IBM RISC System/6000
Scalable POWERparallel Systems
SP Installation Guide

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Note!

Before using this information and the product it supports, be sure to read the general information under “Notices” on page xi.

First Edition (August 1995)

This edition applies to IBM Parallel System Support Programs for AIX, Version 2 Release 1, which runs on IBM RISC System/6000 Scalable POWERparallel Systems, and to all subsequent releases and modifications until otherwise indicated in new editions or Technical Newsletters.

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Publicly Available Software

This product includes software that is publicly available:

Amd Berkeley Software Distribution automount daemon

expect Programmed dialogue with interactive programs

Kerberos Provides authentication of the execution of remote commands

NTP Network Time Protocol

Perl Practical Extraction and Report Language

SUP Software Update Protocol

Tcl Tool Command Language

TclX Tool Command Language Extended

Tk Tcl-based Tool Kit for X-windows

This book discusses the use of these products only as they apply specifically to the RS/6000 SP system. The distribution for these products includes the source code and associated documentation. (Kerberos does not ship source code.) **/usr/lpp/ssp/public** contains the compressed **tar** files of the publicly available software. (IBM has made minor modifications to the versions of Tcl and Tk used in the SP system to improve their security characteristics. Therefore, the IBM-supplied versions do not match exactly the versions you may build from the compressed **tar** files.) All copyright notices in the documentation must be respected. You can find version and distribution information for each of these products that are part of your selected install options in the **/usr/lpp/ssp/README/ssp.public.README** file.

About This Book

The *IBM RISC System/6000 Scalable POWERparallel Systems: SP Installation Guide* provides information to help you understand and perform RS/6000 SP installation, configuration, and maintenance. It includes concepts and instructions pertaining to:

- Installing and configuring the IBM Parallel System Support Programs for AIX
- Installing on an existing RS/6000 SP system
- Reconfiguring the system
- Performing system maintenance

Other books that help you administer and use the SP system include:

- The *IBM RISC System/6000 Scalable POWERparallel Systems: System Planning* book helps you plan for the SP system. It tells you how to prepare for software installation and provides considerations for integrating it into your existing computing network.
- The *IBM RISC System/6000 Scalable POWERparallel Systems: System Administration Guide* provides information to help you understand and perform SP system administration. It includes concepts and instructions for:
  - Understanding IBM RISC System/6000 Scalable POWERparallel Systems
  - Making the system secure
  - Managing the system
  - Tuning the system
  - Defining and managing Virtual Shared Disks
  - Installing, defining, and configuring Distributed Tape Management System Enablement
- The *IBM RISC System/6000 Scalable POWERparallel Systems: Diagnosis and Messages* book provides information to help you diagnose SP system problems and describes error messages, their meaning, and appropriate actions to take to recover from problems.
- The *IBM RISC System/6000 Scalable POWERparallel Systems: Command and Technical Reference* provides detailed syntax and parameter information for all commands you can use to install, customize, and maintain the SP system.

Documentation Note

The information in this book supports the use of IBM Parallel System Support Programs for AIX, Version 2 Release 1, which runs on AIX 4.1.3. If you are running IBM AIX Parallel System Support Programs, Version 1 Release 2, which runs on AIX 3.2.5, in a system partition, you may also need to refer to the documentation that supports that product level.

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Who Should Use This Book

This book is intended for system administrators responsible for installing, configuring, and maintaining the RS/6000 SP system. It assumes the administrators have a working knowledge of AIX* or Unix** and experience with network systems.

The System Administrators Guide of USENIX (SAGE), has developed a classification for skills required for system administrators. Administrators of RS/6000 SP systems are expected to have level II skills (Junior System Administrator) or level III skills (Intermediate/Advanced System Administrator) depending on the complexity of your site and system. See Appendix D, “SAGE Job Descriptions” on page 121 for more information on these job skills.

How This Book Is Organized

- Chapter 1, “Understanding RS/6000 SP Installation” on page 1 explains what happens when you perform the installation and customization procedure.
- Chapter 2, “Installing and Configuring the RS/6000 SP System” on page 11 provides the information you need to get the RS/6000 SP system set up and functioning in your environment.
- Chapter 3, “Migrating to PSSP V2R1 from PSSP V1R2” on page 69 describes how to install PSSP V2R1 on a system that is already running PSSP V1R2.
- Chapter 4, “Reconfiguring the RS/6000 SP System” on page 89 discusses adding and replacing hardware components.
- Chapter 5, “Performing Software Maintenance” on page 103 provides information on updating installatiom images, LPPs, and support programs.
- Appendix A, “Directory Information” on page 111 contains a list of the directories created when you install the RS/6000 SP LPP image.
- Appendix B, “Sample script.cust File” on page 113 contains a sample boot customization file (**script.cust**).
- Appendix C, “Sample tuning.cust File” on page 119 contains a sample tuning customization file (**tuning.cust**).
- Appendix D, “SAGE Job Descriptions” on page 121 contains system administrator job descriptions defined by SAGE.

This book also includes a glossary and index.

Typographic Conventions

This book uses the following typographic conventions:

Typographic	Usage
Bold	• **Bold** words or characters represent system elements that you must use literally, such as commands, flags, and path names. • **Bold** words also indicate the first use of a term included in the glossary.
Italic	• *Italic* words or characters represent variable values that you must supply. • *Italics* are also used for book titles and for general emphasis in text.
`Constant width`	Examples and information that the system displays appear in `constant width` typeface.
[ ]	Brackets enclose optional items in format and syntax descriptions.
{ }	Braces enclose a list from which you must choose an item in format and syntax descriptions.
|	A vertical bar separates items in a list of choices. (In other words, it means “or.”)
< >	Angle brackets (less-than and greater-than) enclose the name of a key on the keyboard. For example, <**Enter**> refers to the key on your terminal or workstation that is labeled with the word Enter.
...	An ellipsis indicates that you can repeat the preceding item one or more times.
<**Ctrl-***x*>	The notation <**Ctrl-***x*> indicates a control character sequence. For example, <**Ctrl-c**> means that you hold down the control key while pressing <**c**>.

Interface Instructions

Some sections of this book give step-by-step instructions for performing tasks with a graphical user interface. The instructions use a format that distinguishes between the user action and the system response.

User actions appear in uppercase bold type.

PRESS Cancel

Selections from a menu bar are indicated with an →.

SELECT SP → Topology

The system response to an action follows the ▲ symbol.

▲ The diagnostic display appears.

Related Publications

SP Hardware Publications

- *IBM RISC System/6000 Scalable POWERparallel Systems: Site Planning*, GC23-3905
- *IBM RISC System/6000 Scalable POWERparallel Systems: Maintenance Information, Volume 1, Installation and CE Operations*, GC23-3903
- *IBM RISC System/6000 Scalable POWERparallel Systems: Maintenance Information, Volume 2, Maintenance Analysis Procedures and Parts Catalog*, GC23-3904
- *IBM RISC System/6000 Scalable POWERparallel Systems: Library Guide*, GC23-3868-01
- *IBM RISC System/6000 Scalable POWERparallel Systems: Installation Aid Licensed Program Specification*, GC23-3838-02

SP Software Publications

- *IBM RISC System/6000 Scalable POWERparallel Systems: System Planning*, GC23-3902
- *IBM RISC System/6000 Scalable POWERparallel Systems: Administration Guide*, GC23-3897
- *IBM RISC System/6000 Scalable POWERparallel Systems: Diagnosis and Messages Guide*, GC23-3899
- *IBM RISC System/6000 Scalable POWERparallel Systems: Command and Technical Reference*, GC23-3900
- *IBM RISC System/6000 Scalable POWERparallel Systems: IBM Parallel System Support Programs for AIX Licensed Program Specification*, GC23-3901

As an alternative to ordering the individual books, you can use GBOF-8587 to order the entire SP software library.

Recoverable Virtual Shared Disk Publications

- *IBM Recoverable Virtual Shared Disk: User's Guide and Reference*, GC23-3849-01
- *IBM Recoverable Virtual Shared Disk: Licensed Program Specification*, GC23-3848-01

LoadLeveler Publications

- *IBM LoadLeveler: Administration Guide*, SH26-7220-03
- *IBM LoadLeveler: User's Guide*, SH26-7226-03
- *IBM LoadLeveler: Licensed Program Specification*, GH2340-02

Parallel Environment for AIX Publications

- *IBM Parallel Environment for AIX: General Information*, GC23-3906
- *IBM Parallel Environment for AIX: Hitchhiker's Guide*, GC23-3895
- *IBM Parallel Environment for AIX: Installation, Administration, and Diagnosis*, GC23-3892
- *IBM Parallel Environment for AIX: Operation and Use*, GC23-3891
- *IBM Parallel Environment for AIX: MPL Programming and Subroutine Reference*, GC23-3893
- *IBM Parallel Environment for AIX: MPI Programming and Subroutine Reference*, GC23-3894
- *IBM Parallel Environment for AIX: Licensed Program Specification*, GC23-3896

As an alternative to ordering the individual books, you can use GBOF-8588 to order the entire Parallel Environment for AIX library.

PVMe for AIX Publications

- *IBM PVMe for AIX: Fact Sheet*, GC23-3907
- *IBM PVMe for AIX: User's Guide and Reference*, GC23-3884
- *IBM PVMe for AIX: Licensed Program Specification*, GC23-3885

Client Input Output/Sockets (CLIO/S) Publications

- *IBM CLIO/S General Information*, GC23-3879
- *IBM CLIO/S Licensed Program Specification*, GC23-3789-01
- *IBM CLIO/S User's Guide and Reference*, available from your IBM representative

Parallel I/O File System Publications

- *IBM AIX Parallel I/O File System: Fact Sheet*, G325-0649-01
- *IBM AIX Parallel I/O File System: Installation, Administration, and Use*, SH34-6065
- *IBM AIX Parallel I/O File System: Licensed Program Specification*, GH34-6066

Other IBM Publications

AIX and RISC System/6000 Publications

- *IBM AIX for RISC System/6000 System Overview*, GC23-2406
- *IBM Getting Started: Using IBM RISC System/6000*, GC23-2377
- *IBM Getting Started: Managing RISC System/6000*, GC23-2378
- *IBM General Concepts and Procedures for RISC System/6000*, GC23-2202
- *IBM AIX Communication Concepts and Procedures*, GBOF-1524
- *IBM AIX Version 3.2 for RISC System/6000 Files Reference*, GC23-2200
- *IBM AIX Version 4.1 Files Reference*, SC23-2512

- *IBM AIX Version 3.2 System Management Guide*, SC23-2457
- *IBM AIX Version 3.2 System Management Guide: Communications and Networks*, GC23-2487
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- *IBM AIX Version 4.1 Commands Reference*, SBOF-1851
- *IBM AIX Versions 3.2 and 4.1 Performance Tuning Guide*, SC23-2365
- *IBM RISC System/6000 Problem Solving Guide*, SC23-2204
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- *IBM AIX Version 4.1 Communications Programming Concepts* SC23-2610
- *Diskless Workstation Management Guide*, SC23-2433
- *C++ for AIX/6000: Language Reference*, SC09-1606
- *C++ for AIX/6000: Standard Class Library Reference*, SC09-1604
- *C++ for AIX/6000: User's Guide*, SC09-1605

Service

- *Common Diagnostic and Service Guide*, SA23-2632
- *RISC System/6000 Diagnostic Programs: Service Guide Version 1.2*, SA23-2632
- *RISC System/6000 Problem Solving Guide*, SC23-2204
- *POWERstation and POWERserver Common Diagnostics and Service Guide*, SA23-2687
- *7012 Operator Guide*, SA23-2623.
- *7012 POWERstation and POWERserver: Installation and Service Guide*, SA23-2624
- *7013 Operator Guide*, SA23-2621.
- *7013 POWERstation and POWERserver: Installation and Service Guide*, SA23-2622
- *Electrical Safety for IBM Service Representatives*, S229-8124
- *Service Information Binder*, SX33-6060

Network Queueing System/MVS (NQS/MVS)

- *IBM NQS/MVS Installing and Administering*, SC23-0232
- *IBM NQS/MVS Client User's Guide*, SC23-0231
- *IBM NQS/MVS General Information*, GC23-3684
- *IBM NQS/MVS Licensed Program Specifications*, SC23-0233

Network Connectivity

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Perl

- Larry Wall and Randal L.Schwartz, *Programming Perl*, O'Reilly & Associates, Inc., ISBN 0-937175-64-1.
- Randal L.Schwartz and Forword by Larry Wall, *Learning Perl*, O'Reilly & Associates, Inc., ISBN ISBN 1-56592-042-2.

Manual Pages for Public Code

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SUP /usr/lpp/ssp/man/man1/sup.1

Amd /usr/lpp/ssp/man/man8/amd.8

/usr/lpp/ssp/man/man8/amq.8

NTP /usr/lpp/ssp/man/man8/xntpd.8

/usr/lpp/ssp/man/man8/xntpdc.8

Perl /usr/lpp/ssp/perl/man/perl.man

/usr/lpp/ssp/perl/man/h2ph.man

/usr/lpp/ssp/perl/man/s2p.man

/usr/lpp/ssp/perl/man/a2p.man

Manual pages and other documentation for Tcl, TclX, Tk, and expect can be found in the compressed **tar** files located in **/usr/lpp/ssp/public**.

Chapter 1. Understanding RS/6000 SP Installation

This chapter is an overview of the installation process, describing what happens during system installation. It includes the following topics:

Planning to Install Your SP System 1
Installing Your SP System 2
Working With the Basic AIX Image 6
Detailed Overview of Network Installation of a Node 7

Planning to Install Your SP System

Before you install the SP system, you must perform several planning activities. These activities include completing worksheets or checklists that reflect your decisions regarding:

- Device support
- System partitioning
- Network connections
- Node and switch configuration
- System management options
- Boot/Install Server and node relationships
- Location and type of authentication servers

See the *SP System Planning Guide* for more details. Careful planning helps make your installation successful and efficient.

What's Changed from PSSP V1R2 to PSSP V2R1?

The following are changes from AIX 3.2.5 to AIX 4.1:

- /usr client and /usr server are not supported.
- Primary dump space is now defined as paging space instead of hd7.

Refer to the AIX documentation for more information. (See “AIX and RISC System/6000 Publications” on page xvii.)

The following are changes from PSSP V1R2 to PSSP V2R1:

- A new logical volume, hd7, is created as the primary dump device.
- Support for installation over Ethernet type DIX is added.
- **firstboot.cust** is now **script.cust**.
- A tuning customization file, **tuning.cust**, is added.
- **bos.obj.ssp.325** is now **bos.obj.ssp.41**.
- **/usr/sys/inst.images/ssp** is now **/spdata/sys1/install/images**.

  In PSSP V1R2, the **mksysb** image could be a symbolic link. This is no longer the case. Because Network Installation Management (NIM), exports the file, the **mksysb** image must be a regular file in the **/spdata/sys1/install/images** directory on the control workstation.
- **ssp.installp** is now **pssp.installp**.
- **spbootins** now has:

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  - a diagnosis option, **-r diag**.
  - new syntax for the **-h** option. See the *SP Commands and Technical Reference* for details.
- Remote diagnosis support is added. For more information, see the *Diagnosis and Messages Guide*.

Installing Your SP System

Installation involves these major steps:

1. Prepare and install the control workstation.
2. Enter node and configuration information.
3. Install and customize the nodes.

You complete all installation and configuration steps centrally from the control workstation.

Prepare and Install the Control Workstation

The first step in installing the SP system is preparing the control workstation. This involves connecting your frame's RS-232 lines to the serial ports of your control workstation and configuring the RS/6000 SP Ethernet connections on your control workstation. Other steps include verifying name resolution, installing IBM Parallel System Support Programs for AIX (PSSP) software, and configuring the SP authentication services.

Enter Node and Configuration Information

After the control workstation has been prepared, you can begin configuring the RS/6000 SP nodes. To configure them, you can use PSSP commands or the Software Management Interface Tool (SMIT) interface to enter information into the System Data Repository (SDR). (Both methods are described throughout the detailed installation information, Chapter 2, “Installing and Configuring the RS/6000 SP System” on page 11.)

After you enter all the configuration information, you press the PSSP System Monitor netboot button to network boot (netboot) the nodes to install and customize them. PSSP uses the information in the SDR to do the installation and customization. The information you enter is based on the planning worksheets you completed. If you have not yet completed these worksheets, turn to the *SP System Planning Guide* and understand the information presented there before you begin installing your system.

Install SP on the Nodes (Externals)

SP node installation consists of these phases:

- Network installation
- Customization
- Boot processing

In the network installation phase, PSSP uses the AIX Network Installation Management (NIM) process to restore an AIX system image created with the **mksysb** command to the hard disk of the node. During the customize phase, PSSP personalizes the node with host names, default routes, and TCP/IP network

adapter information from the SDR. PSSP reboots the node. Final customization takes place after the node reboots, during boot processing.

Use the **spbootins** command to change the **bootp_response** attribute of the node object in the SDR. If you set this attribute to **install**, AIX installation, customization, and boot processing takes place. If you set this attribute to **customize**, only the customization and boot processing takes place. Use **customize** if you already have AIX installed—you can define new adapters or change the addresses for existing adapters by performing customization only. Because new systems are not shipped with an AIX image installed on the nodes, the default **bootp_response** attribute value is **install**. This allows you to install each node with the basic image and customize with information from the SDR.

Network Installation

To install SP nodes, netboot the nodes to boot them over the network. Boot/Install Servers on the same network respond by installing the AIX image on the nodes. For more details, turn to “Install SP on the Nodes (Internals)” on page 4 and “Detailed Overview of Network Installation of a Node” on page 7.

Customization

Customization involves the following:

- Updating the node's host name and default route
- Defining the network adapters
- Installing the PSSP LPP options
- Running the **script.cust** you updated for your site-specific customization
- Running the **tuning.cust** you updated for your site-specific customization

Customize always runs after an installation. You can also run customize at any time on a node that already has AIX installed. Situations that would call for a customize-only step include:

- You have added or changed the networking or routing for one or more nodes.
- You have changed your authentication servers or reinitialized them, invalidating the kerberos service keys stored on the nodes.

You can do additional customization by copying the **/usr/lpp/ssp/samples/script.cust** and **/usr/lpp/ssp/samples/tuning.cust** files on the control workstation to the **/tftpboot** directory and by tailoring these files to meet your needs. Commands in these files are run after the **mksysb** installation and PSSP customization and before the reboot of each node, or after an installation or customization. IBM recommends you use **script.cust** to complete your installation and **tuning.cust** to set initial network performance values. See Appendix B, “Sample script.cust File” on page 113 and Appendix C, “Sample tuning.cust File” on page 119 for printed samples.

Before the initial boot of a node, the required RS/6000 SP options (**ssp.clients**, **ssp.basic**, and **ssp.sysctl**) are installed if they are not part of the AIX 4.1 image already on the node.

Boot Processing

After PSSP completes installation and customization, PSSP reboots the node. You can do additional PSSP configuration, depending upon the choices you made in the SMIT Site Environment panel or on the **spsitenv** command.

Install SP on the Nodes (Internals)

Note: The information in this section is optional reading. Read on if you are interested in learning what is happening “under the hood” during SP installation.

AIX 4.1 provides the NIM environment to install AIX on the nodes. PSSP defines the control workstation as a NIM master. If a system is larger than one frame, NIM masters are defined on the boot/install servers so they can install nodes. In a multi-frame system, Node 1 by default is a NIM master for its frame. You can change this by using the **spbootins** command. You can define other nodes as boot/install servers and have PSSP make them NIM masters. This section discusses the parts of NIM exploited by the SP system. For more detailed information about the NIM environment, see the *AIX Network Installation Management Guide and Reference*.

The NIM environment includes a NIM master and its clients. The NIM master contains the information necessary to install its NIM clients.

What Is a NIM Master?

In the NIM environment, a NIM master is an AIX system that can install one or more NIM clients. A system must be defined as a NIM master before any NIM clients are defined. A NIM master must be an AIX 4.1 system with the NIM master file set installed. A NIM master manages the configuration database containing the information for the NIM clients.

A site may have more than one NIM master, but these NIM masters and their clients are considered to be separate NIM environments. NIM does not provide any services to share information across these separate environments.

Defining NIM Masters

As a default, the control workstation is the NIM master for a single frame system. If you have more than one frame, the default configuration is different: the control workstation installs the first node in each frame and defines it as a NIM master. Then, each NIM master installs the rest of the nodes in its frame. You can change the default by using SMIT or the **spbootins** command.

Whether you use the default configuration or define your own, you use **spbootins** to define the boot/install server. The **spbootins** command updates the SDR with the information specified with the command and invokes the **setup_server** function on the boot/install servers to define them as NIM masters.

The **setup_server** function configures and defines the NIM master, resources, and clients that allow the nodes to be installed using the NIM environment.

What Is a NIM Client?

A NIM client is a system installed and managed by a NIM master. SP supports the standalone type of NIM client. Nodes are defined as standalone clients for normal operations.

Installing Nodes (NIM Clients)

After PSSP configures the NIM masters and the NIM clients, you can begin installing the nodes. If you have a single-frame system, the control workstation installs the nodes. If you have a multi-frame system, the first node in each frame (or another node you specified as a NIM master) installs the other nodes. (The default is the first node in each frame.)

When the node is network booted, the NIM master completes the installation steps as follows:

1. Installs the AIX 4.1 **mksysb** image
2. Runs **pssp_script** to do the following:
   a. Defines the host name and the primary adapter interface
   b. Defines the network adapters specified in the SDR for this NIM client
   c. Installs **ssp.basic**, **ssp.client**, **ssp.sysctl**, and depending on the choices you make to meet your site environment needs, **ssp.sysman** if you have a switch, and **ssp.css** if a boot/install server has **ssp.jm**
   d. Runs **script.cust** if it exists in the boot/install server's /**tftpboot**
   e. Runs **tuning.cust** if it exists in the boot/install server's /**tftpboot**
3. Reboots the node

Storing NIM Information

NIM stores information about the NIM environment as objects in the NIM database. The types of objects defined for the SP system are:

- Network
- Machine
- Resource

Network objects represent information about the network interfaces required for installing a client. The SP system uses the en0 Ethernet interface on the client for the NIM installation.

Machine objects represent the machine configuration for a NIM client. Each machine object contains attributes defining it. Examples of machine attributes are:

- Type of machine (standalone)
- Hardware address of the client's network installation interface
- TCP/IP host name of the client
- Name of the network object defining the network to which the client is connected

Resource objects represent available resources in the NIM environment. All operations on a client in a NIM environment require one or more resources. Examples of resources available in a NIM environment are:

Resource Name	Description
spot	Shared Product Object Tree (SPOT) in the /**usr** file system
mksysb	AIX **mksysb** image
script	Scripts run as part of the NIM customization on the client
lppsource	Directory of installable LPP images
bosinst_data	Prompt and noprompt installation information

Note: These are only examples of the resource objects. See the *AIX Network Installation Management Guide and Reference* for a complete list and descriptions of the resource objects.

The SP system supports installation of **mksysb** images only through NIM **mksysb** resource objects.

Working With the Basic AIX Image

The **spimg** installp image contains a **mksysb** of an AIX 4.1 system you can use to install AIX 4.1 on the nodes in your RS/6000 SP system after you have successfully installed and configured your control workstation.

The **mksysb** is an image of a *minimal* AIX 4.1 system. This minimal system is made up of the following:

- The basic operating system
- Extensions
- Networking
- Basic utilities

IBM provides the image as a base for getting your RS/6000 SP system up and running quickly. You should customize this image to meet the needs of your production environment. For instructions on customizing the minimal image, turn to "D. Power On and Install the Nodes" on page 54.

See the *Memo to Licensees* and **spimg lpp.README** for details of the contents of AIX 4.1.

Building a New AIX 4.1 Image

When you are installing your RS/6000 SP system for the first time, you can generate a **mksysb** image and install that on your nodes during the initial installation. To generate this image, do either of the following:

- Generate this image on a node after you have installed the node using the basic image and additional LPPs.
- Use a standalone workstation (either the control workstation or a different standalone workstation).

  Note: After you have completed "Step 12: Initialize RS/6000 SP Authentication Services" on page 27, you cannot use the control workstation to build a new image. Running the **setup_authent** command on any workstation makes the workstation unsuitable for generating a **mksysb** image for a node.

The control workstation (or a different standalone workstation) must be at the right level of the AIX RS/6000 operating system and must have all required PTFs applied. See the *Memo to Users* for the list of required AIX operating system level and PTFs. One way to ensure this is to install the **mksysb** image that resides in the **spimg installp** image on its installation media.

If you are generating your **mksysb** from a node, you can first use the basic image to install AIX 4.1 and PSSP LPP options on the node. Then you can use **script.cust** to install the LPPs and service your system requires. See Chapter 5, "Performing Software Maintenance" on page 103 for more details.

At this point, you can test the node with applications specific to your users' needs to make sure it meets your environment requirements. When you are satisfied this node has all of the LPPs and service, you can make a **mksysb** image from it by using the SMIT **mksysb** option.

After the image is created, you must copy it to **/spdata/sys1/install/images** on the control workstation. This directory is the starting point for all the **mksysb** images used for the RS/6000 SP system. Make sure the directory has permissions `rwxr-sr-x` and the images have permissions `rw-r--r--`.

Changing the Node's Install Image Attribute in the SDR

After a new image has been created and copied to the control workstation, you are ready to update the SDR with the name of the new image for the nodes you want to reinstall. To define a new install image to be used for a node in the SDR, you can use the **spbootins** command or the SMIT server_dialog interface to do the following:

- Redefine the node's **install_image_name** and the **bootp_response** attributes in the SDR.
- Create new installation and configuration files for the boot/install server.
- Copy the new image to the boot/install servers for the nodes to be reinstalled.

Detailed Overview of Network Installation of a Node

Note: The information in this section is optional. Read this section if you want to understand the details of the network installation described in "Install SP on the Nodes (Externals)" on page 2.

Network Installation

When a node boots over the network, it issues a **bootp** request on that network specifying its network device hardware address. (For the RS/6000 SP, this is the node's en0 Ethernet). The boot/install server has a list of nodes it boots and their associated hardware Ethernet addresses.

The **bootp** daemon on the boot/install server gets the request and looks in its table (**/etc/bootptab**) for this node's hardware or Ethernet address. If it finds the address in its table, it responds by sending the node's IP address.

The node's IPL Read-Only Storage (ROS) requests a boot image transferred to the node using **tftp**. The boot image is run and NIM performs the installation of the mksysb image. After the **mksysb** installation is complete, NIM invokes the **pssp_script** script resource.

Customization

pssp_script transfers netinstall information files /**tftpboot**/*node_name***.install_info** and /**tftpboot**/*node_name***.config_info** from the boot/install server to the node and then performs the netinstall. **install_info** and **config_info** are used during a network installation of an AIX image. These files contain information necessary to successfully complete the netinstall.

