device by running the **smitty dumpchgp**. You are prompted to enter the path to the primary dump device.
5. Validate your dump devices by running the **smitty dump** command.
6. Select **Show Current Dump Devices**. The output will be similar to the following:

```
COMMAND STATUS
Command: OK          stdout: yes          stderr: no
Before command completion, additional instructions may appear below.
primary              /dev/dumplv
secondary            /dev/sysdumpnull
copy directory       /var/adm/ras
forced copy flag     TRUE
always allow dump    FALSE
dump compression     OFF
```

Verifying your dump device

If your machine has more than 4 GB of real memory, a dedicated dump device is created at installation time. Otherwise, the `/dev/hd6` paging space is used as the dump device.

If a system crash occurs and paging space was used as the dump device, the dump is copied to the `/var/adm/ras/vmcore.n` file by default, where `n` is a sequence number. If there is not enough space to perform the copy, the user is prompted during reboot to save the dump to some other media. To avoid losing a dump due to a lack of a tape drive configured to the partition, always create a separate dump device that is the same size as your paging space, given that paging space is currently your dump device.

To verify your dump device, type `smitty dump`, and select **Show Current Dump Devices**. If paging space is your dump device, the output will be similar to the following:

```
COMMAND STATUS
Command: OK          stdout: yes          stderr: no
Before command completion, additional instructions may appear below.
primary              /dev/hd6
secondary            /dev/sysdumpnull
copy directory       /var/adm/ras
forced copy flag     TRUE
always allow dump    FALSE
dump compression     OFF
```

Shutting down a partition

You can shut down an AIX partition to return it to the *Ready* state.

When a partition is up, it is in the *Running* state. To use AIX to shut down a partition, complete the following steps:

1. Type `shutdown -Fr` on the AIX command line. The partition changes to the *Starting* state, and the operator panel values display, which indicates AIX is now rebooting. When the reboot is issued within AIX, the partition will boot according to the contents of the bootlist. To check the order of the boot devices, type `bootlist -m normal -o`.
2. Type `shutdown -F` to shut down AIX.

The partition will eventually change to the *Ready* state. You have now shut down AIX and its partition.

Changing your operating system host name

Each partition, including the Full System Partition, must have a unique host name that can be resolved. If you want to change the host name of a partition, you must also change the operating system host name.

Host names cannot be reused between the Full System Partition and the logical partitions. To change the operating system host name, complete the following steps:

1. Run the **lsrsrc** command as follows:

```
/usr/sbin/rsct/bin/lsrsrc ManagementServer Hostname
```

If the partition is managed by multiple HMCs, multiple entries might exist because each HMC has its own entry. The output will be similar to the following:

```
resource 1:  
  Hostname      = "hmc1.mydomain.mycompany.com"
```

2. For each entry, use the **rmrsrc** to remove the host name shown. For example, run the following command:

```
/usr/sbin/rsct/bin/rmrsrc -s 'Hostname = "hmc1.mydomain.mycompany.com"' ManagementServer
```

You can verify that all entries have been removed by running the **lsrsrc** command again.

3. Run the **rmcctrl** command as follows:

```
/usr/sbin/rsct/bin/rmcctrl -z
```

4. Change the host name of the partition.

5. Run the following command:

```
/usr/sbin/rsct/bin/rmcctrl -A
```

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Publication No. SC23-6616-00

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