Fields in the **install_info** file contain the following information:

- Client en0 IP address and host name
- Netinstall server IP address and host name
- Control workstation IP information and host name

Fields in the **config_info** file contain the following information:

- Node number
- Initial host name
- Default route
- An entry for each adapter defined in the SDR, listing the following:
  - Adapter name
  - Adapter IP address host name
  - Netmask
  - ring_speed (for token ring)
  - bnc_select (DIX/BNC for Ethernet)

After a node is installed, it gets a copy of the **config_info** file from its master. The information in the **config_info** file is used to customize the SP adapters with information like host name and default route. This file is transferred from the server to the node during customization. The file is read at this time and the node is configured.

ssp.basic, **ssp.sysctl** and **ssp.clients** are installed if they are not already installed. At this time the **ssp.sysman** option is installed if you have selected any of the additional system management options (See “Step 15: Enter Site Environment Information” on page 38 in Chapter 2, Installing and Configuring the RS/6000 SP System.) The **ssp.css** is installed if your system has a **css0** adapter definition in the SDR. The **ssp.jm** option is installed if the node's boot/install server has it installed.

As part of completing the network install, NIM modifies the boot/install server's /**etc**/**bootptab** file so that the node does not perform a netinstall again on the next boot. PSSP changes the SDR node object **bootp_response** attribute to **disk**.

Boot Processing

The node is then shut down and rebooted. During the subsequent boot, PSSP checks the SDR to determine if any of the PSSP Site Environment options were chosen. If an options is selected, the node configuration for that option is performed now.

Configuring Boot/Install Servers as NIM Masters

When you run **/usr/lpp/ssp/bin/setup_server** to configure a boot/install server, it does the following:

- Creates /**tftpboot**/*node_name***.install_info** and /**tftpboot**/*node_name***.config_info**
- Configures the server as a NIM master
- Defines the following NIM resources:
  - spot
  - mksysb
  - script
  - lppsource
  - bosinst
- Defines nodes to be installed or booted in diagnostics or maintenance as NIM clients
- Allocates NIM resources to the NIM clients as needed.
- Copies the **mksysb** images (if any of its nodes need to be installed)
- Creates required authentication files, /**tftpboot**/*host name***-new-srvtab**

Chapter 2. Installing and Configuring the RS/6000 SP System

This chapter shows you how to install the IBM Parallel System Support Programs for AIX (PSSP), configure your control workstations, servers, and processor nodes, and initialize the system. It includes the following tasks and steps:

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Before You Begin

- Do the steps in this chapter only if you are not migrating from RS/6000 SP PSSP V1R2 to RS/6000 SP PSSP V2R1, or if you are doing a complete reinstall.

  Otherwise, do the installation steps outlined in Chapter 3, “Migrating to PSSP V2R1 from PSSP V1R2” on page 69.
- Make sure you have your configuration worksheets filled in and available before you proceed with installation. During the procedure you are prompted for network, host name, and configuration data. It is easier to install the system if you plan your configuration beforehand.

You can install your system by using either the System Management Interface Tool (SMIT) or PSSP commands. SMIT is a graphical menu-driven interface to enter information into the System Data Repository (SDR). Experienced users may prefer to issue the PSSP commands directly. Throughout this chapter, instructions for both methods are given. Use default options unless instructed to do otherwise.

Finding Related Installation Information

You can find more information about SMIT in *IBM General Concepts and Procedures for RISC System/6000*.

You can find more information about the AIX 4.1 Network Installation Management in *AIX Network Installation Management Guide and Reference*.

The **installp** command is explained in *IBM AIX for RISC System/6000 Commands Reference*.

A. Prepare the Control Workstation

This section describes the steps you take to prepare the control workstation. Check off each step after you complete it.

- ☐ "Step 0: Update the root User Path"
- ☐ "Step 1: Verify the Control Workstation Requirements"
- ☐ "Step 2: Verify Network Requirements" on page 14
- ☐ "Step 3: Connect Frames to Your Control Workstation" on page 14
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- ☐ "Step 6: Verify Control Workstation Interfaces" on page 15
- ☐ "Step 7: Define Space for SP Data" on page 17
- ☐ "Step 8: Copy the AIX 4.1 LPP Images" on page 21

Step 0: Update the root User Path

You must run all installation tasks from root on the control workstation, except where indicated. All of the RS/6000 SP commands in this chapter are in **/usr/lpp/ssp/bin**, except where indicated.

To avoid entering the complete path name each time you want to invoke a RS/6000 SP command, add **/usr/lpp/ssp/bin** to the root user path in root's **.profile** file.

The RS/6000 SP authentication services **klist** command is in **/usr/lpp/ssp/kerberos/bin**. Add this path to root's **.profile** file.

The following is an example of the root user path statement in **.profile**:

```
PATH=$PATH:/usr/lpp/ssp/bin:/usr/lpp/ssp/kerberos/bin
```

Step 1: Verify the Control Workstation Requirements

The RISC System/6000 you use as the control workstation for your RS/6000 SP system must have the following software installed:

- AIX Version 4.1 Base Operating System
- TCP/IP
- NFS
- NIM file sets

In addition, your control workstation requires one serial port available per frame for the RS-232 cable that supports hardware monitoring and control. If your RS/6000 SP system has more than two frames, you may need an asynchronous adapter card to provide the extra ports if your control workstation does not already have them.

The control workstation must have ample disk space for the boot/install server files. See the *SP System Planning Guide* for detailed information about space requirements.

Notes:

1. All names and addresses of all IP interfaces on your nodes must be resolvable on the control workstation before you install and configure the RS/6000 SP.
2. After you have set the host names and IP addresses on the control workstation, you should not change them for the duration of the installation.

See the document, *Memo to Current Licensees*, that accompanies the installation media for the exact AIX version required on the control workstation and other prerequisites.

Step 2: Verify Network Requirements

Using your node worksheets, check all RS/6000 SP Ethernet and additional adapter information to ensure that you have assembled the correct host name, IP address, and netmask data for installation.

Step 3: Connect Frames to Your Control Workstation

Connect RS-232 and Ethernet cables from the RS/6000 SP System frames to the control workstation according to your RS/6000 SP Control Workstation Worksheet. See the *SP Maintenance Information Volume 1* for instructions.

Step 4: Configure RS-232 Control Lines

Each frame in your RS/6000 SP system requires a serial port on the control workstation configured to accommodate the RS-232 line. For example, if you have two frames, configure two tty terminals.

Use SMIT or the **mkdev** command to define the RS-232 interfaces as they appear on your Control Workstation Worksheet.

Using SMIT:

To configure an RS-232 line using SMIT:

TYPE	**smit tty**
	▲ The TTY menu appears
SELECT	Add a TTY
SELECT	RS-232 Asynchronous Terminal
SELECT	An appropriate serial port (parent adapter) connection. For example, **sa0**.
	▲ A data entry window appears
PRESS	**List** to show the available port numbers. Select a port number. For example, **s1**, **s2**, **s3**, or **s4**.
PRESS	**Do** to configure the line.

Using mkdev:

Enter a command similar to this example, which defines and configures an RS-232 line for parent adapter sa0 on port serial port 1:

```
mkdev -c tty -t tty -s rs232 -p sa0 -w s1
```

Note: You can accept the default baud rate of 9600. When the SP System Monitor starts, it changes the rate to 19200.

Step 5: Configure Ethernet Adapters

Use **smit chinet** or the **chdev** command to configure each Ethernet adapter connecting your RS/6000 SP frames to the control workstation. For details on the correct use of **chdev**, see the *AIX Commands Reference*, the man pages, or the online information database accessed through the **info** command.

Refer to your RS/6000 SP Control Workstation Worksheet in the *SP System Planning Guide* for the IP addresses and netmask values of your Ethernet adapters.

Note: If adapter is not yet defined or configured, use **smit mkinet** or the **mkdev** command instead of **smit chinet** or **chdev** to specify new IP host name and netmask values.

Using SMIT:

TYPE	**smit chinet**
SELECT	The Ethernet interface to be configured
ENTER	IP interface and netmask information from worksheet.
TYPE	**up** in the `current STATE` option
PRESS	**Do** to complete operation

Using chdev:

Enter a command similar to this example, which configures an en0 adapter.

```
chdev -l en0 -a netaddr=129.33.41.1 -a netmask=255.255.255.0 -a state=up
```

Using mkdev:

Enter a command similar to this example, which defines and configures an en0 adapter.

```
mkdev -c if -s EN -t en -a netaddr=129.33.34.1 netmask=255.255.255.0 state=up -q -w en0
```

Step 6: Verify Control Workstation Interfaces

Verify the configuration for each Ethernet adapter in the control workstation.

You can verify each Ethernet adapter by *pinging* its IP address and seeing if you get a response. For example:

ping 129.33.34.1 -c 1

Reconfigure the adapter if you do not receive a response.

Changing root Default Processes

When you first install your RS/6000 SP system, the number of processes the root user can have is set to **40**, an AIX 4.1 default. You will not be able to continue installing your system with this default value—you must increase the number.

To change the value, enter the following command:

chdev -l sys0 -a maxuproc='256'

Tunables and Tunable Values

When you first install your RS/6000 SP system, the network tunable values are set to AIX 4.1 defaults. (A **tunable** is a SP performance parameter you can set to a value that makes your system run its workload most efficiently.) Your system may not run efficiently with the default values. Use the **no** command to display these values. This command and all its parameters are described in the *SP Commands and Technical Reference*.

When you install PSSP on your control workstation, change the network tunables on the control workstation interface to the values in Table 1 on page 76.

Table 1. Control Workstation Tunables

Tunable	Recommended Initial Value
thewall	16384
sb_max	163840
ipforwarding	1
tcp_sendspace	65536
tcp_recvspace	65536
udp_sendspace	32768
udp_recvspace	65536

These tunables are defined as follows:

Tunable	Description
thewall	The upper bound on the amount of real memory that can be used by the communications subsystem. The units are in 1 KB increments.
sb_max	Upper limit on the size of the TCP and UDP buffers in mbufs of allocated space to a connection.
ipforwarding	Specifies whether the kernel should forward packets. A value of **1** forwards packets when they are not for the local system; a value of **0** prevents forwarding.
tcp_sendspace	The default size of the TCP send window.
tcp_recvspace	The default size of the TCP receive window.
udp_sendspace	The default size of the UDP send buffer. The effective maximum is 65536 (64K).
udp_recvspace	The default size of the UDP receive buffer.

Using no:

To display network tunable values, enter:

```
/usr/sbin/no -a
```

AIX responds similarly to the following:

```
                thewall = 16384
                 sb_max = 163840
       net_malloc_police = 0
                rto_low = 1
               rto_high = 64
              rto_limit = 7
             rto_length = 13
            arptab_bsiz = 7
              arptab_nb = 25
             tcp_ndebug = 100
                 ifsize = 8
        subnetsarelocal = 1
                 maxttl = 255
              ipfragttl = 60
        ipsendredirects = 1
           ipforwarding = 1
                udp_ttl = 30
                tcp_ttl = 60
             arpt_killc = 20
          tcp_sendspace = 65536
          tcp_recvspace = 65536
          udp_sendspace = 32768
          udp_recvspace = 65536
         rfc1122addrchk = 0
         nonlocsrcroute = 0
          tcp_keepintvl = 150
           tcp_keepidle = 14400
              bcastping = 0
               udpcksum = 1
            tcp_mssdflt = 1500
        icmpaddressmask = 0
           tcp_keepinit = 150
ie5_old_multicast_mapping = 0
                 rfc1323 = 1
              ipqmaxlen = 100
      directed_broadcast = 1
            ipforwarding = 1
        subnetsarelocal = 1
```

To change the value of **thewall**, enter:

```
/usr/sbin/no -o thewall=16384
```

When you change the network tunables, they take effect immediately. However, they are not preserved across a boot. To make the changes to the tunables effective across boots, add the **no -o** commands you used to change the network tunables to the bottom of the file /**etc**/**rc.sp**.

Step 7: Define Space for SP Data

The /**spdata** directory contains mksysb and installp file sets. IBM recommends you create a separate volume group for the /**spdata** file system. These file sets are large and need much space (at least 2 GB). If you have not done so already, use the *SP System Planning Guide* to help you estimate how much space you need to define.

Define a Volume Group

The logical volume manager (LVM) configuration you define can also include placing the /**spdata** file system in its own volume group rather then using the default volume group **rootvg**.

This task is optional. You need to section off space on the control workstation disk, and this is one way to do it. IBM recommends you create a separate file system because of the large amount of SP data.

Note: You cannot create a volume group if:

- All control workstation disks are in use.

or

- The control workstation has only one physical volume.

To create a volume group, you can use SMIT or the command **mkvg**.

Using SMIT:

TYPE	**smit vg**
	▲ The Volume Groups menu appears
SELECT	Add a Volume Group
	▲ The Add a Volume Group window appears
TYPE	The volume group name (for example, **spdatavg**).
TYPE	The physical volume name (press F4 and select a volume).
PRESS	**Do** to create the volume group.

SMIT automatically varies on the volume group.

Using mkvg:

The following command will create a new logical volume named **spdatavg**, using **hdisk1** as the physical volume.

```
/usr/sbin/mkvg -f -y spdatavg hdisk1
```

After you create the new volume group **spdatavg**, vary on the volume group on your control workstation using the **varyonvg** command.

```
/usr/sbin/varyonvg spdatavg
```

Define a File System within a Logical Volume

Now define a new logical volume for the **spdata** file system. You can define a logical volume and a file system within that volume group. This method gives you flexibility in allocating the space on your system. The name for the logical volume can be your choice—what is important is to allocate enough space for your /**spdata** file system configuration, based on your estimates.

If you have not already estimated the space you need for your file system, see the *SP System Planning Guide* for help in doing this.

The logical volume can be defined using SMIT or the AIX command **mklv**.

Using SMIT:

TYPE	**smit lv**
	▲ The Logical Volume menu appears
SELECT	Add a Logical Volume
SELECT	The proper volume group **rootvg** or your spdata volume group.
NAME	The logical volume (anything you want)
SELECT	The Number of logical partitions used
	Note: Each logical partition is allocated in 4 MB blocks.

Using mklv:

To create a logical volume called **spdata_lv** with 2 GB (assuming a default physical partion size of 4 MB) use the **mklv** command. Enter:

```
/usr/sbin/mklv -y spdata_lv spdatavg 500
```

Create the File System for spdata

You now need to create the /**spdata** file system on the control workstation. The file system must be mounted as /**spdata**. You can use SMIT or the AIX command **crfs** to create the /**spdata** file system.

Using SMIT:

TYPE	**smit crfs**
SELECT	Add a Journaled File System on a Previously Defined Logical Volume
SELECT	Your logical volume (press F4 and select a volume).
SPECIFY	/**spdata** as mount point
SELECT	**yes** for `Mount AUTOMATICALLY at system restart?`

Using crfs:

To create a file system /**spdata** within the newly created logical volume **spdata_lv**, use the **crfs** command. The following example creates the /**spdata** file system, using logical volume **spdata_lv** and mount point /**spdata**. It also adds the /**spdata** into the /**etc**/**filesystems** to be automatically mounted at system restart.

```
/usr/sbin/crfs -v jfs -d spdata_lv -m /spdata -A yes -p rw -t no
```

Mount the /spdata File System

After you create the new /**spdata** file system, you need to mount it on the control workstation. Use the AIX command **mount**.

The following example mounts the /**spdata** file system.

```
/usr/sbin/mount /spdata
```

Expand the root File System

Before You Begin

- This step is **optional**. Skip this step if you have already created a logical volume and file system for /**spdata**.
- IBM does not recommend the expanded root file system configuration because of possible performance and backup considerations with the control workstation.

You can choose not to create a logical volume and file system for /**spdata** and increase your current root / file system to hold the required AIX 4.1 LPP file sets, AIX **mksysb** images, and RS/6000 SP installp file sets.

You can use SMIT or the AIX command **chfs** to expand the root file system.

Using SMIT:

TYPE	**smit chfs**
SELECT	Change / Show Characteristics of a Journaled File System
SELECT	/
SPECIFY	The size in 512-byte blocks to increase the file system

Using chfs:

The following example increases the root file system by 400 MB, which is equal to 781250 512-byte blocks.

```
/usr/sbin/chfs -a size=+781250 /
```

Create Required /spdata Directories

Note: Make sure you mount the new /**spdata** file system before you create the /**spdata** directories.

The RS/6000 SP requires you create sub-directories on the /**spdata** file system for storing critical PSSP data. Table 2 on page 81 lists the required directories.

Table 2. Required /spdata Directories

Directory	Purpose
/spdata/sys1	Main directory for SDR, SPMON, Log Mgt, and Installation
/spdata/sys1/install	Main directory for PSSP installation
/spdata/sys1/install/lppsource	Location of required AIX 4.1 file sets
/spdata/sys1/install/images	Location of all required AIX **mksysb** images
/spdata/sys1/install/pssplpp	Location of all RS/6000 SP installp file sets
/spdata/sys1/install/pssp	Location of NIM configuration data files

To create these directories, use the following **mkdir** commands:

- **mkdir -p /spdata/sys1/install/lppsource**
- **mkdir /spdata/sys1/install/images**

- **mkdir /spdata/sys1/install/pssp**
- **mkdir /spdata/sys1/install/pssplpp**

Make sure the directories have the permissions `rwxr-sr-x`.

Step 8: Copy the AIX 4.1 LPP Images

If you have not done so already, you must now download the AIX file sets into the **lppsource** directory on the control workstation. You have a choice. You can download:

- All of the AIX file sets (approximately 1.5 GB)

or

- The minimal required AIX file sets (approximately 450 MB)

The following is the minimal list of AIX file sets required to perform **mksysb** installations:

bos
bos.info.any
bos.net
bos.rte.up
bos.rte.mp
bos.diag
bos.powermgt
bos.sysmgt
bos.terminfo.all
devices.all
X11.apps
X11.base
X11.compat
X11.Dt
X11.fnt
X11.loc
X11.motif
X11.msg.all
X11.vsm

Note: The *<prefix>*.all syntax in this list refers to everything that starts with the *<prefix>*. For example, **devices.all** refers to all of the file sets starting with **devices**.

Copy the LPP images from the installation media to **/spdata/sys1/install/lppsource** on your hard disk.

Notes:

1. Make sure you copy the AIX file sets to **/spdata/sys1/install/lppsource**. If you change the path name in any way, the installation fails.
2. Make sure the directory has the permissions `rwxr-sr-x` and the images have the permissions `rw-r--r--`.
3. Refer to your disk usage planning in the "Combining the Space Requirements" section of the *SP System Planning Guide* to determine if you have allocated enough space to accomplish this task.
4. Allow at least 1-3 hours for moving all the file sets from media to disk.

Load AIX Media

Use the AIX 4.1 media. Login to the control workstation as root and run **bffcreate** using SMIT or the command line.

Using SMIT:

TYPE **smit bffcreate**

▲ The Copy Software to Hard Disk for Future Installation window appears.

PRESS **List** (F4) to show the available devices. Select the device containing the product installation media.

PRESS **Do** to display the target parameters.

▲The Copy Software to Hard Disk for Future Installation window appears.

PRESS **List** to show the LPP packages to load. Select the required file sets to copy.

TYPE /**spdata**/**sys1**/**install**/**lppsource** in the `DIRECTORY for storing software` field.

PRESS **Do** to begin downloading.

The following warning message may be issued—ignore it:

```
bffcreate: Warning: important size information is missing from
           the table of contents file.  Consequently, there may not
           be enough free file system space to successfully create
           the bff image(s).  Continuing anyway...
```

Using the Command Line

Note: This example shows the product media on **rmt0** and selection of all LPPs. Using **all** may load unnecessary file sets into the directory.

Enter:

```
bffcreate -qvX -t/spdata/sys1/install/lppsource -d /dev/rmt0 all
```

The following warning message is issued—ignore it:

```
bffcreate: Warning: important size information is missing from
           the table of contents file.  Consequently, there may not
           be enough free file system space to successfully create
           the bff image(s).  Continuing anyway...
```

B. Install PSSP

This section describes the steps you take to install PSSP. After you prepare the control workstation, you are ready to install the PSSP software. Check off each step after you complete it.

- ☐ "Step 9: Copy the PSSP Images"
- ☐ "Step 10: Install a Basic AIX (mksysb) Image" on page 24
- ☐ "Step 11: Install PSSP on the Control Workstation" on page 25
- ☐ "Step 12: Initialize RS/6000 SP Authentication Services" on page 27
- ☐ "Step 13: Complete System Support Installation on the Control Workstation" on page 36
- ☐ "Step 14: Run SDR and System Monitor Verification Tests" on page 36

Step 9: Copy the PSSP Images

The RS/6000 SP package is comprised of these install images:

- The **pssp** install image, which contains the PSSP options
- The **ssp.csd** install image (IBM Virtual Shared Disk)
- The **ssp.mte** install image (magnetic tape extension)

Before you install the PSSP, copy the PSSP images from the installation media to **/spdata/sys1/install/pssplpp** directory on your hard disk.

Load PSSP Media

Login to the control workstation as root and run **bffcreate** using SMIT or the command line.

Using SMIT:

TYPE **smit bffcreate**

▲ The Copy Software to Hard Disk for Future Installation window appears.

PRESS **List** (F4) to show the available devices. Select the device containing the product installation media.

PRESS **Do** to display the target parameters.

▲The Copy Software to Hard Disk for Future Installation window appears.

TYPE **/spdata/sys1/install/pssplpp** in the `DIRECTORY for storing software` field.

PRESS **Do** to begin the install process.

The following warning message is issued, and you can ignore it:

```
bffcreate: Warning: important size information is missing from
           the table of contents file.  Consequently, there may not
           be enough free file system space to successfully create
           the bff image(s).  Continuing anyway...
```

Using the Command Line

Note: This example shows the product media on **rmt0**.

Enter

```
/etc/bffcreate -d /dev/rmt0 -t /spdata/sys1/install/pssplpp -X all
```

The following warning message is issued, and you can ignore it:

```
bffcreate: Warning: important size information is missing from
           the table of contents file.  Consequently, there may not
           be enough free file system space to successfully create
           the bff image(s).  Continuing anyway...
```

Completing the Step: Updating .toc

When **bffcreate** completes, rename **ssp.usr.2.1.0.0** in **/spdata/sys1/install/pssplpp** to **pssp.installp**.

Do the following:

```
cd /spdata/sys1/install/pssplpp
mv ssp.usr.2.1.0.0 pssp.installp
```

Because the installation tools expect the name of the installp image to be **pssp.installp**, and installp places a different image name in its **.toc** file, update that **.toc** file by running the **inutoc** script as follows:

```
cd /spdata/sys1/install/pssplpp
/usr/sbin/inutoc .
```

Note: Make sure you rename the **ssp.usr.2.1.0.0** image to **/spdata/sys1/install/pssplpp/pssp.installp**. If you change the path name in any way, the installation of PSSP options fails.

Step 10: Install a Basic AIX (mksysb) Image

The media shipped with the RS/6000 SP hardware contains the **spimg** installp image, a **mksysb** image of the minimal AIX 4.1 system. You can use SMIT or **installp** to install the AIX 4.1 image directly from installation media to **/spdata/sys1/install/images/bos.obj.ssp.41**

If you intend to use your own **mksysb** image, copy it to **/spdata/sys1/install/images/bos.obj.ssp.41** and continue with “Step 11: Install PSSP on the Control Workstation” on page 25.

Using SMIT:

TYPE **smit install_latest**

▲ The Install New Software Products at Latest Level window appears.

TYPE The input device (press F4 and select a device).

PRESS **Do** to begin the install.

Using installp:

Enter:

```
installp -a -d /dev/rmt0.1 -X spimg
```

Step 11: Install PSSP on the Control Workstation

The RS/6000 SP package is comprised of these install images:

- The **pssp** install image, which contains the PSSP options
- The **ssp.csd** install image (IBM Virtual Shared Disk)
- The **ssp.mte** install image (magnetic tape extension)

See the *SP System Planning Guide* for details on the various installation options.

Full Installation

The recommended full installation includes:

PSSP Options:

ssp.authent	Authentication Server
ssp.basic	Code for installing and monitoring the RS/6000 SP, including • SP System Monitor • SDR • Centralized Management Interface (CMI—the SMIT panels) • Installation and Configuration Commands
ssp.clients	All user authentication commands, kshell services, monitor command line interfaces, and logging daemon.
ssp.css	Device Drivers and High Performance Switch Support
ssp.docs	Man Pages and Online Information
ssp.gui	SP System Monitor GUI
ssp.jm	Resource manager for parallel application scheduling
ssp.public	Tar files for Amd, PERL, SUP, NTP, Tcl, TclX, TK-X11, and Expect.
ssp.sysctl	The Sysctl component
ssp.sysman	RS/6000 SP Management Tools including • User Management Support • Print Support • File Collections • Login Control • Accounting Support • NTP
ssp.top	The system partitioning configuration directory and files

Images:

ssp.csd	IBM Virtual Shared Disk performance enhancements and data striping The **ssp.csd** image is discussed separately in the Virtual Shared Disk chapter in the *SP Administration Guide*.
ssp.mte	This image contains the magnetic tape extension pseudo-device driver The **ssp.mte** image is discussed separately in the Distributed Tape Management System chapter in the *SP Administration Guide*.
spimg	Contains a single file containing a **mksysb** image of a minimal AIX 4.1 system.

Minimal PSSP Installation

A minimal installation requires:

- **ssp.basic**
- **ssp.clients**
- **ssp.gui**
- **ssp.sysctl**

Notes:

1. You must install **ssp.authent** if you are installing a RS/6000 SP authentication server. If you are using MIT Version 4 or AFS authentication services, **ssp.authent** is not required.
2. If you select any RS/6000 SP Management Tools from the **ssp.sysman** option, all tools on that option are automatically installed. See the RS/6000 SP Site Environment Worksheet in the *SP System Planning Guide*.
3. If you are planning to set up system partitions, you must install **ssp.top**.

Selecting LPP Options for Authentication

Selecting RS/6000 SP options to install depends on the server configuration you use. RS/6000 SP authentication code is distributed in two separately installable options:

- **ssp.authent**, which contains the parts required on a system that is used by the authentication server
- **ssp.clients**, which contains authentication commands and authenticated client services for the RS/6000 SP system

You must install **ssp.clients** on the control workstation in all cases. This includes when you use AFS or the MIT Version 4 authentication servers. **ssp.clients** needs to be installed on any other RISC System/6000 workstation that is an authentication server. **ssp.clients** is required to perform system management tasks using SP System Monitor commands, AIX remote commands, or the sysctl remote command execution facility.

You must install **ssp.authent** if you are using the RS/6000 SP authentication server. You can install **ssp.authent** on any other RISC System/6000 workstation that is an authentication server. You cannot install **ssp.authent** if the system already has an MIT Kerberos Version 4 or AFS authentication implementation installed. If you want to use the RS/6000 SP authentication facilities, you must first remove the other authentication service.

Installation without AIX Preinstalled

Because your system does not have AIX 4.1 preinstalled on the nodes, you must add an install image to your list of installation options. You can install **spimg**, AIX 4.1 (**bos.obj.ssp.41**) shipped with the RS/6000 SP PSSP package.

Or if you prefer, you can provide your own AIX image for installation on the nodes. See “Build an Installation Image” on page 106 for more information.

PSSP Installation Instructions

You can install PSSP using SMIT or the **installp** command.

Login to the control workstation as root and follow either of these procedures.

Using SMIT:

TYPE	**smit install_latest**
	▲ The Install New Software Products at Latest Level window appears.
ENTER	**/spdata/sys1/install/pssplpp/pssp.installp** for Input Device
PRESS	**Do** to display the default install parameters.
PRESS	**List** to show options.
SELECT	One or more program options, or select the header file (called **ssp** with **ALL** on the far right side) to do the full installation.
PRESS	**Do** to complete option selection and to begin installation.

When the installation is complete, check the SMIT log file for the installation status. If errors occur, see the *IBM RISC System/6000 Problem Solving Guide*.

Using installp:

You can use **installp** to install multiple options. For example, to install **ssp.basic** and **ssp.sysctl**, enter:

```
installp -a -d /spdata/sys1/install/pssplpp/pssp.installp -X ssp.basic ssp.sysctl
```

Note: In AIX 4.1, **installp** automatically commits the packaging file set when you specify the **-a** option.

To list all of the options for **ssp**, enter:

```
installp -l -d /spdata/sys1/install/pssplpp/pssp.installp
```

Step 12: Initialize RS/6000 SP Authentication Services

To do this step, you must have decided what type of authentication server to use: RS/6000 SP, AFS, or another MIT Kerberos Version 4 implementation. In preparation, you should have completed the checklist in the SP System Planning Guide. See the *SP System Planning Guide* for more information.

RS/6000 SP authentication provides a program, **/usr/lpp/ssp/bin/setup_authent**, to initialize RS/6000 SP authentication services on RISC System/6000 workstations (including the control workstation) for authentication servers and authentication client systems. This program defines instances of the **hardmon** and **rcmd** authenticated services, and does one of the following:

- Creates a primary authentication server and database
- Creates a secondary authentication server and database, after the primary server has been initialized
- Initializes the control workstation or other RISC System/6000 workstation to use AFS authentication
- Creates an authentication client system

Examples of Initializing Authentication Services

The procedure for completing this step varies, depending on your authentication configuration. In each of the following sections, an example is included where the **setup_authent** command is invoked.

Review the examples. Substitute the principal names and passwords on your system for the *DescriptiveTerms* shown in the examples, and use them to initialize the authentication services on your system.

Before You Begin

- <screenclear> shows where **setup_authent** clears the screen before displaying an explanation of the next part of the initialization procedure.
- *poobah* refers to the administration ID. It can be **root** or any name you choose. It must be a user in the system.

  The kerberos administrator should be separate from the root user, and be used for the installing and monitoring the PSSP spmon and authentication files. Some AIX commands require the root (uid 0) privilege in order to run, but the administrator can lock out and reassign root-based privileges as necessary.

The examples include:

- "Initializing as the Primary Authentication Server"
- "Initializing as a Secondary Authentication Server" on page 31
- "Initializing as an Authentication Client System" on page 33
- "Initializing to use AFS Authentication" on page 35

Initializing as the Primary Authentication Server

This example shows the procedure you should follow to initialize your primary authentication server on the RS/6000 SP control workstation or another RISC System/6000 workstation:

1. Create a **/etc/krb.conf** file, unless you want **setup_authent** to create a default configuration file with one authentication server for the default local realm name.
2. Create a **/etc/krb.realms** file, if you need to map any domains to the local realm name.
3. Run the **/usr/lpp/ssp/bin/setup_authent** program.
4. Issue the **/usr/lpp/ssp/kerberos/bin/klist** command to make sure a ticket exists for the account.

The following example shows the interaction you can expect when you run **setup_authent** when initializing the primary authentication server.

```
#setup_authent
<screenclear>
 ********************************************************************
                  Creating the Kerberos Database

   Invoking the kdb_init and kstash utilities to create the database.

   You must decide on a master password for the database. You will be
   prompted to enter it twice.  Save this password in a very secure
   place, since it is used to encrypt all keys in the database and you
   will need it for other administrative tasks.

   After you complete this task, the Kerberos daemons will be started:
   kerberos for ticket-granting services, kadmind for administration.

   For more information see the kdb_init and kstash man pages.
 ********************************************************************
You will be prompted for the database Master Password.
It is important that you NOT FORGET this password.

Enter Kerberos master key: YourDatabasePassword

Enter Kerberos master key: YourDatabasePassword

<screenclear>
 ********************************************************************
           Defining an Administrative Principal to Kerberos

   The kdb_edit utility is used to define the initial Kerberos user.
   You must define this user as a Kerberos database administrator. The
   root user will have to login to Kerberos with this name prior to
   performing installation tasks that result in execution of the
   spsitenv, spbootins, or setup_server commands, if any nodes have been
   added to the configuration or renamed using the sphostnam command.

   kdb_edit prompts you separately for the name and the instance. First
   enter the user name, specifying the login name of the user who will be
   the primary Kerberos administrator for the local realm. When you are
   prompted for the instance, you must enter admin.  You must assign a
   Kerberos password for this user and enter it twice (you may use the
   login password). To take default values on other options, hit <Enter>.

   To exit kdb_edit, hit <Enter> when prompted for a second name.
   For more information see the kdb_edit man page.
 ********************************************************************
Opening database...
Previous or default values are in [brackets] ,
enter return to leave the same, or new value.

Principal name: poobah

Instance: admin

<Not found>, Create [y] ? <Enter>
Principal: poobah, Instance: admin, kdc_key_ver: 1

New Password: PoobahPassword
```

```
Verifying, please re-enter
New Password: PoobahPassword

Principal's new key version = 1
Expiration date (enter yyyy-mm-dd) [ 1999-12-31 ] ? <Enter>
Max ticket lifetime (*5 minutes) [ 255 ] ? <Enter>
Attributes [ 0 ] ? <Enter>
Edit O.K.
Principal name: <Enter>
<screenclear>
 ****************************************************************************
                Logging into Kerberos as an admin user

   You must assume the role of a Kerberos administrator <user>.admin
   to complete the initialization of kerberos on the local system.
   The kinit command is invoked and will prompt you for the password.
   If you are setting up your primary server here, you just defined it.
   If your primary server is on another system, you must first enter
   the user name of an administrative principal defined on that server.

   You need to be authenticated as an administrator so that this
   program can create the service principals required by the
   authenticated services that are included in the ssp package.

       hardmon - for the System Monitor facilities
       rcmd    - for sysctl and Kerberos-authenticated rsh and rcp

   For more information, see the kinit man page.
 ****************************************************************************

Kerberos Initialization for "poobah.admin"
Password: PoobahPassword

# klist
Ticket file:    /tmp/tkt0
Principal:  poobah.admin@XYZ.ABC.COM

  Issued           Expires          Principal
Nov 11 16:26:11  Dec 12 16:26:11  krbtgt.XYZ.ABC.COM@XYZ.ABC.COM
#

# <end_of_example>
```

Initializing as a Secondary Authentication Server

Before You Begin

- To do this step, the primary authentication server must already be initialized.
- Ensure clock synchronization between the primary and secondary authentication servers.

This example shows the procedure you should follow to initialize a secondary authentication server on the RS/6000 SP control workstation or another RISC System/6000 workstation.

1. Copy the **/etc/krb.conf** file from the primary authentication server to this secondary server system.
2. Add a line to the **/etc/krb.conf** file, listing this system (by its full host name) as a secondary server for the local authentication realm.

   For example, to add **sp2cw.xyz.com** as a secondary server for the authentication realm **XYZ.COM**, add this line to **/etc/krb.conf**:

   ```
   XYZ.COM sp2cw.xyz.com
   ```

3. Copy the **/etc/krb.realms** file from the primary server to this secondary server system.
4. Run the **setup_authent** program.

   setup_authent requires you to login to the authentication service using the same administrative principal name that was defined when the primary server was set up. The remainder of the initialization of authentication services on this secondary local system takes place automatically.
5. After **setup_authent** completes, add an entry for the new server to the **/etc/krb.conf** file on all RS/6000 SP systems on which you have already initialized authentication.
6. On the primary server, if this is the first secondary server, you should create a root **crontab** entry that invokes the script **/usr/kerberos/etc/push-kprop** to periodically propagate database changes.
7. Issue the **/usr/lpp/ssp/kerberos/bin/klist** command to make sure a ticket exists for the account.

The following example shows the interaction you can expect when you run **setup_authent** when initializing as a secondary authentication server.

```
#setup_authent
<screenclear>
 ************************************************************************
                Logging into Kerberos as an admin user

   You must assume the role of a Kerberos administrator <user>.admin
   to complete the initialization of kerberos on the local system.
   The kinit command is invoked and will prompt you for the password.
   If you are setting up your primary server here, you just defined it.
   If your primary server is on another system, you must first enter
   the user name of an administrative principal defined on that server.

   You need to be authenticated as an administrator so that this
   program can create the service principals required by the
   authenticated services that are included in the ssp package.

       hardmon - for the System Monitor facilities
       rcmd    - for sysctl and Kerberos-authenticated rsh and rcp

   For more information, see the kinit man page.
 ************************************************************************

setup_authent: Enter name of admin user: poobah
Kerberos Initialization for "poobah.admin"

Password: PoobahPassword
backup.abc.com: success.


backup.abc.com:          Succeeded
#
```

Note: The last two messages shown in the example above are issued by the programs that transfer the database from primary to secondary servers, to indicate that the backup database has been installed.

```
# klist
Ticket file:    /tmp/tkt0
Principal:  poobah.admin@XYZ.ABC.COM

  Issued           Expires          Principal
Nov 11 16:26:11  Dec 12 16:26:11  krbtgt.XYZ.ABC.COM@XYZ.ABC.COM
#
<end_of_example>
```

Initializing as an Authentication Client System

Before You Begin

To do this step, the primary authentication server must already be initialized.

This example shows the procedure you should follow to initialize the RS/6000 SP control workstation or another RISC System/6000 workstation as an authentication client system.

1. Copy the /**etc**/**krb.conf** file from the primary authentication server to this system.
2. Copy the /**etc**/**krb.realms** file from the primary server.

   Note: If the new workstation is outside the realm of the primary server, you must add this new workstation to the /**etc**/**krb.realms** file on the primary server before you copy the /**etc**/**krb.realms** file from the primary server to the new workstation. Otherwise, the next step will fail.
3. Run the **setup_authent** program.

   setup_authent requires you to login to the authentication service using the same administrative principal name that was defined when the primary server was set up. The remainder of the initialization of authentication services on the local system takes place automatically.
4. The root **.klogin** file on a client workstation contains just the administrative principal name you used to install authentication. You may want to edit the **.klogin** file to add other principals in your configuration.
5. Issue the /**usr**/**lpp**/**ssp**/**kerberos**/**bin**/**klist** command to make sure a ticket exists for the account.

The following example shows the interaction you can expect when you run **setup_authent** when initializing as an authentication client system.

Note: The initial warning message shown in the example is issued if you have installed the **ssp.authent** option on a system configured as a client rather than a server.

```
#setup_authent
setup_authent: This system is not listed as a Kerberos server in /etc/krb.conf.
Continuing setup as a Kerberos client system only.
<screenclear>
 ************************************************************************
               Logging into Kerberos as an admin user

   You must assume the role of a Kerberos administrator <user>.admin
   to complete the initialization of kerberos on the local system.
   The kinit command is invoked and will prompt you for the password.
   If you are setting up your primary server here, you just defined it.
   If your primary server is on another system, you must first enter
   the user name of an administrative principal defined on that server.

   You need to be authenticated as an administrator so that this
   program can create the service principals required by the
   authenticated services that are included in the ssp package.

       hardmon - for the System Monitor facilities
       rcmd    - for sysctl and Kerberos-authenticated rsh and rcp

   For more information, see the kinit man page.
 ************************************************************************

setup_authent:  Enter name of admin user: poobah

Kerberos Initialization for "poobah.admin"

Password: PoobahPassword

# klist
Ticket file:    /tmp/tkt0
Principal:  poobah.admin@XYZ.ABC.COM

  Issued           Expires          Principal
Nov 11 16:26:11  Dec 12 16:26:11  krbtgt.XYZ.ABC.COM@XYZ.ABC.COM
#

# <end_of_example>
```

Initializing to use AFS Authentication

Before You Begin

To do this step, the primary authentication server must already be initialized.

This example shows the procedure you should follow to initialize using AFS authentication servers.

1. If the AFS configuration files (**ThisCell, CellServDb**) are not in /**usr**/**vice**/**etc**, you must create a symbolic link from /**usr**/**vice**/**etc** to the directory containing those files.
2. If the **kas** command is not installed in /**usr**/**afsws**/**etc**, create a symbolic link from /**usr**/**afsws**/**etc** to the directory containing the **kas** command.
3. Run the **setup_authent** program.

   setup_authent requires you to enter the name and password of the AFS administrator.
4. Issue the /**usr**/**lpp**/**ssp**/**kerberos**/**bin**/**klist** command to make sure a ticket exists for the account.

The following example shows the interaction you can expect when you run **setup_authent** when initializing to use AFS authentication.

Note: The following message is always displayed when the workstation has AFS installed, either as a client or server.

```
#setup_authent
<screenclear>
 ************************************************************************
                           Option to Use AFS

   Because this system is configured for use of AFS, you may choose to
   use the AFS authentication servers instead of installing RS/6000 SP
   authentication servers or using other Kerberos Version 4 servers.

   The choice of AFS indicates that you will be using AFS authentication
   servers exclusively in your RS/6000 SP system's local realm.

   Do you want to set up authentication services to use AFS servers?
 ************************************************************************

Enter y or n: y


afs_add_principal: Enter afs admin principal name [login-name] user-name
Password: UserNamePassword

# klist
Ticket file:    /tmp/tkt0
Principal:  poobah.admin@XYZ.ABC.COM

  Issued           Expires          Principal
Nov 11 16:26:11  Dec 12 16:26:11  krbtgt.XYZ.ABC.COM@XYZ.ABC.COM
#

# <end_of_example>
```

Step 13: Complete System Support Installation on the Control Workstation

Before You Begin

Performing the following tasks requires that your identity be authenticated as an authorized user of the system management commands and System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

This step does the following:

- Configures the control workstation
- Installs PSSP SMIT Panels
- Starts SP daemons
- Configures the SDR
- Updates **/etc/inittab** and **/etc/services**
- Sets **node_number** for the control workstation to 0 in the Object Data Management (ODM) databases
- Creates the **hardmon hmacls** file with the administrator's ACL
- Configures the system as one system partition. There is one system partition corresponding to the name of the control workstation in the SP object. It's called the **default** or **persistent** system partition because it always exists.

Using install_cw: To complete installation of PSSP on the control workstation, enter the following command:

```
install_cw
```

Step 14: Run SDR and System Monitor Verification Tests

This step directs you to run verification tests that check for correct installation of the SDR and the SP System Monitor. You can run these verification tests from SMIT panels or from the command line.

Using SMIT:

TYPE **smit SP_verify**

▲ The Installation/Configuration Verification Menu appears.

SELECT SSP System Data Repository

SELECT SSP System Monitor Installation

Using the Command Line:

Enter:

```
SDR_test
spmon_itest
```

See the *SP Commands and Technical Reference* for more information about **SDR_test** and **spmon_itest** and on what these tests do.

See the section about Diagnosing RS/6000 SP Problems in the *Diagnosis and Messages Guide*.

C. Enter Site Environment, Frame, and Node Information

This section describes the steps you take to enter the information defining the SP2 configuration. After you prepare the control workstation and install the PSSP software, you are ready to enter the data to define your SP2 configuration. Check off each step after you complete it.

- ☐ "Step 15: Enter Site Environment Information"
- ☐ "Step 16: Enter Frame Information and Reinitialize the SDR" on page 39
- ☐ "Step 17: Verify Frame Information Using the SP System Monitor" on page 40
- ☐ "Step 18: Enter Required Node Information" on page 40
- ☐ "Step 19: Run SP System Monitor Communication Facilities Verification Test" on page 43
- ☐ "Step 20: Acquire Hardware Ethernet Addresses" on page 43
- ☐ "Step 22: Configure Additional Adapters for Nodes" on page 45
- ☐ "Step 23: Configure Initial Host Names for Nodes" on page 47
- ☐ "Step 24: Set Up Nodes to Be Installed" on page 48
- ☐ "Step 25: Run setup_server on the Control Workstation" on page 50
- ☐ "Step 26: Verify All Node Information" on page 51

Step 15: Enter Site Environment Information

Before You Begin

If you do not want to change any of the default site environment variables, skip this step.

Use SMIT or the **spsitenv** command to enter information about your site environment. The *SP System Planning Guide* contains a worksheet for these site environment values. Use the information in the *SP System Planning Guide* to fill out the worksheet before you enter this data.

The site environment data is written to the SDR. Before you run any of the installation scripts, you must enter the following data on the control workstation. Refer to the *SP System Planning Guide* for additional explanation.

Site environment data includes

- The name of the default network install image
- Your method of time service, the name of your time servers, and the version of NTP in use
- Whether or not you want to use Amd to automount user's home directories
- How you want RS/6000 SP Print Management integrated in your network
- How you want to use RS/6000 SP User Management
- Whether you want RS/6000 SP File Collection Management installed and where the daemon will run

- Whether you want to use RS/6000 SP Accounting

You can enter the site environment information using SMIT or the **spsitenv** command. Whichever method you chose, remember that these options can be easily changed at any time after installation is complete.

If you prefer to issue commands directly, refer to the *SP Commands and Technical Reference* for **spsitenv** syntax and parameter information.

Using SMIT:

TYPE **smit enter_data**

▲ The Enter Database Information menu appears.

SELECT Site Environment Information

▲ The Site Environment Information window appears.

TYPE Your environment choices. Refer to the Site Environment Worksheet.

PRESS **Do** to complete operation

Note: If you do not make any changes to the information already in the window, SP displays a usage information message. This is normal—continue on.

Using spsitenv:

The following example configures NTP service as consensus and specifies that file collection be installed.

```
spsitenv ntp_config=consensus filecoll_config=true
```

Step 16: Enter Frame Information and Reinitialize the SDR

This step creates frame objects in the SDR for each frame in your RS/6000 SP system. At the end of this step, the SDR is reinitialized, resulting in the creation of node objects for each node attached to your frames.

You can enter information about your RS/6000 SP frames using SMIT or the **spframe** command. See the *SP Commands and Technical Reference* for **spframe** syntax and parameter information.

If frames are not contiguously numbered, repeat this step for each series of contiguous frames. To save time, do not specify reinitialization of SDR until you are entering the final series of contiguous frames.

Using SMIT:

TYPE **smit enter_data**

▲The Enter Database Information menu appears.

SELECT Frame Information

▲The Frame Information window appears.

TYPE The number of frames in the Frame Count field. (Start Frame defaults to **1**.)

SELECT **yes** or **no** next to `Re-initialize the System Data Repository`, as follows:

no if you have more (noncontiguous) frame entries to make in this panel.

yes if you are entering only one series of contiguous frames, or entering the last series of noncontiguous frames.

PRESS **Do** to enter frame data to the SDR.

Using spframe:

Specify **spframe** command with **-r yes** to reinitialize the SDR (when running the command for final series of frames), a starting frame number, a frame count, and the starting frame's tty port.

The following example enters information for four frames (frame 1 to frame 4) and indicates that frame 1 is connected to /**dev**/**tty0**, frame 2 to /**dev**/**tty1**, and so on, and reinitializes the SDR.

```
spframe -r yes 1 4 /dev/tty0
```

Step 17: Verify Frame Information Using the SP System Monitor

To access the SP System Monitor GUI, enter:

spmon -g

From the SP System Monitor pop-up window:

SELECT SP

SELECT All Node Summary Display

▲ The selection screen for node variables appears.

SELECT 3DigitDisplay from the list of variables

PRESS Display all-node summary

▲ The 3-Digit Display Summary appears.

You should see the RS/6000 SP frames represented with thin or wide no de LED displays, depending on your configuration. If your frames are not correctly represented, you may have a hardware problem, such as a misplugged RS-232 cable. See the chapter on diagnosing RS/6000 SP problems in the *Diagnosis and Messages Guide* for help in correcting the error.

Step 18: Enter Required Node Information

Before You Begin

- Be sure to have your node configuration worksheet on hand with all the node information completed before attempting to perform this step. The *SP System Planning Guide* explains how to fill out your worksheet.
- If multiple IP interfaces map to the same host name on the starting node, you must enter the Ethernet IP address for the starting node. Do not enter its host name.

This step adds IP address-related information to the node objects in the SDR. It also creates adapter objects in the SDR for the en0 adapters on your nodes. This information is used during node configuration mechanisms after the nodes are powered on.

Enter information about your RS/6000 SP nodes attached to each Ethernet adapter using SMIT or the **spethernt** command.

If you want to use the **spethernt** command, but want more information about command syntax and parameters, see the *SP Commands and Technical Reference* for syntax and parameter information.

Using SMIT:

TYPE **smit node_data**

▲The Enter Database Information menu appears.

SELECT SP Ethernet Information

▲ The SP Ethernet window appears:

If you have wide nodes which occupy two node slots each in your RS/6000 SP system, entering **yes** next to `Skip IP Address for Unused Slots?` can be useful in assigning IP addresses that correspond to the slots in the frame, with each wide node address incrementing by 2 and each thin node address incrementing by 1.

You can avoid skipping IP addresses for the empty slots by entering **no** next to `Skip IP Address for Unused Slots?` In this way IP addresses are assigned consecutively for both thin and wide nodes.

The distribution of your IP addresses determines how many times you perform this step. You may have to do it more than once if:

- There are gaps in your IP addresses that are not caused by wide nodes
- You want to set up alternate default routes or netmasks for certain IP address ranges

Enter the following information for each consecutive block of nodes.

1. Start Frame, Start Slot, and Node Count

   OR

   Node List
2. Starting Node's en0 Host name or IP Address
3. Netmask
4. Default Route IP Address or Host name
5. Skip IP Addresses for Unused Slots?

If you specify nodes with a node list, you cannot specify **yes** for `Skip IP Addresses for Unused Slots?`

Notes

This discussion applies to this step and “Step 22: Configure Additional Adapters for Nodes” on page 45.

Starting Slot

The starting slot is always relative to the frame and not to the system. This means that the first slot in the second, third, and fourth frames is still slot 1 rather than slots 17, 33, and 49. For example, for the first frame you might enter:

```
Start Frame 1
Start Slot  1
```

and for a second frame, you might enter:

```
Start Frame 2
Start Slot  1
```

Node List

With the node list, you can specify a group of node numbers separated by commas. Node numbers can be referenced for systems with more than one frame. (Node number 17 would be used for frame 2 slot 1.) For example:

1,5,7,9,15,17,19

You can also specify a file that contains a single line of data containing the node list, separated by commas. Enter the full-path name, unless the file is in your current directory. For example, if you have a list of nodes in **/tmp/node_list**, enter the following in the **Node List** field:

/tmp/node_list

TYPE Data in the fields as required. Refer to your worksheet.

PRESS **Do** to store the data.

Using spethernt:

This example configures an en0 network of 16 nodes with IP addresses ranging from 129.33.32.1 to 129.33.32.16, a netmask of 255.255.255.192, and a default route of 129.33.32.200.

```
spethernt -s no 1 1 16 129.33.32.1 255.255.255.192 129.33.32.200
```

If you are using twisted-pair Ethernet instead of the default BNC adapter, you need to use the **-t dix** option with the **spethernt** command. This example configures an en0 network of 16 nodes with IP addresses ranging from 129.33.32.1 to 129.33.32.16, a netmask of 255.255.255.192, and a default route of 129.33.32.200, using twisted-pair Ethernet.

```
spethernt -t dix -s no 1 1 16 129.33.32.1 255.255.255.192 129.33.32.200
```

Step 19: Run SP System Monitor Communication Facilities Verification Test

This step directs you to run verification tests that check for correct installation of the SP System Monitor. You can run these verification tests from SMIT panels or from the command line.

Using SMIT:

TYPE **smit SP_verify**

▲ The Installation/Configuration Verification Menu appears.

SELECT SSP System Monitor Configuration

Using the Command Line:

Enter:

```
spmon_ctest
```

After the tests are run, the system creates a log in **/var/adm/SPlogs** called **sysmon_ctest.log**.

See the section on diagnosing RS/6000 SP problems in the *Diagnosis and Messages Guide* if the verification test fails.

Step 20: Acquire Hardware Ethernet Addresses

Before You Begin

- Do not do this step on a running system because it shuts down the nodes.
- If you are adding a node, select only the new node. All the nodes you select are powered off and back on.
- The nodes must be physically powered on when you perform this step. No ttys can be open.

This step gets hardware Ethernet addresses for the en0 adapters for your nodes, either from a file or from the nodes themselves, and puts them into the Node Objects in the SDR. That information is used to set up the **/etc/bootptab** files for your boot/install servers.

If you know the hardware Ethernet addresses, you can speed this process by putting the addresses in the **/etc/bootptab.info** file as follows:

Create a file named **/etc/bootptab.info** (if it does not already exist), listing your RS/6000 SP nodes by node number, followed by a blank and the hardware Ethernet address. For example, a file containing addresses for a frame might look like this:

```
1 02608C2E48D9
3 02608C2D6712
5 02608C2E49A4
7 02608C2E465D
9 02608C2E28AC
10 02608C2E6822
11 02608C2E688A
12 02608C2E424E
```

13 02608C2E1824
14 02608C2E440A
15 02608C2E602D
16 02608C2E3128

The /**etc**/**bootptab.info** file is not required. If you do not know your hardware Ethernet addresses, and the /**etc**/**bootptab.info** file does not exist, use **sphrdwrad** to access the SP node and retrieve the hardware Ethernet adapter for you. (This makes **sphrdwrad** take longer to run.)

To write the hardware Ethernet addresses to the SDR, use SMIT or issue the **sphrdwrad** command.

Using SMIT:

TYPE **smit node_data**

▲ The Node Database Information menu appears.

SELECT Get Hardware Ethernet Addresses

▲ The Get Hardware Ethernet Addresses window appears.

TYPE The starting frame, slot, and node count (the number of nodes for each consecutive series of nodes).

or

The node list. Type the node numbers (separated by commas) or the file containing the list (for example, /**tmp**/**node_list**)

PRESS **Do** to get the data.

Note: If this scenario fails, look for the node conditioning instructions in the *Diagnosis and Messages Guide*.

Using sphrdwrad:

This example gets all hardware Ethernet addresses for a RS/6000 SP system.

```
sphrdwrad 1 1 rest
```

This example gets all hardware Ethernet addresses for the nodes specified in the node list (the **-l** flag):

```
sphrdwrad -l 10,12,17
```

See the *SP Commands and Technical Reference* for **sphrdwrad** syntax and parameter information.

Step 21: Verify Addresses Were Acquired

Use SMIT or issue the **splstdata** command. See the *SP Commands and Technical Reference* for **splstdata** syntax and parameter information.

Using SMIT

TYPE **smit list_data**

▲ The List Database Information menu appears.

SELECT List Node Database Information

▲ The List Node Database Information menu appears.

SELECT List Node Boot/Install Information

▲ The List Node Boot/Install Information window appears.

TYPE The Start Frame, Start Slot, and Node Count *or* Node List

PRESS **Do**.

Using splstdata:

Warning: If your system is large, **splstdata** returns great quantities of data. You may want to pipe the command output through a filter to reduce the amount of data you see.

To display SDR boot/install data, enter:

```
splstdata -b
```

Step 22: Configure Additional Adapters for Nodes

Before You Begin

This step is optional if your frame does not have a switch or does not require other additional adapters.

Be sure to have your switch configuration worksheet on hand with all the switch information completed before attempting to perform this step. The *SP System Planning Guide* explains how to fill out your worksheet.

This step creates adapter objects in the SDR for each node. The data in the adapter objects is used during the customization or installation steps to configure the adapters on the nodes.

Note: The following adapters can be configured with this procedure:

en1
fi0
fi1
tr0
tr1
css0

To configure adapters such as ESCON and PCA, you must login to each node and configure the adapter manually, or use **dsh**.

Configuring the High Performance Switch

To configure your High Performance Switch adapters for use with the RS/6000 SP System, use SMIT or issue the **spadaptrs** command. See the *SP Commands and Technical Reference* for **spadaptrs** syntax and parameter information. The *SP System Planning Guide* contains additional information on IP addressing for the High Performance Switch.

Using SMIT:

TYPE **smit node_data**

▲ The Node Database Information menu appears

SELECT Additional Adapter Information

▲ The Additional Adapter Information window appears.

TYPE The data in the fields. Refer to your worksheet as needed.

PRESS **Do** to store the data.

PRESS **Cancel** to exit SMIT.

The default **css0** adapter attributes are:

```
Skip IP Addresses for Unused Slots?  no
Enable ARP for the css0 Adapter?     no
Use Switch Node Numbers for css0 IP Addresses?  yes
```

If you want to select **yes** next to `Skip IP Addresses for Unused Slots?`, you must set the `Use Switch Node Numbers` to **no**.

If you set `Enable ARP` to **yes**, you must set the `Use Switch Node Numbers` to **no**.

For **css0** adapters, you must use the `Start Frame`, `Start Slot`, and `Node Count` fields.

Note: `Start Slot` must be set to **1**.

Enter the following information for each consecutive block of nodes.

1. Start Frame, Start Slot, and Node Count

   OR

   Node List
2. Adapter Name
3. Starting Node's IP Address or Host name
4. Netmask
5. Token Ring Data Rate (required only when configuring a token-ring adapter.)
6. Skip IP Addresses for Unused Slots?
7. Enable ARP for the css0 Adapter?
8. Use Switch Node Numbers for css0 IP Addresses?

Using spadaptrs: This example adds SDR information for a **css0** (High Performance Switch) network of 30 nodes (frame 1 slot 1 to frame 2 slot 16, with a wide node as the first node in each frame and the rest thin nodes, and a switch on each frame) with IP addresses from 129.33.34.1 to 129.33.34.30, and a net mask of 255.255.255.0. The IP addressing corresponds to the slots in the frame, with each wide node incrementing by 2 and each thin node incrementing by 1.

Note: If you specify the **-s** flag to skip IP addresses when you are setting the **css0** switch addresses, you must also specify **-n no** to not use switch numbers for IP address assignment, and **-a yes** to use ARP.

```
spadaptrs -s yes -n no -a yes 1 1 30 css0 129.33.34.1 255.255.255.0
```

Configuring Other Additional Adapters

To configure other additional adapters, for example Ethernet (en1), token ring (tr0), or FDDI (fi0), you must the `Additional Adapter Database Information`. For these adapters you can select either the Start Frame, Start Slot, and Node Count fields, or the Node List field.

Notes:

1. When using the token ring (tr0) adapter, you must select the token ring rate (4 MB or 16 MB).
2. For best results, exit and get back into this panel for each different type of adapter. This clears any extraneous values left behind in the panel.

The distribution of your IP addresses determines how many times you perform this step. You may have to do it more than once if:

- There are gaps in your IP addresses not caused by wide nodes
- You want to set up alternate default routes or netmasks for certain IP address ranges

Enter the following information for each consecutive block of nodes.

1. Start Frame, Start Slot, and Node Count

   OR

   Node List
2. Adapter Name
3. Starting Node's IP Address or Host name
4. Netmask
5. Token Ring Data Rate (required only when configuring a token-ring adapter.)

Note: These fields are used only for the **css0** adapter:

- Skip IP Addresses for Unused Slots?
- Enable ARP for the css0 Adapter?
- Use Switch Node Numbers for css0 IP Addresses?

Using spadaptrs

1. This example adds SDR information for an fi0 (FDDI adapter) network of 30 nodes (frame 1 slot 1 to frame 2 slot 16, with a wide node as the first node in each frame and the rest thin nodes) with IP addresses from 129.33.34.1 to 129.33.34.30, and a net mask of 255.255.255.0. The IP addressing corresponds to the slots in the frame, with each wide node incrementing by 2 and each thin node incrementing by 1.

   ```
   spadaptrs -s yes 1 1 30 fi0 129.33.34.1 255.255.255.0
   ```

2. This example adds SDR information for a tr0 (token ring adapter) for node 1 with IP address 129.33.35.1 and a net mask of 255.255.255.0, and references the node list field.

   ```
   spadaptrs -l 1 -r 16 tr0 129.33.35.1 255.255.255.0
   ```

Step 23: Configure Initial Host Names for Nodes

Before You Begin

Do this step if you do not want the default host name to match the en0 adapter name. The en0 name is the default.

This step changes the default host name information in the Node Objects used during customization to set up the host name on each node, and allows you to indicate how you want to see your RS/6000 SP nodes. The default is the long form

of the en0 host name, which is how the **spethernt** command processes defaulted host names.

You can indicate an adapter name other than en0 for the host names to be used, as well as whether the long or short form should be used. See the *SP Commands and Technical Reference* for more information.

Use SMIT or issue the **sphostnam** command. See the *SP Commands and Technical Reference* for **sphostnam** syntax and parameter information.

Using SMIT:

TYPE **smit node_data**

▲ The Node Database Information menu appears.

SELECT Hostname Information

▲ The Hostname Information window appears.

TYPE Frame, starting slot, and node count

or

Node List.

Also type the adapter name and whether you are using short or long host names.

PRESS **Do** to store the data.

Using sphostnam:

The following command indicates that the host name of each node is the long (fully qualified) form of the host name of the **css0** adapter, for a system with two frames and 32 nodes.

```
sphostnam -a css0 1 1 32
```

Step 24: Set Up Nodes to Be Installed

Before You Begin

- Do this step if you want to change the default installation settings for all the nodes.
- If you are planning to use system partitioning and to set up an AIX 3.2.5 partition, do this step to set up a boot/install server in this partition.

This step does the following:

- Changes the default boot/install information in the node objects in the SDR so that you can indicate a different boot/install server topology to the RS/6000 SP system
- Runs the **setup_server** command on all affected boot/install servers so that the nodes served are installed by your choice of server at power-on
- Allows you to specify an alternate disk or disks to use when installing AIX on nodes

The default installation assumes one of the following:

- You have only one frame and the control workstation is configured to act as boot/install server
- You have multiple frames and the first node in each frame is configured to act as boot/install server

The default installation assumes your nodes have not been preinstalled. If you want to have them installed with your own install image, you must specify the following:

- Which nodes you are installing
- The name of the installation image you are using if you do not want to use the default image, **bos.obj.ssp.41**

If you want different nodes to be installed by a different boot/install server, you must specify which nodes they are and which node will install them.

Use SMIT or issue the **spbootins** command. Refer to the *SP Commands and Technical Reference* for **spbootins** syntax and parameter information.

Using SMIT:

TYPE **smit node_data**

▲ The Node Database Information Window appears.

SELECT Boot/Install/usr Server Information

▲ The Boot/Install Server Information window appears.

TYPE The data in the fields. Refer to your worksheet as needed. In addition to the node range, you must supply the boot/install server node identifier.

If you are not using the default image, you must supply the network install image name.

To specify an alternate installation disk or disks, fill in the Destination Hard Disks field, using device names.

PRESS **Do** to store the data.

The distribution of the nodes to be served and the number of different servers you want determines how many times you must perform this step. You may have to do it more than once if you want to define more than one server for different groups of nodes.

Using spbootins:

If you are issuing the **spbootins** command more than once, you can use the **-s no** option to keep **spbootins** from running **setup_server**. For example, the following command specifies **hdisk1** and **hdisk2** as alternate installation disks for nodes 10 through 16:

```
spbootins -s no -h hdisk1,hdisk2 1 10 7
```

If you are issuing the **spbootins** command for the last time in this installation, have it run **setup_server** (the **-s yes** flag). For example:

```
spbootins -s yes -h hdisk1,hdisk2 1 10 7
```

In a two-frame system with all thin nodes, the following command specifies that a network install be performed on nodes 17 through 32 when they reset:

```
spbootins -s no -r install 2 1 16
```

If you are issuing the **spbootins** command for the last time in this install, have it run **setup_server** (the **-s yes** flag). For example:

```
spbootins -s yes -r install 2 1 16
```

Step 25: Run setup_server on the Control Workstation

Before You Begin

Do this step if you have not run **setup_server** using the SMIT Boot/Install Server Information window or the **spbootins -s yes** command.

This step uses the information entered in the previous steps to set up the control workstation and optional boot/install servers on nodes. It configures the control workstation as a boot/install server and configures the following options (when selected in your site environment):

- Amd
- File Collections
- NTP
- Print Service
- User Management
- Accounting

You can perform this step more than once. If you encounter any errors, see the *Diagnosis and Messages Guide* for further explanation. After you correct your errors, you can start the task again.

To configure the control workstation, use SMIT or issue the **setup_server** command. Refer to the *SP Commands and Technical Reference* for more information.

Using SMIT:

TYPE **smit enter_data**

▲ The Enter Database Information window appears.

SELECT Run setup_server Command

Using setup_server:

To run the **setup_server** command enter:

```
setup_server
```

with no parameters.

Note: The first time **setup_server** runs, it takes approximately 20-30 minutes to configure the control workstation as a NIM master.

Step 26: Verify All Node Information

Use SMIT or issue the **splstdata** command. See the *SP Commands and Technical Reference* for **splstdata** syntax and parameter information.

Using SMIT: Check each of the List Database panels for correct information. If you find any incorrect data, return to the following steps to make corrections:

Data	Step
Frame data	"Step 16: Enter Frame Information and Reinitialize the SDR" on page 39
Node data	"Step 18: Enter Required Node Information" on page 40
Additional adapters	"Step 22: Configure Additional Adapters for Nodes" on page 45
TYPE	**smit list_data** ▲ The List Database Information Window appears.
SELECT	Each panel listed. Verify all information is correct.
PRESS	**Done** to exit SMIT.

Using splstdata:

Warning: If your system is large, **splstdata** returns great quantities of data. You may want to pipe the command output through a filter to reduce the amount of data you see.

- To display SDR site environment data, enter:

  ```
  splstdata -e
  ```

- To display SDR frame data, enter:

  ```
  splstdata -f
  ```

- To display SDR node data, enter:

  ```
  splstdata -n
  ```

- To display SDR adapter data, enter:

  ```
  splstdata -a
  ```

- To display SDR boot/install data, enter:

  ```
  splstdata -b
  ```

Changing the Default Network Tunable Values

At this point, you can change the default network option tunable values that are set when a node is installed or booted. Changing the tunable values from the AIX 4.1 default values improves the performance of the networks and switch on the RS/6000 SP. This mechanism preserves changes to the network tunable values across boots of the nodes.

The following steps enable you to load a set of network tunable values onto the nodes when they are installed. These values are copied to each node from the control workstation during installation or customization.

1. On the control workstation, copy the file **/usr/lpp/ssp/samples/tuning.cust** to **/tftpboot/tuning.cust**.
2. Select the tunable values that are best for your system. Refer to Table 3 and Table 4 for recommended values based on the adapters installed on the nodes.
3. Edit the **tuning.cust** file by uncommenting the **/usr/sbin/no** commands and changing the default tunable values.

Table 3. Initial Values for AIX 4.1 Ethernet-Based Performance

Tunable	Ethernet No Switch	Ethernet Thin Node	Ethernet Wide Node	Ethernet* Switch
sb_max	163840	442368	475236	655360
rfc1323	1	1	1	1
thewall	16384	16384	16384	16384
ipforwarding	1	1	1	1
tcp_sendspace	65536	221184	237568	262144
tcp_recvspace	65536	221184	237568	262144
udp_sendspace	32768	59392	59392	65536
udp_recvspace	65536	221184	237568	655360
tcp_mssdflt	1500	1500	1500	Varies

Note: *These values are designed to optimize the performance of the switch at the expense of the performance of Ethernet.

If you have additional network adapters in your nodes and you want to optimize the network performance for these adapters, use the initial recommended settings in Table 4.

Table 4. Initial Values for Other AIX 4.1 Network Types

Tunable	Token Ring	FDDI
sb_max	655360	1302528
rfc1323	1	1
thewall	16384	16384
ipforwarding	1	1
tcp_sendspace	262144	196608
tcp_recvspace	262144	196608
udp_sendspace	65536	65536
udp_recvspace	655360	655360
tcp_mssdflt	4096	4352

Modifying Tunables

As you set up the network tunables for your environment, it is important to tune for the type of data transfer your site has. If you transfer mainly large blocks of data or buffer sizes of 4 KB or greater, the tunable settings can be different than when you send files or buffers less than 932 bytes. See the *SP Administration Guide* for more information.

Once you have updated **tuning.cust**, continue installing the nodes. After the nodes are installed and customized, on all subsequent boots, the tunable values in **tunables.cust** will be automatically set on the nodes.

D. Power On and Install the Nodes

This section describes the steps you take to power on the nodes to be installed. Check off each step after you complete it.

- ☐ "Step 27: Define Your Post-Installation Customization"
- ☐ "Step 28: Run System Management Verification Test on the Control Workstation" on page 55
- ☐ "Step 29: Set Up the High Performance Switch" on page 55
- ☐ "Step 30: Verify the Switch Primary Node" on page 57
- ☐ "Step 31: Set High Performance Switch Clock Source for All Switches" on page 58
- ☐ "Step 32: Set Up System Partitions" on page 59
- ☐ "Step 33: Network Boot Optional Boot/Install Servers" on page 59
- ☐ "Step 34: Run System Management Verification Test on Optional Boot/Install Servers" on page 63
- ☐ "Step 35: Network Boot the Remaining RS/6000 SP Nodes" on page 63
- ☐ "Step 36: Verify Node Information Using the SP System Monitor" on page 64
- ☐ "Step 37: Run Verification Tests on All Nodes" on page 65
- ☐ "Step 38: Start the High Performance Switch" on page 65
- ☐ "Step 39: Run Verification Test on the High Performance Switch" on page 65
- ☐ "Step 40: Tune the Network Adapters" on page 66

Step 27: Define Your Post-Installation Customization

Do this step if you want to perform additional customization such as:

- Adding **installp** images
- Configuring host names
- Setting up NFS or AFS
- Configuring adapters that are not configured automatically
- Changing system tunable values

Use **script.cust** for AIX 4.1 nodes. See Appendix B, "Sample script.cust File" on page 113 for a sample **script.cust** file. Do the following tasks:

1. Examine the sample **script.cust** file located in **/usr/lpp/ssp/samples** to determine whether any lines are appropriate to your installation.
2. Copy the file to **/tftpboot/script.cust** and uncomment or edit any necessary lines. Don't forget to change the permissions on the file so that it is world-readable. If you forget to do this, your script will not run.

Name resolution of the control workstation host name is required on the nodes. **script.cust** shows how to copy **/etc/resolv.conf** or **/etc/hosts**, and how to define the node to NIS if that is being used. If you have created a **mksysb** image to install on the nodes, and it already has name resolution defined in it, you do not need to do anything additional.

Commands in this script run after the **mksysb** installation and PSSP customization, and before the reboot of each node.

Step 28: Run System Management Verification Test on the Control Workstation

This step directs you to run a verification test that checks for correct installation of the System Management tools on the control workstation. You can run this verification test from SMIT panels or from the command line.

Using SMIT:

TYPE	**smit SP_verify**
	▲ The 9076 SP Installation/Configuration Menu appears.
SELECT	SSP System Management

Using the Command Line:

Enter:

```
SYSMAN_test
```

See the *Diagnosis and Messages Guide* for information about what this test does. See the section on diagnosing RS/6000 SP problems in the *Diagnosis and Messages Guide* if the verification test fails.

Step 29: Set Up the High Performance Switch

Before You Begin

If you plan to do "Step 32: Set Up System Partitions" on page 59, skip the following steps:

- Step 29: Set Up the High Performance Switch
- Step 30: Verify the Switch Primary Node

and go directly to "Step 31: Set High Performance Switch Clock Source for All Switches" on page 58.

If you do not have the High Performance Switch, go to "Step 33: Network Boot Optional Boot/Install Servers" on page 59.

The optional High Performance Switch connects all the nodes in the RS/6000 SP system to increase the speed of internal system communications. It supports the high volume of message passing that occurs in a parallel environment with increased bandwidth and low latency.

The High Performance Switch includes software called the **Worm** which verifies the actual switch topology against an anticipated topology as specified in the switch topology file. This file tells the Worm how many nodes in your configuration have the switch. You create this file by copying one of the default topology files provided for each RS/6000 SP configuration.

The Worm verifies the switch connections beginning at a node designated as the primary node. By default, the primary node is node 1 in frame 1. You can override

the default and designate another node as the primary node. You *must* do this if node 1 is not operational.

Select a Topology File

Select the correct switch topology file by counting the number of node switch boards (NSBs) and intermediate switch boards (ISBs) in your system, then apply these numbers to the naming convention. The switch topology files are in the **/etc/SP** directory on the control workstation.

NSBs are switches mounted in frames containing nodes. ISBs are switches mounted in the High Performance Switch expansion frame. ISBs are used in large systems to connect many processor frames together.

The topology file naming convention is as follows:

expected.top.*NSBnum***nsb.***ISBnum***isb**.*type*

where *NSBnum* is the number of NSBs in the configuration, *ISBnum* is the number of ISBs in the configuration, and *type* is the type of topology. The default is 0.

For a description of the topology file names, see *SP System Planning Guide*.

Managing the Switch Topology Files

The switch topology file should be stored in the SDR. The switch initialization code uses the topology file stored in the SDR when starting the switch (**Estart**). When the switch topology file is selected for your system's switch configuration, it should be annotated with the **Eannotator**, then stored in the SDR with **Etopology**. The switch topology file stored in the SDR can be overridden by having an **expected.top** file in **/etc/SP** on the primary node. **Estart** always checks for an **expected.top** file in **/etc/SP** before using the one stored in the SDR.

Annotating a Switch Topology File

Annotate a switch topology file before storing it in the SDR.

Using SMIT:

TYPE	**smit switch_ops**
	▲ The Perform Switch Operations menu appears.
SELECT	Topology File Annotator
	▲ The Topology File Annotator menu appears.
TYPE	The data in the fields, as follows: • The fully-qualified name of the topology file (for example, **/etc/SP/expected.top.2nsb.0isb.0**) • The fully-qualified name of the file in which you want to store the annotated topology file (for example, **/etc/SP/expected.top.annotated**) • **yes** to store the topology file in the SDR
PRESS	**Do**

Using the Command Line:

Use **Eannotator** to update the switch topology file's connection labels with their correct physical locations. Use the **-O yes** flag to store the switch topology file in the SDR. Using **Eannotator** makes the switch hardware easier to debug because the switch diagnostics information is based on physical locations.

For example, to annotate a two-switch or maximum 32-node system, enter:

```
Eannotator -F expected.top.2nsb.0isb.0 -f expected.top.annotated -O yes
```

See the *SP Commands and Technical Reference* for more information on **Eannotator**.

Storing the Switch Topology File in the SDR

Before You Begin

If you entered **Eannotator -O yes** or **yes** on the Topology File Annotator menu in "Annotating a Switch Topology File" on page 56, skip this step.

Using SMIT:

TYPE	**smit cluster_mgmt**
	▲ The 9076 SP Cluster Management menu appears.
SELECT	Perform Switch Operations
	▲ The Perform Switch Operations menu appears.
SELECT	Fetch/Store Topology Files
	▲ The Fetch/Store Topology Files menu appears.
SELECT	Store a Topology File
	▲ The Store a Topology File menu appears.
TYPE	The fully-qualified path name of the topology file.
PRESS	**Do**

Using the Command Line: Use **Etopology** to store the switch topology file in the SDR. For example, to store a two-switch or maximum 32-node configuration, enter:

```
Etopology expected.top.2nsb.0isb.0
```

See the *SP Commands and Technical Reference* for more information on **Etopology**.

Step 30: Verify the Switch Primary Node

Frame 1, node 1 is the default primary node. Use SMIT or the **Eprimary** command to verify this node or change the primary to another node.

Using SMIT:

TYPE	**smit cluster_mgmt**
	▲ The 9076 SP Cluster Management Menu appears.

SELECT	Perform Switch Operations
	▲ The Perform Switch Operations Menu appears.
SELECT	Set Primary Node
	▲ The Set Primary Node Menu appears.
PRESS	**Cancel** to keep default node 1
or	
ENTER	A different primary node
PRESS	**Do**

Using the Command Line:

Enter:

```
Eprimary
```

This command, without any parameters, returns the node number of the primary node. See the *SP Commands and Technical Reference* for command syntax.

Step 31: Set High Performance Switch Clock Source for All Switches

Use SMIT or the **Eclock** command to initialize the High Performance Switch's Clock Source. The SMIT and **Eclock** interfaces require that you know the number of Node Switch Boards (NSBs) and Intermediate Switch Boards (ISBs) in your RS/6000 SP system.

Select the Eclock topology file from the control workstation's /**etc**/**SP** subdirectory, based on these numbers. For example, if your RS/6000 SP system has six node switch boards and four intermediate switch boards, you would select /**etc**/**SP**/**Eclock.top.6nsb.4isb.0** as an Eclock topology file.

See the *SP System Planning Guide* for the Eclock topology file names.

Using SMIT:

TYPE	**smit cluster_mgmt**
	▲ The 9076 SP Cluster Management Menu appears.
SELECT	Perform Switch Operations
	▲ The Perform Switch Operations Menu appears.
SELECT	Change/Show Switch Clock Source Settings
	▲ The Change/Show Switch Clock Source Settings Menu appears.
SELECT	Initialize Switch Clock Source Settings
	▲ The Initialize Switch Clock Source Settings Menu appears.
PRESS	List
SELECT	the correct Eclock file
PRESS	**Do**

Using the Command Line: Use the **Eclock** command to set the High Performance Switch clock source for all switches.

For example, if your RS/6000 SP system has six node switch boards and four intermediate switch boards, select **/etc/SP/Eclock.top.6nsb.4isb.0** as an Eclock topology file. Enter:

Eclock -f /etc/SP/Eclock.top.6nsb.4isb.0

This command sets the proper clock source settings on all switches within a 96-way (6 nsb, 4 isb) RS/6000 SP system. See the *SP Commands and Technical Reference* for more information on the **Eclock** command.

Warning: Be careful when using **Eclock** after the switch is initialized. **Eclock** modifies the switch clocking, and can cause the High Performance Switch adapter to lose its clock source.

To verify the switch configuration information, enter:

```
splstdata -s
```

Step 32: Set Up System Partitions

The PSSP V2R1 installation code sets up a default system partition configuration to produce an initial, single-system partition including all nodes in the system. This system partition is created automatically. If you do not want to divide your system into partitions, continue with "Step 33: Network Boot Optional Boot/Install Servers."

If you want to partition your system, you can select an alternate configuration from a predefined set of system partitions to implement before booting the nodes. Follow the procedure described in the Managing System Partitions chapter in the *SP Administration Guide*.

Note: You do not have to partition your system now as part of this installation. You can partition it later. Follow the procedure described in the *SP Administration Guide*.

Step 33: Network Boot Optional Boot/Install Servers

Before You Begin

If you have set up system partitions, do this step in each partition.

Use the System Monitor GUI to network boot the optional boot/install servers which install and customize the nodes you selected. You can check installation progress by checking the node's console.

Note: Depending on the size of the image you are installing and the capacity of your RS/6000 SP Ethernet network, you should network boot (or reboot) eight nodes per boot/install server at a time.

If you are not running the System Monitor GUI, follow these steps to bring up the System Monitor GUI main window:

TYPE **spmon -g**

▲ The System Monitor GUI main window appears.

SELECT SP → All Node Summary Display

▲ The selection screen for node variables appears.

SELECT 3DigitDisplay from list of variables

PRESS Display all-node summary

▲ The 3DigitDisplay summary appears.

At the System Monitor GUI main window:

SELECT SP → Global Controls

▲ The Global Controls panel appears with all the nodes deselected.

SELECT Node(s) to Network Boot

SELECT Net Boot

PRESS **Do**

▲ All selected nodes network boot.

▲ The network boot status window appears

Note: You can use the **splstdata -b** command to determine which nodes are your boot/install servers. See the *SP Commands and Technical Reference* for more information about **splstdata**.

Network Installation Progress

When a network installation is in progress, the LED for the nodes involved show various values. These values indicate the installation stage. Since the node installation process can be long, it is hard to determine where you are in that process.

Table 5 on page 61 lists the sequence of LED values a node goes through. This table is only a sample list of LED values, and a node may not show all values listed. Depending on the adapters installed on the node, there may be additional values displayed. The table also lists the approximate time, after you start to install a node, when the LED values may be shown. Since the elapsed time to reach a specific LED value can vary, you should use these times as a gauge to determine the installation progress of the node. The factors that can affect the actual time it takes a node to reach a specific LED value include the following:

- The number of nodes being installed
- The size of the network installation image you are using.
- The amount of traffic on the SP Ethernet
- How busy the network installation node is

Places in the node installation where a single LED value is displayed for an extended period of time are as follows:

1. c40
2. c54

These values are periods of high volumes of network traffic and are only a problem on a node when the value does not change for a very extended period of time.

You can use Table 5 on page 61 as a debugging tool when a node is stuck on a specific LED value.

Table 5 (Page 1 of 3). Sample NIM Installation Trace

Time (min:sec)	LED Value	Description
0:00		
	124	BIST started a CRC check on the OCS area of NVRAM.
	151	BIST started AIPGM test code.
	214	Power status register failed.
	219	Generating RAM POST bit map.
	291	Running standard I/O POST.
	200	Attempting IPL with key in secure position.
	102	BIST started following power-on reset.
	153	BIST started ACLST test code.
0:30		
	154	BIST started AST test code.
	100	BIST completed successfully; control was passed to IPL ROS.
	219	Generating RAM POST bit map.
	292	Running SCSI POST.
1:00		
	291	Running standard I/O POST.
	262	No keyboard connected to the system.
	260	Displaying information on the display console.
1:30		
	231	Attempting a normal mode IPL from Ethernet specified in IPL ROM.
2:30		
	Blank	
	606	Running the **if_config** command to bring up network interface.
	610	Attempting to NFS mount a remote file system.
	299	IPL ROM passed control to the loaded program code.
	608	Attempting to tftp the **.info** file from client's SPOT server.
	612	Accessing remote configuration files.
	622	Returning control to the /**sbin**/**rc.boot** program.
	520	Running bus configuration.
	890	SCSI-2 differential fast/wide adapter.
	620	Updating special device files.
3:00		
	890	SCSI-2 differential fast/wide adapter.
	570	Configuring virtual SCSI devices.
3:30		
	622	Returning control to the /**sbin**/**rc.boot** program
4:00		
	811	Identifying or configuring processor complex.
	Blank	
	570	Configuring virtual SCSI devices.
	727	Identifying or configuring unknown asynchronous device.
	538	The configuration manager is invoking a configuration method.
	622	Returning control to the /**sbin**/**rc.boot** program.
	c40	Restoring configuration files.
8:00		
	c42	Extracting data from diskette.
	c33	Selecting a tty terminal attached to serial ports S1 or S2.
	c44	Initializing installation database with target disk info.
8:30		

Table 5 (Page 2 of 3). Sample NIM Installation Trace

Time (min:sec)	LED Value	Description
	c46	Normal installation processing.
	Blank	
9:00		
	c50	Creating root volume group on target disks.
	c46	Normal installation processing.
10:30		
	c54	Installing either BOS or additional packages.
19:00		
	c52	Changing from RAM environment to disk environment.
21:30		
	c46	Normal installation processing.
	570	Configuring virtual SCSI devices.
22:00		
	c46	Normal installation processing.
	731	Identifying or configuring PTY.
	539	The configuration method has terminated, returning to config.
	811	Identifying or configuring processor complex.
	538	The configuration manager is invoking a configuration method.
	570	Configuring virtual SCSI devices.
22:30		
	Blank	
23:00		
	u78	Running rsh to complete node processing on boot/install server.
	u60	Creating **/etc/ssp/server_name** and updating **/etc/hosts**.
	u68	Copying kerberos realms file from boot/install server.
	u59	Running **config_node** to define adapters.
27:00		
	u65	SSP completing the **install/customize/maint**. Issuing shutdown.
27:30		
	c46	Normal installation processing.
28:00		
	292	Running SCSI POST.
	298	Attempting a software IPL.
	291	Running standard I/O POST.
	299	IPL ROM passed control to the loaded program code.
	Blank	
	890	SCSI-2 differential fast/wide adapter.
	820	
	538	The configuration manager is invoking a configuration method.
	570	Configuring Virtual SCSI devices.
28:30		
29:00		
	551	Running IPL varyon.
	517	Mounting client remote file system during network IPL.
29:30		
	553	IPL phase 1 is complete.
	570	Configuring virtual SCSI devices.
	538	The configuration manager is invoking a configuration method.
	c33	Selecting a tty terminal attached to serial ports S1 or S2.
30:00		

Table 5 (Page 3 of 3). Sample NIM Installation Trace

Time (min:sec)	LED Value	Description
	Blank	
33:00		
	83u	Running SSP configuration method for TB2 card.
34:00		
	570	Configuring virtual SCSI devices.
	538	The configuration manager is invoking a configuration method.
34:30		
	Blank	

Step 34: Run System Management Verification Test on Optional Boot/Install Servers

Before You Begin

If you have set up system partitions, do this step in each partition.

Now that the boot/install servers are powered up, run the verification test to check for correct installation of the System Management tools on these nodes. You can run this verification test from the control workstation to verify the boot/install servers using SMIT panels or the command line.

Using SMIT:

TYPE	**smit SP_verify**
	▲ The Installation/Configuration Menu appears
SELECT	SSP System Management

Using the Command Line:

Enter:

```
SYSMAN_test
```

See the section on diagnosing RS/6000 SP problems in the *Diagnosis and Messages Guide* for information on what this test does and what to do if the verification test fails.

Step 35: Network Boot the Remaining RS/6000 SP Nodes

Before You Begin

If you have set up system partitions, do this step in each partition.

Repeat the procedure used in Step 33: Network Boot Optional Boot/Install Servers on page 59 to network boot and install, or customize the remaining RS/6000 SP nodes.

Note: If any of your boot/install servers have more than eight clients on a single Ethernet segment, you should Network Boot those nodes in groups of eight or less. See the tuning considerations chapter in the *SP System Planning Guide* for more information.

Using a Token Ring-Bridge Gateway

If you are using a token ring through a bridge as your default gateway to your SP nodes and the token ring bridge is not on the same segment as your LAN, you must change the value of the broadcast field in the ODM for each node. The default value is set to **Yes** (confine broadcast to local token-ring) each time you install or customize a node. However, when you boot the nodes with this bridge setup, the network is unusable.

Using the Command Line

Enter

```
chdev -P -l tr0 -a allcast=off
```

Step 36: Verify Node Information Using the SP System Monitor

Before You Begin

If you have set up system partitions, select a global view to do this step.

Check hostResponds and powerLED indicators for each node. From the SP System Monitor GUI main window:

SELECT	SP
SELECT	Global Controls
SELECT	SP
SELECT	All Node Summary Display
	▲ The selection screen for node variables appears.
SELECT	hostResponds from the list of variables
PRESS	Display all-node summary.
	▲ The hostResponds Summary appears.

Check the indicators for hostResponds. All indicators should be solid green. If not, see the section on diagnosing RS/6000 SP problems in the *Diagnosis and Messages Guide*.

PRESS	Window → Exit
SELECT	powerLED on the selection screen for node variables.
PRESS	Display all-node summary.
	▲ The powerLED Summary appears.

Check the indicators for PowerLED . All indicators should be solid green. If not, see the section on diagnosing RS/6000 SP problems in the *Diagnosis and Messages Guide*.

PRESS	Window → Exit

Step 37: Run Verification Tests on All Nodes

Before You Begin

If you have set up system partitions, do this step in each partition.

This step directs you to run a series of verification tests that check for correct installation of your selected options on all the nodes. You can run these verification tests from SMIT panels or from the command line.

Using SMIT:

TYPE	**smit SP_verify**
	▲ The Installation/Configuration Menu appears
SELECT	SSP System Management

Using the Command Line:

Enter:

```
SYSMAN_test
```

See the section on diagnosing RS/6000 SP problems in the *Diagnosis and Messages Guide* if the verification test fails.

Step 38: Start the High Performance Switch

Before You Begin

- Do this step if you have installed a High Performance Switch.
- If you have set up system partitions, do this step in each partition.

This step initializes the optional High Performance Switch. You can perform this step from SMIT panels or from the command line.

Using SMIT:

TYPE	**smit switch_ops**
	▲ The Perform Switch Operations Menu appears.
SELECT	Start Switch

Using the Command Line:

Enter:

```
Estart
```

Step 39: Run Verification Test on the High Performance Switch

Before You Begin

- Do this step if you have installed a High Performance Switch.
- If you have set up system partitions, do this step in each partition.

Run a verification test to ensure the installation of the high performance switch is complete.

Using SMIT:

TYPE	**smit SP_verify**
	▲ The Installation/Configuration Menu appears
SELECT	The SSP Communication Subsystem option
PRESS	Enter.

Using the Command Line: Enter:

```
CSS_test
```

If the verification test fails, see the section on diagnosing RS/6000 SP problems in the *Diagnosis and Messages Guide*.

Check switchResponds and powerLED indicators for each node. From the SP System Monitor GUI main window:

SELECT	SP
SELECT	Global Controls
SELECT	SP
SELECT	All Node Summary Display
	▲ The selection screen for node variables appears.
SELECT	switchResponds from the list of variables
PRESS	Display all-node summary.
	▲ The switchResponds Summary appears.

Check the indicators for switchResponds. All indicators should be solid green. If not, see the section on diagnosing RS/6000 SP problems in the *Diagnosis and Messages Guide*.

Step 40: Tune the Network Adapters

Various models of the network adapters can have different values for transmit queue sizes. To get peak performance out of the network adapters, increase the transmit and receive queue sizes to their maximum. For all adapters on nodes running AIX 4.1 (except for built-in Ethernet adapters) set the transmit queue size to 160. The built-in Ethernet adapters can be set to 150.

These values can be set using SMIT and selecting the appropriate adapter. If the adapter you are changing is also the adapter for the network you are logged in through, you will have to make the changes to the database only. Then reboot the node for the changes to become effective.

Using SMIT:

To change the network adapter queue length on the control workstation or SP nodes:

TYPE	**smit devices**
	▲ The Devices menu appears
SELECT	Communication
	▲ The Communication menu appears
SELECT	The adapter you want to reset (for example, `Ethernet Adapter`)
	▲ The Ethernet Adapter menu appears
SELECT	Adapter
	▲ The Adapter menu appears
SELECT	Change / Show Characteristics of an Ethernet Adapter
	▲ An Ethernet Adapter window appears
SELECT	An adapter from the list shown
	▲ The Change / Show Characteristics of an Ethernet Adapter window appears
CHANGE	The TRANSMIT queue size to 160 (150 for Ethernet on SP nodes)
CHANGE	`Apply change to DATABASE only` to **yes**. (Press F4 and select yes.)
PRESS	**Do** to apply the changes to the database.

Note: You must reboot the node in order for the changes to take effect.

Run Postinstallation Procedures

Now that your RS/6000 SP System is installed and ready to run, you can set up any additional tools you want to use to manage your parallel environment.

You can find procedures for setting up these facilities as follows:

Table 6. Information About RS/6000 SP Facilities

For RS/6000 SP Facility	**Refer to:**
Error Log	Error logging information in the *Diagnosis and Messages Guide* and the *SP System Planning Guide*.
Resource Manager	Managing RS/6000 SP resources chapter in the *SP Administration Guide*
Login Control	Managing user accounts chapter in the *SP Administration Guide*
IBM Virtual Shared Disk	Virtual Shared Disk chapter in the *SP Administration Guide*
DTMS	Distributed Tape Management System chapter in the *SP Administration Guide*
Sysctl	Sysctl chapter in the *SP Administration Guide*

Chapter 3. Migrating to PSSP V2R1 from PSSP V1R2

This chapter describes how you migrate your system from AIX 3.2.5 to AIX 4.1. Follow these steps if you have chosen the **migration** approach to upgrading from PSSP V1R2 to PSSP V2R1 as described in the migration appendix of *SP System Planning Guide*. Before doing these steps, quiesce all jobs and stop the Resource Manager on the RS/6000 SP system.

This chapter includes the following steps:

Step 1: Back Up Your Control Workstation 70
Step 2: Prepare the AIX 3.2.5 System Partition 70
Step 3: Verify the Control Workstation Requirements 71
Step 4: Prepare for PSSP Migration 72
Step 5: Install AIX 4.1 on the Control Workstation 74
Step 6: Configure RS-232 Control Lines 74
Step 7: Configure Ethernet Adapters 75
Step 8: Verify Control Workstation Interfaces 75
Step 9: Define Space for SP Data 78
Step 10: Copy the AIX 4.1 LPP Images 82
Step 11: Copy the PSSP Images 84
Step 12: Restore Saved Files 85
Step 13: Install PSSP on the Control Workstation 85
Step 14: Authenticate as the Administrative Principal 85
Step 15: Complete PSSP Installation on the Control Workstation 85
Step 16: Configure PSSP Services 86
Step 17: Run SDR and System Monitor Verification Tests 86
Step 18: Validate the Upgraded Control Workstation 86
Step 19: Shut Down the Nodes 86
Step 20: Create System Partitions 86
Step 21: Reboot the Nodes in the Production System Partition 87
Step 22: Install AIX 4.1/PSSP V2R1 in the Test System Partition 87
Step 23: Restore Special Files 87
Step 24: Test PSSP V2R1 87

As an option, you can create a production system partition with AIX 3.2.5/PSSP V1R2-level software and a test system partition with AIX 4.1/PSSP V2R1-level software. In this way, you can test AIX 4.1/PSSP V2R1 while running your existing AIX 3.2.5/PSSP V1R2 production environment. Figure 1 on page 70 shows an example of how this environment could be set up. For more examples of partitioning systems, see the *SP System Planning Guide*.

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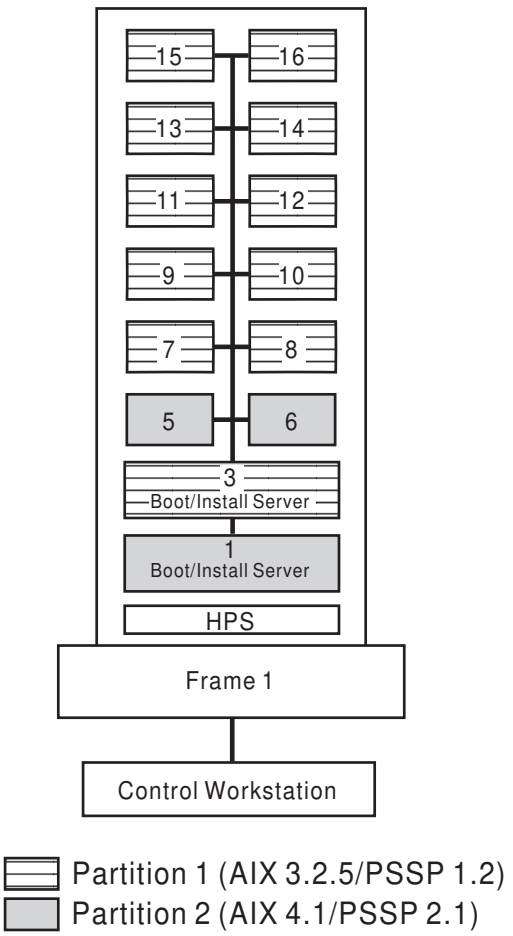

Figure 1. The PSSP V2R1 Migration Environment. You can test PSSP V2R1 in a system partition on your system while also running your PSSP V1R2 production system.

As you prepare for migration, keep these points in mind:

- All the nodes within a system partition must be running the same release level of software.
- Releases earlier than the PSSP V1R2-level software are not supported in a system partition.

Step 1: Back Up Your Control Workstation

Create a **mksysb** image of your existing AIX 3.2.5/PSSP V1R2 root volume group of the control workstation.

Step 2: Prepare the AIX 3.2.5 System Partition

This step is optional. Do this step:

- If you are planning to partition your system and one or more of the system partitions will be running AIX 3.2.5/PSSP V1R2

or

- If you are planning to run your system with just an upgraded control workstation while all of the nodes are still running AIX 3.2.5/PSSP V1R2 (which is considered one AIX 3.2.5/PSSP V1R2 system partition).

Make the boot/install server one of the nodes in an AIX 3.2.5 system partition. This saves you a step later on. The AIX 3.2.5/PSSP V1R2 system partitions must access at least one boot/install server within any system partition so you can reinstall a node in the AIX 3.2.5 system partition in case of a hardware or software failure on the node.

Because you may no longer have the PSSP V1R2 software on your upgraded control workstation, a node's **mksysb** image for the AIX 3.2.5 system partitions should include all the PSSP V1R2 software you currently use in your production system partition. If your current system does not contain such a mksysb, you can create one from a production node before you migrate your system. Copy the node's **mksysb** image from an AIX 3.2.5 partition to /**usr**/**sys**/**inst.images**/**ssp** on the boot/install server node of the system partition, and then update the SDR to reflect the installation image name of the mksysb, if necessary. The command for updating the SDR is:

```
spbootins -i install_image_name -l node_list
```

where *install_image_name* is the name of the **mksysb** image, and *node_list* is a list of nodes this image runs on.

You may want to create a second boot/install server in the production system partition as a backup to the primary boot/install server. To change the boot/install server for a group of nodes, use the following command:

```
spbootins -n boot_server_node_number -l node_list
```

This causes the node indicated by *boot_server_node_number* to become the boot/install server for the nodes in *node_list*.

Note: **spbootins** must be run from the control workstation.

Using /usr Clients

If you are using /**usr** clients, you may have some additional preparation work. If some of the nodes you select for the test partition (the AIX 4.1/PSSP V2R1 system partition) are /**usr** clients, their designation in the SDR as /**usr** clients must be changed *before* you apply the system partition configuration. If you try to change the attribute after the partition configuration is applied, **spbootins** sends a message that /**usr** clients are not supported in a PSSP V2R1 partition.

To change the attribute, issue the following command before you apply the system partition configuration:

```
spbootins -u local -l node_list
```

where *node_list* is a list of the /**usr** client nodes moving to the PSSP V2R1 system partition.

Step 3: Verify the Control Workstation Requirements

The control workstation must have sufficient paging space and disk space for the boot/install server files, and /**usr** must be large enough to contain the new image. For more information, see “Step 1: Verify the Control Workstation Requirements” on page 13.

Important Notes

- Make sure you have your configuration worksheets filled in and available before you proceed with the installation.
- All tasks must be run on the control workstation as root, except where indicated.

  All of the RS/6000 SP commands in this chapter are in **/usr/lpp/ssp/bin**, except where indicated. To avoid entering the complete path name each time you want to invoke a RS/6000 SP command, add **/usr/lpp/ssp/bin** to the root user path.

Step 4: Prepare for PSSP Migration

PSSP V2R1 provides the following software migration paths which preserve certain files on your PSSP V1R2 control workstation:

- An AIX 4.1 migration installation of the control workstation
- Saving a set of files from your AIX 3.2.5 control workstation and restoring them after you install AIX 4.1

Note: The **.klogin** file of the Kerberos Administrative Principal in PSSP V2R1 contains an entry not included in the PSSP V1R2 **.klogin** file. If the entry is not already part of your Kerberos Administrative Principal's **.klogin** file, add it now.

The entry you add references a remote command (**rcmd**) principal for the control workstation. For example, suppose your control workstation is `spctrl`, your authentication realm is `XYZ.ABC.COM`, and root is your Kerberos Administrative Principal. In this example, you would add the following line to **/.klogin**:

```
rcmd.spctrl@XYZ.ABC.COM
```

Saving Files from Your AIX 3.2.5 Control Workstation

If you are not doing an AIX 4.1 migration installation, you must save the following files:

- The contents of **/var/sdr**
- The contents of **/var/kerberos**
- **/.k**
- **/.klogin**
- **/etc/krb-srvtab**
- **/etc/krb.conf**
- **/etc/krb.realms**
- **/etc/hmacls**
- **/usr/lpp/ssp/config/hmthresholds**

Follow this procedure to save the PSSP files required for migration:

1. Create a file called **MigList** containing the following minimum set list of filenames:

   ```
   /.k
   /.klogin
   /etc/krb-srvtab
   /etc/krb.conf
   ```

/etc/krb.realms
/etc/hmacls
/usr/lpp/ssp/config/hmthresholds

2. Run the following tar command:

   ```
   tar -cvf PSSP-1.2.tar -L MigList /var/sdr /var/kerberos
   ```

   This creates a tar archive of the files listed above, the SDR, and the Kerberos database.

   To verify the tar file **PSSP-1.2.tar** is readable, run the following tar command:

   ```
   tar -tvf PSSP-1.2.tar.
   ```

   If you prefer saving the files on tape, substitute the name of a tape device for **PSSP-1.2.tar** in these examples.

3. Copy **PSSP-1.2.tar** to another system or some other safe location before you install AIX 4.1 on your control workstation.

When you restore the PSSP V1R2 SDR on your AIX 4.1 control workstation, the PSSP V2R1 software detects a migration—it upgrades the saved SDR data and converts it to PSSP V2R1. You do not need to re-enter SP configuration information.

If the SP Authentication Services are reinitialized after installation of PSSP V2R1, you must customize all PSSP V1R2 nodes to distribute new **krb-srvtab** files to those nodes. The same migration software detects the presence of your SP Authentication Services configuration and starts the appropriate daemons. You do not need to run **setup_authent**.

Saving Special Files

Whether you are doing an AIX 4.1 migration installation or not, you may want to save other files in addition to the minimum set. Any PSSP configuration or AIX files you modified and want to reuse after the migration are candidates. You may want to back up special or customized files, such as file collection lists and sysctl environment files, and restore them after you complete the installation.

Use the following procedure to save these files:

1. Create a file called **MigList2** containing the list of file names you want to save. For example:

   /etc/sysctl.conf
   /etc/sysctl.acl
   /usr/lpp/ssp/config/hwevents

2. Create a tar archive of the customized files and the **supper** file collections, and verify the tar file is readable. Enter the following commands:

   tar -cvf my.archive -L MigList2 /var/sysman/sup

   tar -tvf my.archive

3. Copy **my.archive** to a safe location, to be restored after you complete the installation.

Step 5: Install AIX 4.1 on the Control Workstation

Use the installation method you chose in the *SP System Planning Guide*.

If you are doing an AIX migration installation of your control workstation from another NIM master, and if you are relying on a **bosinst_data** file or are creating a special noprompt file for the migration installation, make sure the **RM_INST_ROOTS** stanza is no. If **RM_INST_ROOTS** is **yes**, it is impossible to create a /**usr SPOT** after completing the AIX installation.

Step 6: Configure RS-232 Control Lines

Before You Begin

Do this step if you did not do an AIX 4.1 migration installation of the control workstation

Each frame in your RS/6000 SP system requires a serial port on the control workstation configured to accommodate the RS-232 line. For example, if you have two frames, configure two tty terminals.

Use SMIT or the **mkdev** command to define the RS-232 interfaces as they appear on your Control Workstation Worksheet.

Using SMIT:

To configure an RS-232 line using SMIT:

TYPE	**smit tty**
	▲ The TTY menu appears
SELECT	Add a TTY
SELECT	RS-232 Asynchronous Terminal
SELECT	An appropriate serial port (parent adapter) connection. For example, **sa0**.
	▲ A data entry window appears
PRESS	**List** to show the available port numbers. Select a port number. For example, **s1**, **s2**, **s3**, or **s4**.
PRESS	**Do** to configure the line.

Using mkdev:

Enter a command similar to this example, which defines and configures an RS-232 line for parent adapter sa0 on port serial port 1:

```
mkdev -c tty -t tty -s rs232 -p sa0 -w s1
```

Note: You can accept the default baud rate of 9600. When the SP System Monitor starts, it changes the rate to 19200.

Step 7: Configure Ethernet Adapters

Before You Begin

Do this step if you did not do an AIX 4.1 migration installation of the control workstation

Use **smit chinet** or the **chdev** command to configure each Ethernet adapter connecting your RS/6000 SP frames to the control workstation. For details on the correct use of **chdev**, see the *AIX Commands Reference*, the man pages, or the online information database accessed through the **info** command.

Refer to your RS/6000 SP Control Workstation Worksheet in the *SP System Planning Guide* for the IP addresses and netmask values of your Ethernet adapters.

Note: If adapter is not yet defined or configured, use **smit mkinet** or the **mkdev** command instead of **smit chinet** or **chdev** to specify new IP host name and netmask values.

Using SMIT:

TYPE	**smit chinet**
SELECT	The Ethernet interface to be configured
ENTER	IP interface and netmask information from worksheet.
TYPE	**up** in the `current STATE` option
PRESS	**Do** to complete operation

Using chdev:

Enter a command similar to this example, which configures an en0 adapter.

```
chdev -l en0 -a netaddr=129.33.41.1 -a netmask=255.255.255.0 -a state=up
```

Using mkdev:

Enter a command similar to this example, which defines and configures an en0 adapter.

```
mkdev -c if -s EN -t en -a netaddr=129.33.34.1 netmask=255.255.255.0 state=up -q -w en0
```

Step 8: Verify Control Workstation Interfaces

Verify the configuration for each Ethernet adapter in the control workstation.

You can verify each Ethernet adapter by *pinging* its IP address and seeing if you get a response. For example:

ping 129.33.34.1 -c 1

Reconfigure the adapter if you do not receive a response.

Changing root Default Processes

When you first install your RS/6000 SP system, the number of processes the root user can have is set to **40**, an AIX 4.1 default. You will not be able to continue installing your system with this default value—you must increase the number.

To change the value, enter the following command:

```
chdev -l sys0 -a maxuproc='256'
```

Tunables and Tunable Values

When you first install your RS/6000 SP system, the network tunable values are set to AIX 4.1 defaults. (A **tunable** is a SP performance parameter you can set to a value that makes your system run its workload most efficiently.) Your system may not run efficiently with the default values. Use the **no** command to display these values. This command and all its parameters are described in the *SP Commands and Technical Reference*.

When you install PSSP on your control workstation, change the network tunables on the control workstation interface to the values in Table 1.

Table 7. Control Workstation Tunables

Tunable	Recommended Initial Value
thewall	16384
sb_max	163840
ipforwarding	1
tcp_sendspace	65536
tcp_recvspace	65536
udp_sendspace	32768
udp_recvspace	65536

These tunables are defined as follows:

Tunable	Description
thewall	The upper bound on the amount of real memory that can be used by the communications subsystem. The units are in 1 KB increments.
sb_max	Upper limit on the size of the TCP and UDP buffers in mbufs of allocated space to a connection.
ipforwarding	Specifies whether the kernel should forward packets. A value of **1** forwards packets when they are not for the local system; a value of **0** prevents forwarding.
tcp_sendspace	The default size of the TCP send window.
tcp_recvspace	The default size of the TCP receive window.
udp_sendspace	The default size of the UDP send buffer. The effective maximum is 65536 (64K).
udp_recvspace	The default size of the UDP receive buffer.

Using no:

To display network tunable values, enter:

/usr/sbin/no -a

AIX responds similarly to the following:

```
                thewall = 16384
                 sb_max = 163840
        net_malloc_police = 0
                 rto_low = 1
                rto_high = 64
               rto_limit = 7
              rto_length = 13
             arptab_bsiz = 7
               arptab_nb = 25
              tcp_ndebug = 100
                  ifsize = 8
          subnetsarelocal = 1
                   maxttl = 255
                ipfragttl = 60
          ipsendredirects = 1
             ipforwarding = 1
                  udp_ttl = 30
                  tcp_ttl = 60
                arpt_killc = 20
            tcp_sendspace = 65536
            tcp_recvspace = 65536
            udp_sendspace = 32768
            udp_recvspace = 65536
           rfc1122addrchk = 0
           nonlocsrcroute = 0
            tcp_keepintvl = 150
             tcp_keepidle = 14400
                bcastping = 0
                 udpcksum = 1
              tcp_mssdflt = 1500
          icmpaddressmask = 0
             tcp_keepinit = 150
ie5_old_multicast_mapping = 0
                  rfc1323 = 1
               ipqmaxlen = 100
       directed_broadcast = 1
             ipforwarding = 1
          subnetsarelocal = 1
```

To change the value of **thewall**, enter:

/usr/sbin/no -o thewall=16384

When you change the network tunables, they take effect immediately. However, they are not preserved across a boot. To make the changes to the tunables effective across boots, add the **no -o** commands you used to change the network tunables to the bottom of the file /**etc**/**rc.sp**.

Step 9: Define Space for SP Data

The /**spdata** directory contains mksysb and installp file sets. IBM recommends you create a separate volume group for the /**spdata** file system. These file sets are large and need much space (at least 2 GB). If you have not done so already, use the *SP System Planning Guide* to help you estimate how much space you need to define.

Define a Volume Group

The logical volume manager (LVM) configuration you define can also include placing the /**spdata** file system in its own volume group rather then using the default volume group **rootvg**.

This task is optional. You need to section off space on the control workstation disk, and this is one way to do it. IBM recommends you create a separate file system because of the large amount of SP data.

Note: You cannot create a volume group if:

- All control workstation disks are in use.

or

- The control workstation has only one physical volume.

To create a volume group, you can use SMIT or the command **mkvg**.

Using SMIT:

TYPE	**smit vg**
	▲ The Volume Groups menu appears
SELECT	Add a Volume Group
	▲ The Add a Volume Group window appears
TYPE	The volume group name (for example, **spdatavg**).
TYPE	The physical volume name (press F4 and select a volume).
PRESS	**Do** to create the volume group.

SMIT automatically varies on the volume group.

Using mkvg:

The following command will create a new logical volume named **spdatavg**, using **hdisk1** as the physical volume.

```
/usr/sbin/mkvg -f -y spdatavg hdisk1
```

After you create the new volume group **spdatavg**, vary on the volume group on your control workstation using the **varyonvg** command.

```
/usr/sbin/varyonvg spdatavg
```

Define a File System within a Logical Volume

Now define a new logical volume for the **spdata** file system. You can define a logical volume and a file system within that volume group. This method gives you flexibility in allocating the space on your system. The name for the logical volume can be your choice—what is important is to allocate enough space for your /**spdata** file system configuration, based on your estimates.

If you have not already estimated the space you need for your file system, see the *SP System Planning Guide* for help in doing this.

The logical volume can be defined using SMIT or the AIX command **mklv**.

Using SMIT:

TYPE	**smit lv**
	▲ The Logical Volume menu appears
SELECT	Add a Logical Volume
SELECT	The proper volume group **rootvg** or your spdata volume group.
NAME	The logical volume (anything you want)
SELECT	The Number of logical partitions used
	Note: Each logical partition is allocated in 4 MB blocks.

Using mklv:

To create a logical volume called **spdata_lv** with 2 GB (assuming a default physical partion size of 4 MB) use the **mklv** command. Enter:

```
/usr/sbin/mklv -y spdata_lv spdatavg 500
```

Create the File System for spdata

You now need to create the /**spdata** file system on the control workstation. The file system must be mounted as /**spdata**. You can use SMIT or the AIX command **crfs** to create the /**spdata** file system.

Using SMIT:

TYPE	**smit crfs**
SELECT	Add a Journaled File System on a Previously Defined Logical Volume
SELECT	Your logical volume (press F4 and select a volume).
SPECIFY	/**spdata** as mount point
SELECT	**yes** for `Mount AUTOMATICALLY at system restart?`

Using crfs:

To create a file system /**spdata** within the newly created logical volume **spdata_lv**, use the **crfs** command. The following example creates the /**spdata** file system, using logical volume **spdata_lv** and mount point /**spdata**. It also adds the /**spdata** into the /**etc**/**filesystems** to be automatically mounted at system restart.

```
/usr/sbin/crfs -v jfs -d spdata_lv -m /spdata -A yes -p rw -t no
```

Mount the /spdata File System

After you create the new /**spdata** file system, you need to mount it on the control workstation. Use the AIX command **mount**.

The following example mounts the /**spdata** file system.

```
/usr/sbin/mount /spdata
```

Expand the root File System

Before You Begin

- This step is **optional**. Skip this step if you have already created a logical volume and file system for /**spdata**.
- IBM does not recommend the expanded root file system configuration because of possible performance and backup considerations with the control workstation.

You can choose not to create a logical volume and file system for /**spdata** and increase your current root / file system to hold the required AIX 4.1 LPP file sets, AIX **mksysb** images, and RS/6000 SP installp file sets.

You can use SMIT or the AIX command **chfs** to expand the root file system.

Using SMIT:

TYPE	**smit chfs**
SELECT	Change / Show Characteristics of a Journaled File System
SELECT	/
SPECIFY	The size in 512-byte blocks to increase the file system

Using chfs:

The following example increases the root file system by 400 MB, which is equal to 781250 512-byte blocks.

```
/usr/sbin/chfs -a size=+781250 /
```

Create Required /spdata Directories

Note: Make sure you mount the new /**spdata** file system before you create the /**spdata** directories.

The RS/6000 SP requires you create sub-directories on the /**spdata** file system for storing critical PSSP data. Table 2 lists the required directories.

Table 8. Required /spdata Directories

Directory	Purpose
/spdata/sys1	Main directory for SDR, SPMON, Log Mgt, and Installation
/spdata/sys1/install	Main directory for PSSP installation
/spdata/sys1/install/lppsource	Location of required AIX 4.1 file sets
/spdata/sys1/install/images	Location of all required AIX **mksysb** images
/spdata/sys1/install/pssplpp	Location of all RS/6000 SP installp file sets
/spdata/sys1/install/pssp	Location of NIM configuration data files

To create these directories, use the following **mkdir** commands:

- **mkdir -p /spdata/sys1/install/lppsource**

- **mkdir /spdata/sys1/install/images**
- **mkdir /spdata/sys1/install/pssp**
- **mkdir /spdata/sys1/install/pssplpp**

Make sure the directories have the permissions `rwxr-sr-x`.

Step 10: Copy the AIX 4.1 LPP Images

If you have not done so already, you must now download the AIX file sets into the **lppsource** directory on the control workstation. You have a choice. You can download:

- All of the AIX file sets (approximately 1.5 GB)

or

- The minimal required AIX file sets (approximately 450 MB)

The following is the minimal list of AIX file sets required to perform **mksysb** installations:

bos
bos.info.any
bos.net
bos.rte.up
bos.rte.mp
bos.diag
bos.powermgt
bos.sysmgt
bos.terminfo.all
devices.all
X11.apps
X11.base
X11.compat
X11.Dt
X11.fnt
X11.loc
X11.motif
X11.msg.all
X11.vsm

Note: The *<prefix>*.all syntax in this list refers to everything that starts with the *<prefix>*. For example, **devices.all** refers to all of the file sets starting with **devices**.

Copy the LPP images from the installation media to **/spdata/sys1/install/lppsource** on your hard disk.

Notes:

1. Make sure you copy the AIX file sets to **/spdata/sys1/install/lppsource**. If you change the path name in any way, the installation fails.
2. Make sure the directory has the permissions `rwxr-sr-x` and the images have the permissions `rw-r--r--`.
3. Refer to your disk usage planning in the "Combining the Space Requirements" section of the *SP System Planning Guide* to determine if you have allocated enough space to accomplish this task.
4. Allow at least 1-3 hours for moving all the file sets from media to disk.

Load AIX Media

Use the AIX 4.1 media. Login to the control workstation as root and run **bffcreate** using SMIT or the command line.

Using SMIT:

TYPE	**smit bffcreate**
	▲ The Copy Software to Hard Disk for Future Installation window appears.
PRESS	**List** (F4) to show the available devices. Select the device containing the product installation media.
PRESS	**Do** to display the target parameters.
	▲The Copy Software to Hard Disk for Future Installation window appears.
PRESS	**List** to show the LPP packages to load. Select the required file sets to copy.
TYPE	**/spdata/sys1/install/lppsource** in the `DIRECTORY for storing software` field.
PRESS	**Do** to begin downloading.

The following warning message may be issued—ignore it:

```
bffcreate: Warning: important size information is missing from
           the table of contents file.  Consequently, there may not
           be enough free file system space to successfully create
           the bff image(s).  Continuing anyway...
```

Using the Command Line

Note: This example shows the product media on **rmt0** and selection of all LPPs. Using **all** may load unnecessary file sets into the directory.

Enter:

```
bffcreate -qvX -t/spdata/sys1/install/lppsource -d /dev/rmt0 all
```

The following warning message is issued—ignore it:

```
bffcreate: Warning: important size information is missing from
           the table of contents file.  Consequently, there may not
           be enough free file system space to successfully create
           the bff image(s).  Continuing anyway...
```

Step 11: Copy the PSSP Images

The RS/6000 SP package is comprised of these install images:

- The **pssp** install image, which contains the PSSP options
- The **ssp.csd** install image (IBM Virtual Shared Disk)
- The **ssp.mte** install image (magnetic tape extension)

Before you install the PSSP, copy the PSSP images from the installation media to **/spdata/sys1/install/pssplpp** directory on your hard disk.

Load PSSP Media

Login to the control workstation as root and run **bffcreate** using SMIT or the command line.

Using SMIT:

TYPE	**smit bffcreate**
	▲ The Copy Software to Hard Disk for Future Installation window appears.
PRESS	**List** (F4) to show the available devices. Select the device containing the product installation media.
PRESS	**Do** to display the target parameters.
	▲The Copy Software to Hard Disk for Future Installation window appears.
TYPE	**/spdata/sys1/install/pssplpp** in the `DIRECTORY for storing software` field.
PRESS	**Do** to begin the install process.

The following warning message is issued, and you can ignore it:

```
bffcreate: Warning: important size information is missing from
           the table of contents file.  Consequently, there may not
           be enough free file system space to successfully create
           the bff image(s).  Continuing anyway...
```

Using the Command Line

Note: This example shows the product media on **rmt0**.

Enter

```
/etc/bffcreate -d /dev/rmt0 -t /spdata/sys1/install/pssplpp -X all
```

The following warning message is issued, and you can ignore it:

```
bffcreate: Warning: important size information is missing from
           the table of contents file.  Consequently, there may not
           be enough free file system space to successfully create
           the bff image(s).  Continuing anyway...
```

Completing the Step: Updating .toc

When **bffcreate** completes, rename **ssp.usr.2.1.0.0** in /**spdata**/**sys1**/**install**/**pssplpp** to **pssp.installp**.

Do the following:

```
cd /spdata/sys1/install/pssplpp
mv ssp.usr.2.1.0.0 pssp.installp
```

Because the installation tools expect the name of the installp image to be **pssp.installp**, and installp places a different image name in its **.toc** file, update that **.toc** file by running the **inutoc** script as follows:

```
cd /spdata/sys1/install/pssplpp
/usr/sbin/inutoc .
```

Note: Make sure you rename the **ssp.usr.2.1.0.0** image to /**spdata**/**sys1**/**install**/**pssplpp**/**pssp.installp**. If you change the path name in any way, the installation of PSSP options fails.

Step 12: Restore Saved Files

This step is optional. Do this step if you have chosen not to do an AIX 4.1 migration installation. Restore the PSSP files you saved in "Step 4: Prepare for PSSP Migration" on page 72. Copy the archive file to the control workstation and restore the files using the command:

```
tar -xvf PSSP-1.2.tar
```

Step 13: Install PSSP on the Control Workstation

Complete "Step 11: Install PSSP on the Control Workstation" on page 25.

Step 14: Authenticate as the Administrative Principal

Because you restored the SP Authentication Services environment, you should not run **setup_authent** now. Instead, authenticate as the Kerberos administrative user. Use the command:

kinit *admin_user*.**admin**

where *admin_user* is the name of your Kerberos administrative user.

Step 15: Complete PSSP Installation on the Control Workstation

To complete installation of the PSSP on the control workstation, enter the following command with no parameters:

```
install_cw
```

For more information, see "Step 13: Complete System Support Installation on the Control Workstation" on page 36.

Step 16: Configure PSSP Services

To configure the PSSP services defined by the Site Environment information, run the following script:

/usr/lpp/ssp/install/bin/services_config.

This script initializes services if necessary and starts daemons for services including NTP and Amd.

Step 17: Run SDR and System Monitor Verification Tests

In this step, run verification tests that check for correct installation of the SDR, correct installation of the System Monitor and correct configuration of the System Monitor.

Complete "Step 14: Run SDR and System Monitor Verification Tests" on page 36 and "Step 19: Run SP System Monitor Communication Facilities Verification Test" on page 43.

Step 18: Validate the Upgraded Control Workstation

This step is optional, but you may want to let your system run for a period of time with only the updated control workstation supporting the AIX 3.2.5/PSSP V1R2 nodes. This indicates the stability of the upgraded control workstation at AIX 4.1/PSSP V2R1.

Step 19: Shut Down the Nodes

Before You Begin

Do "Step 19: Shut Down the Nodes" through "Step 24: Test PSSP V2R1" on page 87 if you are setting up system partitions.

In this step, you shut down all the nodes of your system to prepare for system partitioning. You can do this from the SP System Monitor Global Controls Display by selecting the All and Shutdown options or by the **cshutdown** command.

Using cshutdown

Enter the following command, which runs the command **shutdown**, on all the nodes of an SP system:

```
cshutdown -F ALL
```

Step 20: Create System Partitions

Follow the procedures described in the *SP Administration Guide* to create the following system partitions:

- A production system partition running your existing production environment
- A test system partition to test PSSP V2R1

Step 21: Reboot the Nodes in the Production System Partition

1. Reboot the nodes of your AIX 3.2.5 production partition.
2. Verify the production partition. When the nodes have booted and initialized, the production partition is ready for use.
3. If you have a High-Performance Switch, **Estart** the switch in the production partition.

Step 22: Install AIX 4.1/PSSP V2R1 in the Test System Partition

This is a full installation of SP software on the nodes of the PSSP V2R1 test system partition. Follow the instructions starting with “Step 33: Network Boot Optional Boot/Install Servers” on page 59.

Step 23: Restore Special Files

This step is optional. Do this step if you saved special or customized files in “Step 4: Prepare for PSSP Migration” on page 72. Copy the archive file to the control workstation and restore the files by using the following command:

```
tar -xvf my.archive
```

Step 24: Test PSSP V2R1

You can test the PSSP V2R1 software while also running the production system partition. The control workstation manages both system partitions. If the production system partition becomes disrupted, use the same backout procedure you would use for the control workstation applied to all the nodes in the test system partition. This procedure is described in “Step 1: Back Up Your Control Workstation” on page 70.

When you complete your testing, you can install production system nodes with the same image currently running as a test system. If problems occur in production, restore the nodes with the **mksysb** image you created.

Chapter 4. Reconfiguring the RS/6000 SP System

This chapter explains the tasks necessary to manage your RS/6000 SP hardware. It shows you the SP commands before and after you make hardware changes, and how to expand your system with additional hardware.

This chapter includes the following tasks:

Adding a Frame 90
Deleting a Frame 91
Adding Nodes 93
Deleting Nodes 94
Replacing a Node with an Equivalent Node 95
Replacing a Node with a Different Type of Node 96
Adding a High Performance Switch 98
Replacing a Fixed Disk 99
Replacing a Disk Not in rootvg 100
Replacing an I/O Planar Card in a Thin Node or an Ethernet Adapter in a Wide Node 100

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Adding a Frame

When you add a frame to your RS/6000 SP System, you should plan how it fits into your network configuration. Consider the number of new nodes and how many interfaces they will have when planning your network configuration. Record this information in your Frame and Node Configuration Worksheets, located in the *SP System Planning Guide*. Both the *SP System and Site Planning* and the *SP System Planning Guide* offer information to help you with these decisions.

If you are running with system partitions, adding a new frame to an existing system partition or to a new system partition requires a different switch topology file. The system administrator must do the following:

1. Select a new system partitioning configuration.
2. Reconfigure the system partitions.

After you plan the configuration, follow these steps to add the frame and its nodes to your RS/6000 SP System, referring to your worksheets as necessary. Many steps include a reference to a previous chapter where it was explained as part of the initial installation and integration process.

Note

Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

See the section on using RS/6000 SP authentication services in *SP Administration Guide* for more information.

Step 1: Connect Frames to Your Control Workstation

Connect RS-232 and Ethernet cable from the new RS/6000 SP System frame to the control workstation according to your Frame Configuration Worksheet.

Step 2: Configure the RS-232 Control Line

Each frame in your RS/6000 SP system requires a serial port on the control workstation configured to accommodate the RS-232 line. Use SMIT or the **mkdev** command to define a serial port for each frame.

See “Step 4: Configure RS-232 Control Lines” on page 14 for more information.

Step 3: Configure the Ethernet Adapter (Optional)

Use SMIT or the **mkdev** command to configure the Ethernet adapter connecting your SP frame to the control workstation.

See “Step 5: Configure Ethernet Adapters” on page 15 for more information.

Step 4: Enter Frame Information and Reinitialize the SDR

Enter information about your RS/6000 SP frames using SMIT or the **spframe** command.

This step creates frame objects in the SDR for each frame in your SP system. At the end of this step, the SDR is reinitialized if you specify **-r yes** on the **spframe** command, resulting in the creation of Node Objects for each node attached to your frames. If frames are not contiguously numbered, repeat sequence for each series of contiguous frames. To save time, do not specify reinitialization of System Data Repository until you are entering final series of contiguous frames.

See "Step 16: Enter Frame Information and Reinitialize the SDR" on page 39 for more information.

Step 5: Reconfigure the System Partitions (Optional)

Note: Complete this step if you are running system partitions.

Follow the instructions in the *SP Administration Guide* to do the following:

1. Select a new system partitioning configuration.
2. Reconfigure the system partitions.

Step 6: Add Nodes to the System

1. To complete this task, follow the installation steps starting at "Step 18: Enter Required Node Information" on page 40 and proceeding through the rest of the chapter.

   Note: Because you are adding a new frame, you must do "Step 25: Run setup_server on the Control Workstation" on page 50.

2. If you are running with system partitions, make sure the SP_NAME environment variable on the control workstation is set to the correct system partition. When you add a node, you must be in the environment of the node's partition.
3. Stop and restart the resource manager server. For more information on this step, see the section on managing RS/6000 SP resources in *SP Administration Guide*.

Deleting a Frame

Use SMIT or the **spdelfram** command to delete frame information from the SDR.

Note

Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

See the section on using RS/6000 SP authentication services in *SP Administration Guide* for more information.

Step 1: Stop the Resource Manager Server

Stop the resource manager server by following this procedure:

Using SMIT

TYPE	**smit RM_options**
SELECT	Stop the Resource Manager
PRESS	**Do** to complete the operation

For more information, see the section on managing RS/6000 SP resources in *SP Administration Guide*.

Step 2: Shut Down the Nodes

Use the SP System Monitor GUI or the **cshutdown** command.

Step 3: Delete Frame Information from the SDR

Using SMIT

TYPE	**smit delete_data**
	▲ The Delete Data Information window appears
SELECT	Delete Frame Information
	▲ The Delete Frame Information window appears
TYPE	The start frame and frame count.

Using spdelfram: This example deletes the last two frames in a four-frame system:

```
spdelfram -G 3 2
```

See the **spdelfram** man page for more information.

Step 4: Reconfigure the System Partitions (Optional)

Note: Complete this step if you are running system partitions.

Follow the instructions in the *SP Administration Guide* to do the following:

1. Select a new system partitioning configuration.
2. Reconfigure the system partitions.

Step 5: Restart the SP System Monitor GUI

Exit the SP System Monitor GUI. To restart the SP System Monitor GUI, enter

```
spmon -g
```

Step 6: Restart the Resource Manager Server

Start the resource manager server by following this procedure:

Using SMIT

TYPE	**smit RM_options**
SELECT	Start the Resource Manager

PRESS	**Do** to complete the operation

Adding Nodes

When you add nodes to an existing frame, you need to know which nodes provide their boot/install service. You can configure a new boot/install server for these nodes or add them to an existing boot/install server as clients. Record this information on your Frame and Node Configuration Worksheets and refer to them as you perform these steps. The worksheets can be found in the *SP System Planning Guide*.

Before You Begin

- Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

  See the section on using RS/6000 SP authentication services in *SP Administration Guide* for more information.
- Do these steps in the system partition to which you add the nodes.

Step 1: Refresh the SDR

Refresh the SDR to make sure all the nodes you are adding are in the SDR database. Enter:

/usr/lpp/ssp/install/bin/SDR_config

Step 2: Connect New Nodes to the Frame

Your IBM Customer Engineer (CE) performs this step.

Step 3: Set Up, Power, and Configure the Nodes

1. To complete this task, follow the installation steps starting at “Step 18: Enter Required Node Information” on page 40 and proceed through the rest of the chapter.

   Notes:

   a. Only the new node needs to be selected in “Step 18: Enter Required Node Information” on page 40. Any production nodes chosen will be powered off.

   b. Only the new node needs to be selected in “Step 20: Acquire Hardware Ethernet Addresses” on page 43. Any production nodes chosen will be powered off.

   c. If you have a switch and are using system partitions, in “Step 22: Configure Additional Adapters for Nodes” on page 45 the starting node is the first node in the system partition and the total number of nodes is the number of nodes in the system partition.

   d. When you add a node, you must complete “Step 25: Run setup_server on the Control Workstation” on page 50.

2. Exit the SP System Monitor GUI. To restart the SP System Monitor GUI, enter

   ```
   spmon -g
   ```

3. Stop and restart the resource manager server. For more information, see the section on managing RS/6000 SP resources in *SP Administration Guide*.

Deleting Nodes

Before You Begin

- Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

  See the section on using RS/6000 SP authentication services in *SP Administration Guide* for more information.

- Do these steps in the system partition from which you delete the nodes.

Step 1: Stop the Resource Manager Server

Stop the resource manager server. Using SMIT, enter the following:

```
smit RM_options
```

For more information, see the section on managing RS/6000 SP resources in *SP Administration Guide*.

Step 2: Shut Down the Node

Step 3: Disconnect the Node From the Frame

Your IBM CE performs this step.

Step 4: Delete Node Information From the SDR

Use SMIT or the **spdelnode** command to delete node information from the SDR.

Using SMIT

TYPE	**smit delete_data**
	▲ The Delete Data Information window appears
SELECT	Delete Node Information
	▲ The Delete Node Information window appears
TYPE	Start Frame, Start Slot, and Node Count
	or
	The Node List.
PRESS	**Do**

Using the Command Line: To delete the SDR information for the 16 nodes in frame 3, enter:

```
spdelnode 3 1 16
```

See *SP Commands and Technical Reference* for more information on **spdelnode**.

Step 5: Restart the Resource Manager Server

Using SMIT, enter the following:

```
smit RM_options
```

Replacing a Node with an Equivalent Node

Follow the steps in this section to replace a node in one of your frames with an equivalent node. Equivalent nodes have the same adapters and configuration data.

Before You Begin

- Be sure to back up any local data you want to preserve.
- Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

  See the section on using RS/6000 SP authentication services in *SP Administration Guide* for more information.
- Do these steps in the system partition in which you replace the nodes.

Step 1: Shut Down the Node and Power It Off

Step 2: Replace the Old Node with the New One and Physically Power It On

Your IBM CE performs this step.

Step 3: Acquire the Hardware Ethernet Address

This step takes the hardware Ethernet address for your new node (either from the node itself or from a file), puts it in the Node Object of the SDR, and sets up the **/etc/bootptab** file on the boot/install server.

Important Note

If you have information for the node being replaced in **/etc/bootptab.info**, be sure to remove it, and then add the new Ethernet address.

Use SMIT or the **sphrdwrad** command to write the hardware Ethernet address to the SDR.

See “Step 20: Acquire Hardware Ethernet Addresses” on page 43 for more information.

Step 4: Set Up Nodes to Be Installed

Use SMIT or issue the **spbootins** command to change the default boot/install information in the Node Objects in the SDR so that you can indicate a different bootp response for nodes to be installed. This step also runs the **setup_server** command on all affected server nodes so that the nodes served is installed accordingly at power-up.

Step 5: Restart the SP System Monitor GUI

Exit the SP System Monitor GUI. To restart the SP System Monitor GUI, enter

```
spmon -g
```

Step 6: Network Boot the New SP Node

At the SP System Monitor GUI main window:

SELECT	SP → Global Commands
	▲ The Global Commands panel appears.
SELECT	The new node
SELECT	Net boot
PRESS	**Do**
	▲ The SP System Monitor boots the new node.
	▲ The network boot status window appears.

See the chapter on using the SP system monitor in *SP Administration Guide* for more information.

Step 7: Run Postinstallation Procedures

Set up the new nodes for any additional tools you use to manage your RS/6000 SP System environment.

See Table 6 on page 68 for a listing of information on the procedures for setting up these facilities.

Replacing a Node with a Different Type of Node

Follow these steps to replace a node with a different type of node in one of your frames:

Before You Begin

- Be sure to back up any local data you want to preserve.
- Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

  See the section on using RS/6000 SP authentication services in *SP Administration Guide* for more information.
- Do these steps in the system partition in which you replace the nodes.

Step 1: Shut Down the Node and Power It Off

Step 2: Disconnect the Node From the Frame

Your IBM CE performs this step.

Step 3: Stop the Resource Manager Server

Stop the resource manager server. Using SMIT, enter the following:

```
smit RM_options
```

For more information, see the section on managing RS/6000 SP resources in *SP Administration Guide*.

Step 4: Delete Node Information from the SDR

Use SMIT or the **spdelnode** command to delete node information from the SDR.

Using SMIT

TYPE	**smit delete_data**
	▲ The Delete Data Information window appears
SELECT	Delete Node Information
	▲ The Delete Node Information window appears
TYPE	Start Frame, Start Slot, and Node Count
	or
	The Node List
PRESS	**Do**

Using the Command Line: To delete the SDR information for the 16 nodes in frame 3, enter:

```
spdelnode 3 1 16
```

See *SP Commands and Technical Reference* for more information on **spdelnode**.

Step 5: Replace the Old Node with the New One and Physically Power It On

Your IBM CE performs this step.

Step 6: Set Up, Power, and Configure the Nodes

1. To complete this task, follow the installation steps starting at "Step 18: Enter Required Node Information" on page 40 and proceed through the rest of the chapter.

   Note: When you add a node, you must complete "Step 25: Run setup_server on the Control Workstation" on page 50.

2. Restart the resource manager server. For more information, see the section on managing RS/6000 SP resources in *SP Administration Guide*.

Adding a High Performance Switch

If you are adding a High Performance Switch, an IBM CE installs the switch hardware on your RS/6000 SP System. You must plan which frames the switch supports and record your information on the High Performance Switch Configuration Worksheet, located in the *SP System Planning Guide*. Both *SP System and Site Planning* and the *SP System Planning Guide* offer information to help you with the worksheet. After you complete the worksheet, follow these steps to install and configure the switch according to your configuration worksheet.

Before You Begin

- Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

  See the section on using RS/6000 SP authentication services in *SP Administration Guide* for more information.

- Do these steps in the system partition to which you add the switch.

Step 1: Install the Communication Subsystem Software

Install the Communication Subsystem software that supports the High Performance Switch

Use SMIT or **installp** to install **ssp.css** on the control workstation. For more information, see "Step 11: Install PSSP on the Control Workstation" on page 25.

Step 2: Configure High Performance Switch Adapters for New Nodes (Optional)

Use SMIT or the **spadaptrs** command to create **css0** adapter objects in the SDR for each new node. Refer to your High Performance Switch Configuration Worksheet. Use this data to configure the High Performance Switch on the nodes.

See “Step 22: Configure Additional Adapters for Nodes” on page 45 for more information.

Step 3: Set Up the High Performance Switch

(Optional)

Do installation steps “Step 29: Set Up the High Performance Switch” on page 55 through “Step 32: Set Up System Partitions” on page 59. If you have set up system partitions, you need to reconfigure them.

Step 4: Set Up Nodes to Reboot

Use SMIT or issue the **spbootins** command to change the boot/install information for all the Node Objects in the SDR to specify a bootp response of **customize**.

Step 5: Network Boot the SP Nodes

Power up the new SP nodes using the Global Controls display. Follow these installation steps:

- “Step 33: Network Boot Optional Boot/Install Servers” on page 59
- “Step 35: Network Boot the Remaining RS/6000 SP Nodes” on page 63

Step 6: Start Up and Verify the High Performance Switch

1. To complete this step, follow the installation steps starting at “Step 38: Start the High Performance Switch” on page 65 and proceed through the rest of the chapter.
2. Exit the SP System Monitor GUI. To restart the SP System Monitor GUI, enter

   ```
   spmon -g
   ```

Replacing a Fixed Disk

This procedure applies only to disks that are part of the **rootvg** volume group.

Before You Begin

- Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

  See *SP Commands and Technical Reference* for more information on **kinit**.
- If possible, back up any required data on the disk before replacing it.
- Do these steps in the system partition in which you replace the disk.

Step 1: Power Off the Node

Step 2: Replace the Disk

Your IBM CE performs this step.

Step 3: Install the System Image on the Disk

Use the **spbootins** command to:

1. Select image to be installed, if necessary.
2. Set **bootp_response** to `install`.

See *SP Commands and Technical Reference* for **spbootins** command syntax.

Step 4: Network Boot the Node

Use the SP System Monitor GUI to network boot the node.

Replacing a Disk Not in rootvg

To replace disks that are *not* in the **rootvg** volume group:

1. Power off the node.
2. Replace the failing fixed disk.
3. Power on the node.
4. Restore any data previously backed-up.

Replacing an I/O Planar Card in a Thin Node or an Ethernet Adapter in a Wide Node

The I/O planar card for a thin node or the en0 adapter for a wide node has a hardware address used to network boot the nodes. This procedure updates the SDR Ethernet address.

Before You Begin

- A ticket is required to perform some of the commands in this procedure. Run the **kinit** command. See *SP Commands and Technical Reference* for more information on **kinit**.
- Do these steps in the system partition in which you replace the card.

Step 1: Power Off the Node

Step 2: Replace the Card

Your IBM CE performs this step.

Step 3: Get the New Hardware Ethernet Address

Important Note

If you have information for the node being replaced in /**etc/bootptab.info**, be sure to remove it.

Use the **sphrdwrad** command to get the new hardware Ethernet address. See *SP Commands and Technical Reference* for command syntax.

Chapter 5. Performing Software Maintenance

This chapter provides information on updating installation images, LPPs, and support programs. It includes the following topics:

Installing Program Updates 103
Reinstalling PSSP 105
Updating the Print Subsystem 105
Installing Updates on a Per Node Basis 105
Installing Updates through Reinstallation 106
Applying PTFs to the SP System 108

Installing Program Updates

Before You Begin

Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

See the section on using RS/6000 SP authentication services in *SP Administration Guide* for more information.

There are two approaches to installing program updates.

Approach	Description
Per-node	Apply the maintenance on each node individually. For the per-node approach, you can apply service on all the nodes in one of the following ways: • Logging in to each node and using SMIT for installation • Running the installation command on each node using **dsh**
Reinstall	Install the maintenance on a single node, building an image on that node, and then propagate the changes to all other nodes by reinstalling that image on each node. The reinstall approach requires you install the programs and updates on your maintenance test node using SMIT or **installp** in order to generate an installation image and then place the new image on the control workstation. SMIT or the **spbootins** command enables you to specify all the nodes to be reinstalled with the new image. All that remains is to boot the nodes, which causes the nodes to be reinstalled.

Regardless of which approach you choose, do the following:

1. Apply the desired maintenance to a single test node. This allows you to gauge how long the service takes for a single node and enables you to verify the

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success of the maintenance before applying the service to the rest of the nodes.

2. Generate a **mksysb** image of your updated system. In the event of a required reinstall, you can use the **mksysb** image instead of reapplying the maintenance to any nodes that need to be reinstalled.

Which Approach is Right for You?

How do you know which approach to take? Consider these factors:

- How many nodes you have in your system.
- How long it takes to apply the desired maintenance.
- Whether you have user data on a node in its root volume group. (This data is destroyed on a reinstall.)

If you have fewer than 16 nodes in your RS/6000 SP System or the maintenance is minor, it may be faster to apply the maintenance directly on each node than to reinstall. On the other hand, if there is a large amount of maintenance to be done and you have no user data to preserve in the root volume group, it may be faster to install the maintenance once, generate a new installation image, and reinstall all your nodes.

Working With Nodes That Are Down

Regardless of your approach, nodes that were down when service was applied must get updated. This situation is handled differently in the two approaches.

Using the Per-Node Approach

When using the per-node approach, you need to note the nodes that are down and service them when they come back up. You can use the **lslpp** command to help determine what maintenance has been applied on a particular node, and use **dsh** to run the **lslpp** command on a group of nodes.

Using the Reinstall Approach

If you are using the reinstall approach and a node is unavailable when you are reinstalling images, whenever the node comes back up it reinstalls the correct image. To ensure that a node is reinstalled when it comes back up, use the flags of the **spbootins** command to set the **bootp_response** attribute for the node to **install** and the **install_image** attribute to indicate that the new installation image is to be used. (See the *SP Commands and Technical Reference* for **spbootins** command syntax.)

In addition to the **bootp_response** and the **install_image** attributes values, the name of the installation image last used and the date and time of the last install are kept in the Node Object in the SDR for each node and can be examined using the **-b** flag of the **splstdata** command. (See the *SP Commands and Technical Reference* for **splstdata** command syntax.)

Reinstalling PSSP

If you need to apply service to PSSP or reinstall PSSP, you must install the maintenance on the control workstation first. Then proceed to install the maintenance on the nodes depending on which approach you have chosen, as described in "Installing Program Updates" on page 103.

Make sure you read the Memo to Users that comes with any updates to PSSP. The Memo to Users indicates if there are any updates that would require you service all nodes in your RS/6000 SP System before continuing to run your system.

Note: If you are restoring from a **mksysb** image, issue the **install_cw** command to initialize the ODM.

Updating the css Option

When reinstalling or updating the **ssp.css** option of PSSP, you must reboot all affected nodes.

Updating the Print Subsystem

If you are applying service to any base AIX print commands and you are using the RS/6000 SP Print Management Utility, you must do the following when applying the service:

1. Use SMIT or the **spsitenv** command to set the **print_config** attribute to **none**. This causes the links to be removed and the original AIX commands to be renamed to the original names.
2. Perform any updates.
3. Use SMIT or the **spsitenv** command to set the **print_config** attribute to **open** or **secure** to reconfigure the Print Management Service.

Installing Updates on a Per Node Basis

Note: A ticket is required to perform some of the commands in this procedure. Run the **kinit** command. See the *SP Commands and Technical Reference* for more information on **kinit**.

After you have made the service you want to apply available as an image on the control workstation, you can apply service to each node individually by selecting one of the following methods:

- Login to each node and use SMIT for installation.
- Run the installation command on each node using **dsh** from the control workstation. This requires that you know exact syntax of the **installp** command you want to issue. See the *SP Commands and Technical Reference* for **dsh** command syntax. For example, to use **installp** to install the Resource Manager program on every node, issue:

```
dsh -a /etc/umount /mnt
dsh -a /etc/mount <cw>:/spdata/sys1/install/pssplpp /mnt
dsh -a /etc/installp -d /mnt/ssp/pssp.installp  -X ssp.jm
```

Installing Updates through Reinstallation

Before You Begin

Performing this task requires that your identity be authenticated as an authorized user of the system management commands and SP System Monitor GUI interfaces shown in the following steps. You do this by issuing the **kinit** command to obtain a ticket from the RS/6000 SP authentication services, specifying the administrative principle name that was used when authentication was set up.

See the section on using RS/6000 SP authentication services in *SP Administration Guide* for more information.

If you choose the reinstall approach, you may want to target particular nodes for maintenance images. For instance, if you have groups of nodes with distinct identities such as:

- Boot/install servers
- Compute nodes
- Interactive nodes

you may want to select one representative node in each group from which to apply maintenance and generate new installation images. The other nodes in the group should always then be reinstalled with the image generated from that node.

Notes:

1. All nodes using the switch must be at the same level of base AIX.
2. The communications subsystem software (**ssp.css**) must be at the same level on each node using the switch.

Build an Installation Image

Before building an installation image, install all the LPPs and service to the node on which you intend to create your installation image. Careful planning in selecting LPPs and required service spares you from repeating this process.

After you have installed the LPPs and service required for your nodes, you are ready to make an installation image. Login to the node where you want to create an installation image and enter

```
smit -C mksysb
```

Enter the file name of the image that you want to create and press Enter.

Note: The installation tools require that the name of this image begin with **bos.obj**. A suggested naming convention for these images is:

```
bos.obj.<level>.<date>
```

For example:

```
bos.obj.41.950515
```

You can generate a **mksysb** image to install on your nodes. You can do this on a node after you have installed at least that node, or you can use a standalone workstation (either the control workstation or a different standalone workstation).

However, after you have done “Step 12: Initialize RS/6000 SP Authentication Services” on page 27, you cannot use the control workstation for this purpose. Running the **setup_authent** command on any workstation makes the workstation unsuitable for generating a **mksysb** image for a node.

The control workstation (or a different standalone workstation) must be at the right level of the AIX RS/6000 operating system and must have all required PTFs applied. One way to ensure this is to install the **mksysb** image that resides in the **spimg installp** image on its product tape. You can also install any of the RS/6000 SP software options on that machine. After installing extra LPPs or maintenance, you can generate a **mksysb** image of the system and copy it back to /**spdata**/**sys1**/**install**/**images** on the control workstation. You can then use that image to install your nodes.

After you install a node, you can install any RS/6000 SP software options or LPPs, other LPPs, or any maintenance that you need. You can then test your node and generate a **mksysb** image of that node. Before doing this, you may want to remove certain files from the node that you do not want in the image. These include any **mksysb** images in that node's /**spdata**/**sys1**/**install**/**images** directory (if the node is a boot/install server itself).

Do not remove /**home** from the node. If you do so, when you use the **mksysb** image to install a boot/install server node, you cannot create the **netinst** user ID that is required for network install after you install the image. After you create the **mksysb** image, copy it back to /**spdata**/**sys1**/**install**/**images** on the control workstation and install the rest of your nodes with that image.

Test Your Image on a Single Node

After you create your netinstall image, you must test the image. Use **ftp** (remember to use binary mode) or **rcp** to transfer the image to the control workstation. The RS/6000 SP installation tools require all installation images to reside on the control workstation. Remember that the image must be placed in the /**spdata**/**sys1**/**install**/**images** directory and that the permissions must allow it to be read by **other**.

To test the image, you must reinstall a node with this new image and run your applications to see if it meets your requirements.

Propagate Your Installation Image

After you create the netinstall image and copy it to the control workstation in /**spdata**/**sys1**/**install**/**images**, you are ready to reinstall.

On the control workstation issue the following:

/usr/lpp/ssp/bin/spbootins -i *install-image-name* **-r install** *start-frame start-slot node-count*

In the following example:

```
spbootins -i bos.obj.41.940515 -r install 2 3 1
```

would change the SDR information to install the image **bos.obj.41.950515** on node 3 in rack 2 from its boot/install server.

This command automatically issues the **setup_server** on node 3's boot/install server to update its install files with the new information. Note that **setup_server**

copies the installation image from the control workstation to the appropriate boot/install servers if the boot/install server is not the control workstation. If the image has to be copied to a boot/install server, this may take some time. You can now use the SP System Monitor to reset the node, which causes the netinstall of the test image on the node.

The boot list of a node is set by **/etc/rc.sp** to boot from **hdisk0** only. When the **bootp_response** of a node is changed from **disk** to be some other response, such as "install," the node is sent a boot list command to cause it to boot from **ent0** before **hdisk0**. If a node is down when its **bootp_response** is changed, its boot list is not changed. In order to cause the node to boot over the network, you must use the Network Boot button of the SP System Monitor display manager.

After the netinstall is complete, the node reboots and you can verify the image runs your applications. When you are satisfied that this image meets your requirements, you can use the **spbootins** command to change the **install_image** attribute and **bootp_response** and reinstall the rest of your nodes.

Applying PTFs to the SP System

This section outlines a procedure you can follow to install PTFs on your SP system using the procedure described in “Installing Updates on a Per Node Basis” on page 105.

A: Prepare the Control Workstation

1. Create a **mksysb** backup of the control workstation.
2. Create a **mksysb** backup of the test node.
3. Copy the PTFs into an appropriate directory on the control workstation, for example:

   /spdata/sys1/install/pssplpp/ptf2
4. Run the command **inutoc .** in that directory to build a new .toc file.
5. Verify **/spdata/sys1/install/pssplpp** is exported to all nodes.
6. Apply the PTFs to the control workstation.

   Note: Do *not* commit.
7. Verify the correct operation of all SP and AIX control workstation functions.

   Note: You may want to reboot the control workstation. Check the README in the PTF to see if this is required.

B: Apply PTFs on One SP Node and Verify Correct Operation

Before You Begin

Some PTFs require you apply them to all the nodes in your system. To do this, set up a test AIX 4.1 partition. See the *SP Administration Guide* for instructions.

1. Select one node for PTF installation.

2. NFS mount /**spdata**/**sys1**/**install**/**pssplpp** from the control workstation onto that node:

   ```
   /etc/mount <cw>:/spdata/sys1/install/pssplpp /mnt
   ```

3. Apply PTFs to that node.
4. Reboot the node and verify correct operation.
5. Verify correct installation and operation of the node.
6. Create a **mksysb** image of this node and store it in an appropriate directory on the control workstation, for example:

   ```
   /spdata/sys1/install/images/bos.obj.ssp.41.ptf2
   ```

   Note: You may want to install one node using the **mksysb** image you just saved to make sure the image is correct.

C: Apply PTFs to All Nodes

Before You Begin

You can follow these instructions to install the PTF code from the directory onto each node. You can also install the PTFs by using the **mksysb** you just saved.

1. Using the **dsh** command, NFS mount /**spdata**/**sys1**/**install**/**pssplpp** onto each node. You can exclude the node you used for testing since it is now at the correct level.

   ```
   dsh -a /etc/mount <cw>:/spdata/sys1/install/pssplpp /mnt
   ```

2. Use **dsh** to run the appropriate **installp** command to apply PTFs to all nodes.

   ```
   dsh -a /etc/installp -d /mnt/ssp/pssp.installp  -X ssp.jm
   ```

   Note: The **dsh -f** option allows the dsh commands to be fanned out to multiple nodes.

3. Reboot the nodes and verify their correct operation.

D: Commit PTFs on Node and Control Workstation

Before You Begin

See the README in the PTF to determine if you are required to commit the PTFs. If you are not required to commit, you can skip this task.

1. Using **dsh**, commit the PTFs onto all nodes.
2. Commit the PTFs on the control workstation.

E: Create New mksysb Images

- Create a new **mksysb** backup of the control workstation. The **mksysb** image you created in step B.6 is now the **mksysb** image for all nodes. Store any earlier **mksysb** images you created before you installed the PTFs in case you need to restore your system to its previous maintenance level.

Appendix A. Directory Information

Table 9 lists the directories created when you install the RS/6000 SP LPP image.

Table 9 (Page 1 of 2). RS/6000 SP LPP Images Directories

Directory	Contents
/etc/amd	amd files
/etc/ssp/css	css user space library
/spdata/sys1/err_methods	
/spdata/sys1/logtables	
/spdata/sys1/sdr	SDR database files
/spdata/sys1/spmon	
/spdata/sys1/syspar_configs	System partition configuration files
/spdata/sys1/vsd	
/usr/lpp/ssp	Package files
/usr/lpp/ssp/amd	amd/amq files
/usr/lpp/ssp/bin	ssp command files
/usr/lpp/ssp/config	Setup file for switch, etc.
/usr/lpp/ssp/config/admin	User mgmt SMIT stanzas
/usr/lpp/ssp/config/cmi	Cluster setup/management SMIT stanzas
/usr/lpp/ssp/config/msg	Message catalogs
/usr/lpp/ssp/css	Communication subsystem (css) files
/usr/lpp/ssp/css/diags	css diagnosis files
/usr/lpp/ssp/filec	File collection installation files
/usr/lpp/ssp/info	InfoExplorer setup files
/usr/lpp/ssp/inst_root	Root package files
/usr/lpp/ssp/install/backup	Backup files needed for network booting
/usr/lpp/ssp/install/bin	Configuration scripts
/usr/lpp/ssp/install/config	Install/config data and templates
/usr/lpp/ssp/kerberos/bin	kerberos user commands
/usr/lpp/ssp/kerberos/etc	kerberos daemons and privileged administrative commands
/usr/lpp/ssp/man	man page files
/usr/lpp/ssp/perl/bin	perl translation commands
/usr/lpp/ssp/perl/lib	perl functions and headers
/usr/lpp/ssp/perl/lib/sys	c headers converted to perl

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Table 9 (Page 2 of 2). RS/6000 SP LPP Images Directories

Directory	Contents
/usr/lpp/ssp/perl/man	perl man page files
/usr/lpp/ssp/rcmd/bin	kerberos-authenticated remote commands
/usr/lpp/ssp/rcmd/etc	RS/6000 SP command daemon
/usr/lpp/ssp/public	Public tar files
/usr/lpp/ssp/samples	Sample scripts
/usr/lpp/ssp/sysctl/bin	Supported client code
/var/adm/acct	Node accounting data
/var/adm/cacct	Cluster consolidated accounting data
/var/adm/SPlogs	Logs and other run time data collectors
/var/adm/SPlogs/amd	amd logs
/var/adm/SPlogs/cs	Cluster startup/shutown logs
/var/adm/SPlogs/css	css logs
/var/adm/SPlogs/filec	File collection logs
/var/adm/SPlogs/kerberos	kerberos server logs
/var/adm/SPlogs/sdr	System Data Repository logs
/var/adm/SPlogs/SPconfig	Vital product data information
/var/adm/SPlogs/spmon	SP System Monitor logs
/var/adm/SPlogs/sysctl	Sysctl server log file
/var/adm/SPlogs/sysman	Installation, configuration, and console logs
/var/kerberos/database	kerberos server database and other files

Appendix B. Sample script.cust File

This appendix contains a sample **script.cust** file, located in **/usr/lpp/ssp/samples**.

```
#!/bin/ksh
##############################################################################
#
# Module: <script.cust>
#
#------------------------------------------------------------------
#
# Description: This script is a sample which is designed to be used by the
#      user as a guide for some functions that might be performed
#       after a node has been netinstalled, but before it boots for the
#       first time.
#
#      If you want  to use some of the examples in this file, then you need
#      to either copy the entire script to /tftpboot/script.cust and
#      edit the lines you want to execute, or just copy over the portions
#      of this sample that you want executed to /tftpboot/script.cust
#
#
##############################################################################

PATH=/bin:/usr/bin:/etc:/usr/sbin:/usr/bin/X11:/var/sysman:
/var/sysman/etc:/etc/amd:/usr/lpp/ssp/bin:/usr/lpp/ssp/install/bin:
SSPDIR=/usr/lpp/ssp
SERVER= cat /etc/ssp/server_hostname | cut -d" " -f3
#
# Set the time zone
# use smit chtz to see the choices for time zones
# (EST5)           Eastern U.S.; Colombia  - daylight time unobserved
# (EST5EDT)        Eastern U.S.; Colombia  - daylight time observed
#chtz EST5EDT
#
##############################################################################
# Importing existing volume groups
##############################################################################
#
#importvg -y uservg hdisk1
#
# To activate a volume group use varyonvg.
#varyonvg uservg
#
##############################################################################
# defining name resolution
# name resolution is required on the nodes. If you have not created an
# image that contains a method for resolving hostnames and addresses, then
# one of these methods must be selected.
##############################################################################
#
##############################################################################
# To perform kerberos authenticated rcp use the ssp rcmdtgt to obtain
```

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```
# a kerberos ticket first.
###############################################################################
#
# Define the file that will store the ticket
#export KRBTKFILE=/tmp/tkt_rcmd$$
#
# Get the kerberos ticket
#/usr/lpp/ssp/rcmd/bin/rcmdtgt
#
# If you are using /etc/resolv.conf to resolve hostnames and addresses
# then use this to copy the /etc/resolv.conf file from the boot/install server
#
# Perform kerberos authenticated rcp
#/usr/lpp/ssp/rcmd/bin/rcp $SERVER:/etc/resolv.conf /etc/resolv.conf
#
# If you are using the /etc/hosts file to resolve hostnames and addresses
# then use the following commands to copy and append the /etc/hosts
# file from the boot/install server
#
# Perform kerberos authenticated rcp
#/usr/lpp/ssp/rcmd/bin/rcp $SERVER:/etc/hosts /tmp/hosts
#/bin/cat /tmp/hosts >>/etc/hosts
#/bin/rm /tmp/hosts
#
# Remove the ticket file
#/bin/rm $KRBTKFILE
#
# If you are using NIS to resolve hostnames and addresses then use the
# next section to define you NIS environment
#
###############################################################################
# defining nis domains, servers, and clients
###############################################################################
#
# To set the NIS domainname use the domainname command.
# To list the NIS domainname, issue domainname with no parameters and it
# will list the NIS domainname.
#
#/usr/etc/yp/chypdom '-B' <NIS domainname>
#
# Make this node an NIS server
# note: replace <NIS mastername> with the hostname of your NIS master
# note: issue: chmaster -s <node hostname>
# on the NIS master to add this node as an NIS server prior to issuing the
# mkslve command on the node.
#
#mkslave <NIS mastername>
#
# Make this node an NIS client
#
#mkclient
#
###############################################################################
# installing other lpp's
```

```
# If you installed other lpp's on your system, made a mksysb image of that
#  system, and are planning to install /usr clients from that mksysb image,
#  you do not need to issue any installp commands here related to those
#  lpp's.  The /usr parts will be available on your /usr server (assuming
#  you installed the server with the same mksysb image), and the root parts
#  will get updated automatically by the finishrclient script, which is
#  run automatically after every /usr client is installed.
###############################################################################
#
# To install Fortran on a node create a backup image of the installp in
# the /usr/sys/inst.images/ssp directory of the control workstation and
# name it xlf.installp (make sure the installp image has read and execute
# permissions by all - chmod +rx xlf.installp).
#
# Check to see if fortran is already installed on this system
#if    -z  lslpp -h | grep xlf  ""
#then
#  # Fortran not installed - Mount the installp image and perform the installp
#  /etc/mount <control workstation address>:/usr/sys/inst.images/ssp /mnt
#     -f /mnt/ssp.installp "" && installp -ac -X -d/mnt/xlf.installp all
#
#  # Unmount the installp image
#  /etc/unmount /mnt
#fi
#
###############################################################################
# Modifying page space
###############################################################################
#
#
# To make a new logical volume mypage for page space with 5 logical
# partitions (4 MB per partition - 20 MB total) on the volume group vg04,
# issue the mklv command.
# -t specifies the logical volume type (jfs, jfslog, or paging)
# -y specifies the name of the logical volume to be used instead of the system
# generated logical volume name(pagelvXX - where XX starts at 00 and increase
# by one).
# Use lsps -a to list all available paging space and its status.
#
#mklv -t paging -y mypage vg04 5
#
# To cause the /dev/mypage device to become available, use the swapon command.
#
#swapon /dev/mypage
#
# To change page space to be active on the next and subsequent reboots
# us the chps command.
# -a specifies to use page spae at next reboot
# y specifies to use page space at subsequent reboots
#
#chps -a y mypage
#
# Change the paging space - to add 100 logical partitions (400 MB )
# to mypage page space
```

```
# note: The default logical partition size is 4 MB.
# note: To use smit to change page space issue: smit chps
#
# Sample check to see if we are greater than what we are asking for
# NOTE: read comments for increasing logical volume space below
#
#num_pps_tox=100         # number of PPs to extend page space by
#
## determine cur size of mypage in PPs
#pps= /etc/lsps -c mypage | tail +2 | cut -d":" -f4
#if (( pps < num_pps_tox ))
#then
#       chps -s$num_pps_tox mypage
#fi
#
# Create a 40 logical partition (default 4 MB partions - 160 MB) page space
# on the root volume group
# -a option actviates page space on subsequent reboots
# -n option actviates page space immediately
# -s option is the size of the page space in partitions
#
#mkps -s'40' -n -a rootvg
#
################################################################################
# increasing logical volume space
#
# Code below is a sample test for increasing LV one time and for a large
# amount... If you need to extend for small amounts, uncomment just
# the extendlv command line or do the extend manually, but remember to
# comment it out for subsequent customizes; otherwise the LV will be
# extended by that amount on ALL customizes.
#
# Assumption: LV is a minimal size (4MB = 1PPs) and want it to be 160MB
# at initial install time ...
################################################################################
#
## increasing logical volume space 40 logical partition (default 4 MB partions - 160 MB)
## pps -> physical partitions equate to logical partitions when LV is COPY=1
#
#num_pps_tox=100                        # number of PPs to extend LV by
#
## determine current number PPs in hd3
#cur_pps_str= lslv hd3 | grep "¬LPs" | cut -d":" -f2
#cur_pps=${cur_pps_str%%PP*}
#
#if (( num_pps_tox >= cur_pps ))        # already that big
#then
#       extendlv hd3 $num_pps_tox               # extend by 100
#fi
#
#
################################################################################
# increasing a filesystem size
################################################################################
```

```
# NOTE: read comments above on increasing logical volume space ...
#
## increasing the /var filesystem by 4 MB
#
##check to see if we did the increase once, by checking size > extend amount
#
#increase=8192          # specified in 512 byte blocks; represents 4M increase
#fssize= /etc/lsfs -c /var | tail +2 | cut -d":" -f6
#if (( fssize < increase ))
#then
#       chfs -a size=+$increase /var
#fi
#
#
################################################################################
#
################################################################################
# changing the maximum number of of users that can be concurrently logged
# in according to the one-time AIX license fee for the system. The change is
# put into effect after the next restart of the system.
################################################################################
#
#chlicense -u30
#
################################################################################
#
# To set the allcast attribute of a Token Ring Network Interface to
# not confine broadcast to the local LAN:
#
# chdev -l tr0 -a allcast=off -P
################################################################################
################################################################################
#
# To estimate the size of a dump for this node, to allocate a logical
# volume called dump_lv, and to make dump_lv the primary dump device:
#
################################################################################
#
#
## determine if dump_lv exists
#
# lslv -l dump_lv > /dev/null 2>&1
#
## if return code is 1, dump_lv was never created, so let's create it
#
#if (($?==1))
#then
#
## estimate the size of the dump, add ten percent in case the estimate is low
#
#         estimated_dump= sysdumpdev -e | /bin/cut -f6 -d " "
#         let dump_space=$estimated_dump+($estimated_dump/10)
#
## how many physical partitions will I need?  Then, create the logical volume
```

```
#
#         let partitions=$dump_space/4096000
#         let partitions=$partitions+1
#          /usr/sbin/mklv -y dump_lv rootvg $partitions > /dev/null 2>&1
#
## now, assign the newly created dump_lv to be the primary dump device
#
#       sysdumpdev -P -p'/dev/dump_lv' > /dev/null 2>&1
#
#fi
```

Appendix C. Sample tuning.cust File

This appendix contains a sample **tuning.cust** file, located in **/usr/lpp/ssp/samples**.

```
#!/bin/ksh
#"@(#)96   1.2   src/ssp/samples/tuning.cust, sysman, ssp_r2.4 6/12/95 19:55:43"
#########################################################################
#
# Module: <tuning.cust>
#
#------------------------------------------------------------------
#
# Description: This script is a sample which is designed to be used by the
#      user as a guide to change the network options for TCP/IP and UDP/IP
#   communications on the SP system
#
#      If you want to use some of the examples in this file, then you need
#      to either copy the entire script to /tftpboot/tuning.cust and
#      edit the lines you want to execute, or just copy over the portions
#      of this sample that you want executed to /tftpboot/tuning.cust
#
#   These settings are only a sample and should be changes to the preferred
#   settings for your system.
#
#   For further recommendations on tuning, refer to the Administration Guide
#
#------------------------------------------------------------------

#
#   Set default mbuf pool size for all TCP/IP and thread buffer
#
#  /usr/sbin/no -o thewall=16384

#
#   Set default sb_max size for all IP connections
#
#  /usr/sbin/no -o sb_max=163840

#
#   Set default TCP send window size for all TCP/IP connections
#
#  /usr/sbin/no -o tcp_sendspace=65536

#
#   Set default TCP receive window size for all TCP/IP connections
#
#  /usr/sbin/no -o tcp_recvspace=65536

#
#   Set default UDP send window size for all UDP/IP connections
#   Effective maximum is limited to 65536
#
#  /usr/sbin/no -o udp_sendspace=65536
```

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```
#
#   Set default UDP receive window size for all UDP/IP connections
#
#  /usr/sbin/no -o udp_recvspace=32768

#
#   Set rfc1323 feature on for faster throughput for High Performance Networks.
#
#  /usr/sbin/no -o rfc1323=1

#
#   Set default Maximum Transmission Unit size for transfers across networks.
#
#  /usr/sbin/no -o tcp_mssdflt=1500
```

Appendix D. SAGE Job Descriptions

This appendix shows the job descriptions for the system administration levels discussed in “Who Should Use This Book” on page xiv.

The System Administrators Guide of USENIX (SAGE), a professional organization for system administrators, has developed a set of job descriptions for system administrators. The Core Templates described in this appendix describe the core set of attributes for system administrators. The checkoff list gives details on additional skill areas that may be important at your site.

For more information, contact the USENIX Association or access the World Wide Web: **http://www.sage.usenix.org/sage/**.

Core Templates Defined by SAGE

The following are templates for the the core skills required for Junior and Intermediate/Advanced System Administrators.

Junior System Administrator

Required skills

- Strong interpersonal and communication skills; capable of training users in applications and UNIX fundamentals, and writing basic documentation.
- Highly skilled in using most UNIX commands/utilities.
- Familiarity with most basic system administration tools and processes; for example, can boot/shutdown a machine, add and remove user accounts, use backup programs and fsck, maintain system database files (groups, hosts, aliases).
- Fundamental understanding of a UNIX-based operating system; for example, understands job control, soft and hard links, distinctions between the kernel and the shell.

Required Background

One to three years of system administration experience.

Desirable Background

- A degree in computer science or a related field.
- Familiarity with networked/distributed computing environment concepts; for example, can use the route command, add a workstation to a network, and mount remote filesystems.
- Ability to write scripts in some administrative language (Tk, Perl, and shell).
- Programming experience in any applicable language.

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Appropriate Responsibilities

Administers a small site alone or assists in the administration of a larger system. Works under the general supervision of a system administrator or computer systems manager.

Intermediate/Advanced System Administrator

Required Skills

- Strong interpersonal and communication skills; capable of writing purchase justifications, training users in complex topics, making presentations to an internal audience, and interacting positively with upper management.
- Independent problem solving; self-direction.
- Is comfortable with most aspects of UNIX system administration; for example, configuration of mail systems, system installation and configuration, printing systems, fundamentals of security, installing third-party software.
- A solid understanding of a UNIX-based operating system; understands paging and swapping, interprocess communication, devices and what device drivers do, file system concepts ("inode", "superblock").
- Familiarity with fundamental networking/distributed computing environment concepts; can configure NFS and NIS, can use nslookup or dig to check information in the DNS, understands basic routing concepts.
- Ability to write scripts in some administrative language (Tk, Perl, and shell).
- Ability to do minimal debugging and modification of C programs.

Required Background

Three to five years system administration experience.

Desirable Background

- A degree in computer science or a related field.
- Significant programming background in any applicable language.

Appropriate Responsibilities

- Receives general instructions for new responsibilities from supervisor.
- Administers a midsized site alone or assists in the administration of a larger site.
- Initiates some new responsibilities and helps to plan for the future of the site/network.
- Manages novice system administrators or operators.
- Evaluates and/or recommends purchases; has strong influence on purchasing process.

Additional Skill Areas

Use this list to identify additional skill areas that may be important at your site.

Local Environment Experience

Experience with the specific operating systems, applications, or programming languages in use at

	the site (for example SunOS, AIX, CAE/CAD software, FrameMaker, Mathematica, Fortran, Ada). Experience with the work done by the users at the site.
Heterogeneity Experience	Experience with more than one UNIX-based operating system. Experience with sites running more than one UNIX-based operating system. Familiarity with both System V and BSD-based UNIX operating systems. Experience with non-UNIX operating systems (for example, MS-DOS, Macintosh OS, or VMS). Experience with internetworking UNIX and other operating systems (MS-DOS, Macintosh OS, VMS).
Programming Skills	Extensive programming experience in an administrative language (Tk, Perl, and shell). Extensive programming experience in any applicable language.
Networking Skills	Experience configuring network file systems (for example, NFS, RFS, or AFS). Experience with network file synchronization schemes (for example, rdist and track). Experience configuring automounters. Experience configuring license managers. Experience configuring NIS/NIS+. Experience with TCP/IP networking protocols (ability to debug and program at the network level). Experience with non-TCP/IP networking protocols (for example, OSI, Chaosnet, DECnet, Appletalk, Novell Netware, Banyan Vines). Experience with high-speed networking (for example, FDDI, ATM, or SONET). Experience with complex TCP/IP networks (networks that contain routers). Experience with highly complex TCP/IP networks (networks that contain multiple routers and multiple media). Experience configuring and maintaining routers. Experience maintaining a site-wide modem pool/terminal servers. Experience with X/X terminals. Experience with dial-up networking (for example, SLIP, PPP, or UUCP). Experience at a site that is connected to the Internet. Experience installing/configuring DNS/BIND. Experience installing/administering Usenet news. Experience as postmaster of a site with external connections.
Security	Experience with network security (for example, building firewalls, deploying authentication systems, or applying cryptography to network applications). Experience with classified computing. Experience with multi-level classified environments. Experience with host security (for example, passwords, uids/gids, file permissions, file system integrity, use of security packages).

Site Specialities	Experience at sites with over 1000 computers, over 1000 users, or over a terabyte of disk space. Experience with supercomputers. Experience coordinating multiple independent computer facilities (for example, working for the central group at a large company or university). Experience with a site with 100% uptime requirement. Experience developing/implementing a site disaster recovery plan. Experience with a site requiring charge-back accounting.
Documentation	Background in technical publications, documentation, or desktop publishing.
Databases	Experience using relational databases. Experience using a database query language. Experience programming in a database query language. Previous experience as a database administrator.
Hardware	Experience installing and maintaining the network cabling in use at the site. Experience installing boards and memory into systems. Experience with SCSI device setup and installation. Experience installing/configuring peripherals (for example, disks, modems, printers, or data acquisition devices). Experience with board-level diagnosis and repair of computer systems. Experience with component-level diagnosis and repair of computer system.
Management	Budget responsibility. Experience in writing personnel reviews, and ranking processes. Experience in interviewing and hiring.

Glossary of Terms and Abbreviations

This glossary includes terms and definitions from:

- The *IBM Dictionary of Computing*, New York: McGraw-Hill, 1994.
- The *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies can be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. Definitions are identified by the symbol (A) after the definition.
- The *ANSI/EIA Standard - 440A: Fiber Optic Terminology*, copyright 1989 by the Electronics Industries Association (EIA). Copies can be purchased from the Electronic Industries Association, 2001 Pennsylvania Avenue N.W., Washington, D.C. 20006. Definitions are identified by the symbol (E) after the definition.
- The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions of published parts of this vocabulary are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.

The following cross-references are used in this glossary:

Contrast with. This refers to a term that has an opposed or substantively different meaning.

See. This refers the reader to multiple-word terms in which this term appears.

See also. This refers the reader to terms that have a related, but not synonymous, meaning.

Synonym for. This indicates that the term has the same meaning as a preferred term, which is defined in the glossary.

This section contains some of the terms that are commonly used in the SP publications.

IBM is grateful to the American National Standards Institute (ANSI) for permission to reprint its definitions from the American National Standard *Vocabulary for Information Processing* (Copyright 1970 by American National Standards Institute, Incorporated), which was prepared by Subcommittee X3K5 on Terminology and Glossary of the American National Standards Committee X3. ANSI definitions are preceded by an asterisk (*).

Other definitions in this glossary are taken from *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems* (SC20-1699) and *IBM DATABASE 2 Application Programming Guide for TSO Users* (SC26-4081).

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A

address. A character or group of characters that identifies a register, a device, a particular part of storage, or some other data source or destination.

AFS. A distributed file system that provides authentication services as part of its file system creation.

AIX. Abbreviation for Advanced Interactive Executive, IBM's licensed version of the UNIX operating system. AIX is particularly suited to support technical computing applications, including high function graphics and floating point computations.

AIX Version 3. The IBM AIX Version 3 for RISC System/6000 (also known as AIX/6000). It is based on UNIX System V, conforms with POSIX IEEE Standard 1003.1, is compatible with Berkeley Software Distribution 4.3 (4.3 BSD), and is designed to meet Trusted Computing Base level C2 security.

Amd. Berkeley Software Distribution automount daemon.

API. Application Programming Interface. A set of programming functions and routines that provide access between the Application layer of the OSI seven-layer model and applications that want to use the network. It is a software interface.

application. The use to which a data processing system is put; for example, a payroll application, an airline reservation application.

application data. The data that is produced using an application program.

ARP. Address Resolution Protocol.

ATM. Asynchronous Transfer Mode. (See *TURBOWAYS 100 ATM Adapter*.)

Authentication. The process of validating the identity of a user or server.

Authorization. The process of obtaining permission to perform specific actions.

B

batch processing. * (1) The processing of data or the accomplishment of jobs accumulated in advance in such a manner that each accumulation thus formed is processed or accomplished in the same run. * (2) The processing of data accumulating over a period of time. * (3) Loosely, the execution of computer programs serially. (4) Computer programs executed in the background.

BMCA. Block Multiplexer Channel Adapter. The block multiplexer channel connection allows the RISC System/6000 to communicate directly with a host System/370 or System/390; the host operating system views the system unit as a control unit.

C

call home function. The ability of a system to call the IBM support center and open a PMR to have a repair scheduled.

charge feature. An optional feature for either software or hardware for which there is a charge.

CLI. Command Line Interface.

client. * (1) A function that requests services from a server and makes them available to the user. * (2) A term used in an environment to identify a machine that uses the resources of the network.

Client Input/Output Sockets (CLIO/S). A software package that enables high-speed data and tape access between SP systems, AIX systems, and ES/9000 mainframes.

CLIO/S. Client Input/Output Sockets.

CMI. Centralized Management Interface provides a series of SMIT menus and dialogues used for defining and querying the SP system configuration.

connectionless. A communication process that takes place without first establishing a connection.

connectionless network. A network in which the sending logical node must have the address of the receiving logical node before information interchange can begin. The packet is routed through nodes in the network based on the destination address in the packet. The originating source does not receive an acknowledgment that the packet was received at the destination.

control workstation. A single point of control allowing the administrator or operator to monitor and manage the SP system using the IBM AIX Parallel System Support Programs.

D

daemon. A process, not associated with a particular user, that performs system-wide functions such as administration and control of networks, execution of time-dependent activities, line printer spooling and so forth.

DASD. Direct Access Storage Device. Storage for input/output data.

DCE. Distributed Computing Environment.

DFS. distributed file system. A subset of the IBM Distributed Computing Environment.

DNS. Domain Name Service. A hierarchical name service which maps high level machine names to IP addresses.

E

Error Notification Object. An object in the SDR that is matched with an error log entry. When an error log entry occurs that matches the Notification Object, a user-specified action is taken.

ESCON. Enterprise Systems Connection. The ESCON channel connection allows the RISC System/6000 to communicate directly with a host System/390; the host operating system views the system unit as a control unit.

Ethernet. (1) Ethernet is the standard hardware for TCP/IP local area networks in the UNIX marketplace. It is a 10-megabit per second baseband type LAN that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by collision detection (CSMA/CD). (2) A passive coaxial cable whose interconnections contain devices or components, or both, that are all active. It uses CSMA/CD technology to provide a best-effort delivery system.

Ethernet network. A baseband LAN with a bus topology in which messages are broadcast on a coaxial cabling using the carrier sense multiple access/collision detection (CSMA/CD) transmission method.

event. An action that takes place in the operation of the system software.

expect. Programmed dialogue with interactive programs.

F

Failover. Also called fallover, the sequence of events when a primary or server machine fails and a secondary or backup machine assumes the primary workload. This is a disruptive failure with a short recovery time.

fall back. Also called fall back, the sequence of events when a primary or server machine takes back control of its workload from a secondary or backup machine.

FDDI. Fiber Distributed Data Interface.

Fiber Distributed Data Interface (FDDI). An American National Standards Institute (ANSI) standard for 100-megabit-per-second LAN using optical fiber cables. An FDDI local area network (LAN) can be up to 100 km (62 miles) and can include up to 500 system units. There can be up to 2 km (1.24 miles) between system units and/or concentrators.

File Transfer Protocol (FTP). The Internet protocol (and program) used to transfer files between hosts. It is an application layer protocol in TCP/IP that uses TELNET and TCP protocols to transfer bulk-data files between machines or hosts.

file. * A set of related records treated as a unit, for example, in stock control, a file could consist of a set of invoices.

file server. A centrally located computer that acts as a storehouse of data and applications for numerous users of a local area network.

foreign host. Any host on the network other than the local host.

FTP. File transfer protocol.

G

gateway. An intelligent electronic device interconnecting dissimilar networks and providing protocol conversion for network compatibility. A gateway provides transparent access to dissimilar networks for nodes on either network. It operates at the session presentation and application layers.

H

HACMP/6000. AIX High Availability Cluster Multi-Processing/6000.

HACWS. High Availability Control Workstation function, based on HACMP/6000, provides for a backup control workstation for the SP system.

help key. In the SP graphical interface, the key that gives you access to the SP graphical interface help facility.

High Availability Cluster Multi-Processing/6000. An IBM facility to cluster nodes or components to provide high availability by eliminating single points of failure.

High Performance Switch. An IBM multi-stage packet switch for high-performance communication between processor nodes.

HiPPI. High Performance Parallel Interface. RISC System/6000 units can attach to a HiPPI network as defined by the ANSI specifications. The HiPPI channel supports burst rates of 100 Mbps over dual simplex cables; connections can be up to 25 km in length as defined by the standard and can be extended using third-party HiPPI switches and fiber optic extenders.

home directory. The directory associated with an individual user.

host. A computer connected to a network, and providing an access method to that network. A host provides end-user services.

HSD. The data striping device for the IBM Recoverable Virtual Shared Disk. The device driver lets application programs stripe data across physical disks in multiple IBM Virtual Shared Disks, thus reducing I/O bottlenecks and hot spots.

I

Internet. A specific inter-network consisting of large national backbone networks such as APARANET, MILNET, and NSFnet, and a myriad of regional and campus networks all over the world. The network uses the TCP/IP protocol suite.

Intermediate Switch Board. Switches mounted in the High Performance Switch expansion frame.

IP address. A 32-bit address assigned to devices or hosts in an IP internet that maps to a physical address. The IP address is composed of a network and host portion.

Internet Protocol (IP). (1) A protocol that routes data through a network or interconnected networks. IP acts as an interface between the higher logical layers and the physical network. This protocol, however, does not provide error recovery, flow control, or guarantee the reliability of the physical network. IP is a connectionless protocol. (2) A protocol used to route data from its source to it destination in an Internet environment.

ISB. Intermediate Switch Board.

K

Kerberos. A service for authenticating users in a network environment.

kernel. The core portion of the UNIX operating system which controls the resources of the CPU and allocates them to the users. The kernel is memory-resident, is said to run in “kernel mode” and is protected from user tampering by the hardware.

L

LAN. (1) Acronym for Local Area Network, a data network located on the user's premises in which serial transmission is used for direct data communication among data stations. (2) Physical network technology that transfers data a high speed over short distances. (3) A network in which a set of devices is connected to another for communication and that can be connected to a larger network.

local host. The computer to which a user's terminal is directly connected.

log database. A persistent storage location for the logged information.

log event. The recording of an event.

log event type. A particular kind of log event that has a hierarchy associated with it.

logging. The writing of information to persistent storage for subsequent analysis by humans or programs.

M

mask. To use a pattern of characters to control retention or elimination of portions of another pattern of characters.

menu. A display of a list of available functions for selection by the user.

Motif. The graphical user interface for OSF, incorporating the X Window System. Also called OSF/Motif.

MTBF. Mean time between failure. This is a measure of reliability.

MTTR. Mean time to repair. This is a measure of serviceability.

N

naive application. An application with no knowledge of a server that fails over to another server. Client to server retry methods are used to reconnect.

network. An interconnected group of nodes, lines, and terminals. A network provides the ability to transmit data to and receive data from other systems and users.

NFS. Network File System. NFS allows different systems (UNIX or non-UNIX), different architectures, or vendors connected to the same network, to access remote files in a LAN environment as though they were local files.

NIM. Network Installation Management is provided with AIX 4.1 to install AIX on the nodes.

NIM client. An AIX system installed and managed by a NIM master. NIM supports three types of clients:

- Standalone
- Diskless
- Dataless

NIM master. An AIX system that can install one or more NIM clients. An AIX system must be defined as a NIM master before defining any NIM clients on that system. A NIM master managers the configuration database containing the information for the NIM clients.

NIM object. A representation of information about the NIM environment. NIM stores this information as objects in the NIM database. The types of objects are:

- Network
- Machine
- Resource

NIS. Network Information System.

node. In a network, the point where one or more functional units interconnect transmission lines. A computer location defined in a network.

Node Switch Board. Switches mounted on frames that contain nodes.

NSB. Node Switch Board.

NTP. Network Time Protocol.

P

parallel environment. A system environment where message passing or SP resource manager services are used by they application.

Parallel Environment. A licensed IBM program used for message passing applications on the SP or RISC System/6000 platforms.

parallel processing. A multiprocessor architecture which allows processes to be allocated to tightly coupled multiple processors in a cooperative processing environment, allowing concurrent execution of tasks.

parameter. * (1) A variable that is given a constant value for a specified application and that may denote the application. * (2) An item in a menu for which the operator specifies a value or for which the system provides a value when the menu is interpreted. * (3) A name in a procedure that is used to refer to an argument that is passed to the procedure. * (4) A particular piece of information that a system or application program needs to process a request.

partition. See system partition.

Perl. Practical Extraction and Report Language.

pipe. A UNIX utility allowing the output of one command to be the input of another. Represented by the | symbol. It is also referred to as filtering output.

port. (1) An end point for communication between devices, generally referring to physical connection. (2) A 16-bit number identifying a particular TCP or UDP resource within a given TCP/IP node.

process. * (1) A unique, finite course of events defined by its purpose or by its effect, achieved under defined conditions. * (2) Any operation or combination of operations on data. * (3) A function being performed or waiting to be performed. * (4) A program in operation. For example, a daemon is a system process that is always running on the system.

protocol. A set of semantic and syntactic rules that defines the behavior of functional units in achieving communication.

PMR. Problem Management Report.

Problem Management Report. The number in the IBM support mechanism that represents a service incident with a customer.

Primary node or machine. (1) A device that runs a workload and has a standby device ready to assume the primary workload if that primary node fails or is taken out of service. (2) A node on the High

Performance Switch that initializes, provides diagnosis and recovery services, and performs other operations to the switch network. (3) In IBM Virtual Shared Disk function, the node at which the logical volume is actually local and that acts as server node to I/O requests from other nodes.

R

RAID. Redundant array of independent disks.

remote host. *See foreign host*.

RISC. Reduced Instruction Set Computing (RISC), the technology for today's high performance personal computers and workstations, was invented in 1975. Uses a small simplified set of frequently used instructions for rapid execution.

rlogin (remote LOGIN). A service offered by Berkeley UNIX systems that allows authorized users of one machine to connect to other UNIX systems across a network and interact as if their terminals were connected directly. The rlogin software passes information about the user's environment (for example, terminal type) to the remote machine.

RPC. Acronym for Remote Procedure Call, a facility that a client uses to have a server execute a procedure call. This facility is composed of a library of procedures plus an XDR.

RSH. A variant of RLOGIN command that invokes a command interpreter on a remote UNIX machine and passes the command line arguments to the command interpreter, skipping the LOGIN step completely. See also *rlogin*.

S

SCSI. Small Computer System Interface.

server. (1) A function that provides services for users. A machine may run client and server processes at the same time. (2) A machine that provides resources to the network. It provides a network service, such as disk storage and file transfer, or a program that uses such a service. (3) A device, program, or code module on a network dedicated to providing a specific service to a network. (4) On a LAN, a data station that provides facilities to other data stations. Examples are file server, print server, and mail server.

Small Computer System Interface (SCSI). An input and output bus that provides a standard interface for the attachment of various direct access storage devices (DASD) and tape drives to the RISC System/6000.

shell. The shell is the primary user interface for the UNIX operating system. It serves as command language interpreter, programming language, and allows foreground and background processing. There are three different implementations of the shell concept: Bourne, C and Korn.

Small Computer Systems Interface Adapter (SCSI Adapter). An adapter that supports the attachment of various direct-access storage devices (DASD) and tape drives to the RISC System/6000.

SMIT. The System Management Interface Toolkit is a set of menu driven utilities for AIX that provides functions such as transaction login, shell script creation, automatic updates of object database, and so forth.

SNMP. Simple Network Management Protocol. (1) An IP network management protocol that is used to monitor attached networks and routers. (2) A TCP/IP-based protocol for exchanging network management information and outlining the structure for communications among network devices.

socket. (1) An abstraction used by Berkeley UNIX that allows an application to access TCP/IP protocol functions. (2) An IP address and port number pairing. (3) In TCP/IP, the Internet address of the host computer on which the application runs, and the port number it uses. A TCP/IP application is identified by its socket.

standby node or machine. A device that waits for a failure of a primary node in order to assume the identity of the primary node. The standby machine then runs the primary's workload until the primary is back in service.

subnet. Shortened form of subnetwork.

subnet mask. A bit template that identifies to the TCP/IP protocol code the bits of the host address that are to be used for routing for specific subnetworks.

subnetwork. Any group of nodes that have a set of common characteristics, such as the same network ID.

SUP. Software Update Protocol.

Sysctl. Secure System Command Execution Tool. An authenticated client/server system for running commands remotely and in parallel.

System Administrator. The user who is responsible for setting up, modifying, and maintaining the SP system.

subsystem. A software component that is not usually associated with a user command. It is usually a daemon process. A subsystem will perform work or provide services on behalf of a user request or operating system request.

syslog. A BSD logging system used to collect and manage other subsystem's logging data.

system partition. A group of nonoverlapping nodes on a switch chip boundary that act as a logical SP system.

T

tar. Tape ARchive, is a standard UNIX data archive utility for storing data on tape media.

Tcl. Tool Command Language.

TclX. Tool Command Language Extended.

TCP. Acronym for Transmission Control Protocol, a stream communication protocol that includes error recovery and flow control.

TCP/IP. Acronym for Transmission Control Protocol/Internet Protocol, a suite of protocols designed to allow communication between networks regardless of the technologies implemented in each network. TCP provides a reliable host-to-host protocol between hosts in packet-switched communications networks and in interconnected systems of such networks. It assumes that the underlying protocol is the Internet Protocol.

Telnet. Terminal Emulation Protocol, a TCP/IP application protocol that allows interactive access to foreign hosts.

Tk. Tcl-based Tool Kit for X Windows.

TMPCP. Tape Management Program Control Point.

token-ring. (1) Network technology that controls media access by passing a token (special packet or frame) between media-attached machines. (2) A network with a ring topology that passes tokens from one attaching device (node) to another. (3) The IBM Token-Ring LAN connection allows the RISC System/6000 system unit to participate in a LAN adhering to the IEEE 802.5 Token-Passing Ring standard or the ECMA standard 89 for Token-Ring, baseband LANs.

transaction. An exchange between the user and the system. Each activity the system performs for the user is considered a transaction.

transceiver (transmitter-receiver). A physical device that connects a host interface to a local area network, such as Ethernet. Ethernet transceivers contain electronics that apply signals to the cable and sense collisions.

transfer. To send data from one place and to receive the data at another place. Synonymous with move.

transmission. * The sending of data from one place for reception elsewhere.

tunable. A SP performance parameter you can set to a value that makes your system run its workload most efficiently.

TURBOWAYS 100 ATM Adapter. An IBM high-performance, high-function intelligent adapter that provides dedicated 100 Mbps ATM (asynchronous transfer mode) connection for high-performance servers and workstations.

U

UDP. User Datagram Protocol.

User Datagram Protocol (UDP). (1) In TCP/IP, a packet-level protocol built directly on the Internet Protocol layer. UDP is used for application-to-application programs between TCP/IP host systems. (2) A transport protocol in the Internet suite of protocols that provides unreliable, connectionless datagram service. (3) The Internet Protocol that enables an application programmer on one machine or process to send a datagram to an application program on another machine or process.

UNIX operating system. An operating system developed by Bell Laboratories that features multiprogramming in a multiuser environment. The UNIX operating system was originally developed for use on minicomputers, but has been adapted for mainframes and microcomputers. **Note:** The AIX operating system is IBM's implementation of the UNIX operating system.

user. Anyone who requires the services of a computing system.

user ID. A nonnegative integer, contained in an object of type *uid_t*, that is used to uniquely identify a system user.

V

Virtual Shared Disk, IBM. The function that allows application programs executing at different nodes of a system partition to access a raw logical volume as if it were local at each of the nodes. In actuality, the logical volume is local at only one of the nodes (the server node).

W

workstation. * (1) A configuration of input/output equipment at which an operator works. * (2) A terminal or microcomputer, usually one that is connected to a mainframe or to a network, at which a user can perform applications.

X

X Window System.. A graphical user interface product.

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