

IBM Cluster Systems Management for Linux



Planning and Installation Guide

Version 1.3.2

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Note

Before using this information and the product it supports, read the information in “Notices” on page 115.

Seventh Edition (September 2003)

This edition applies to version 1, release 3, modification 2 of **IBM Cluster System Management (CSM) for Linux on xSeries licensed program 5765-E88 and Cluster System Management (CSM) for Linux on pSeries licensed program 5765-G16 and to all subsequent releases and modifications of this product until otherwise indicated in new editions**. This edition replaces SA22-7853-06. Significant changes or additions to the text and illustrations are indicated by a vertical line (|) to the left of the change.

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About this book

This book provides planning, installation, backup and recovery, and troubleshooting information related to getting the Cluster Systems Management for Linux product up and running. This book documents CSM for Linux on xSeries product #5765-E88 and Linux on pSeries, product #5765-G16.

Note: This book contains instructions for installing a Linux-only system. If you are installing a mixed AIX and Linux system, see *CSM for AIX 5L: Planning and Installation Guide*.

Attention!

- Except where noted, the information in this book also applies to Linux on pSeries clusters. Linux on pSeries clusters must be homogeneous – a pSeries management server running Linux and pSeries managed nodes running Linux only.
- Refer to the Statement of Direction in the IBM Cluster Systems Management V1.3.2 Release For Announcement (RFA) for information on support for the eServer 325.
- If you are using CSM as part of a prepackaged @server Cluster 1350 solution that you purchased from IBM or an IBM solutions provider, then all of the prerequisite hardware is included. Cluster 1350 hardware and networking are delivered preconfigured for using CSM.

Who should use this book

This guide is intended for system administrators who want to use IBM Cluster Systems Management. The system administrator should have experience in UNIX® administration and network systems and have the following skills:

- Understanding of most basic system administration tools and processes.
- Skills using most Linux commands and utilities.
- Solid understanding of a Linux-based operating system.
- Fundamental networking and distributed computing environment concepts.

Typographic conventions

This book uses the following typographic conventions:

Convention	Usage
bold	Bold words or characters represent system elements that you must use literally, such as: command names, file names, option names, and path names.
constant width	Examples and information that the system displays appear in constant-width typeface.
<i>italic</i>	<i>Italicized</i> words or characters represent variable values that you must supply. <i>Italics</i> are also used for book titles, for the first use of a glossary term, and for general emphasis in text.
[item]	Used to indicate optional items.
<Key>	Used to indicate keys you press.

ISO 9000

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

Prerequisite and related information

See “Bibliography” on page 111 for

- A list of related publications
 - How to get help from IBM
 - Information on Linux XCAT tools
-

How to send your comments

Your feedback is important in helping us to produce accurate, high-quality information. If you have any comments about this book or any other CSM documentation:

- Send your comments by e-mail to: mhvrcfs@us.ibm.com.
Include the book title and order number, and, if applicable, the specific location of the information you have comments on (for example, a page number or a table number).
- Fill out one of the forms at the back of this book and return it by mail, by fax, or by giving it to an IBM representative.

To contact the IBM cluster development organization, send your comments by e-mail to: cluster@us.ibm.com.

Chapter 1. CSM Overview

What is Cluster Systems Management (CSM)?

Cluster Systems Management (CSM) software provides a distributed system management solution that allows a system administrator to set up and maintain a cluster of nodes that run Linux operating system. CSM runs Linux, and is designed for managing large numbers of distributed and clustered IBM servers. CSM simplifies cluster administration tasks by providing management from a single point-of-control.

From a high level, a CSM cluster is comprised of a management server and managed nodes, running the Linux operating system. A cluster can be made up of the following types:

- xSeries servers, IntelliStation™, or BladeCenter™ hardware
- pSeries servers

The management server is the machine that is designated to operate, monitor, and maintain the rest of the cluster. Nodes are the machines that you can manage in the cluster. For hardware and software support information, see Chapter 2, “Planning for Cluster Systems Management,” on page 5.

How CSM helps you manage your cluster

CSM enables system administrators to resolve a number of system management challenges. Some of the tasks you can perform from the management server include:

- Installing and updating software on the cluster nodes
- Running distributed commands across the cluster
- Synchronizing files across the cluster
- Monitoring the cluster nodes
- Controlling cluster hardware
- Managing node groups
- Running diagnostic tools

Adding nodes and updating software on the cluster nodes

From the management server, you can define nodes and add them to the CSM cluster as well as install the Linux operating system on the Linux nodes.

Running distributed commands across the cluster

As an administrator, you can run commands in parallel across nodes of the cluster and gather output using the `dsh` (distributed shell) command. You can set up `dsh` to use either `rsh` (UNIX basic remote shell) or `ssh` (secure shell).

The **Distributed Command Execution Manager (DCEM) graphical user interface** allows you to construct command specifications for running commands on multiple target machines, while providing real-time status as commands are run. You can perform the following functions:

- Enter the command definition, run time options, and selected hosts and groups for a command specification
- Save command specifications for future use
- Create and modify node groups to use as targets for a command directly from DCEM.

For more information about the DCEM graphical user interface, see the *CSM for Linux: Administration Guide*.

Note: DCEM is not available for Linux on pSeries nodes.

Synchronizing files across the cluster

The **Configuration File Manager (CFM)** provides a repository for synchronizing configuration files across the nodes of the cluster. CFM works by storing all shared configuration files in one location on the management server and automatically propagating changes to these files throughout the cluster. As a result, you only need to update files once, on the management server, instead of manually updating all the nodes of the cluster. For more information about CFM, see the *CSM for Linux: Administration Guide*.

Monitoring the cluster nodes

CSM allows an administrator to set up monitoring for various conditions across nodes or node groups, and designate specific actions to be run in response to events that occur in the cluster. For monitoring, CSM uses the **Resource Monitoring and Control (RMC)** application, which is part of RSCT (Reliable Scalable Computing Technology). RMC offers a comprehensive set of monitoring and response capabilities that lets you detect, and in many cases correct, system resource problems such as a critical file system becoming full. You can monitor virtually all aspects of your system resources and specify a wide range of actions to be taken when a problem occurs, from simple notification by e-mail to recovery that runs a customized script.

The conditions that you can monitor include

- Network reachability
- Power status
- Status of applications or daemons running on a node (whether they are up or down)
- CPU, memory, and file system utilization.

Actions that you can designate to be run in response to the occurrence of one of these conditions (an event) include:

- Commands that can be run on the management server or any node of the cluster
- Notifications such as logging, e-mailing, or paging
- Recovery actions for cleaning up filesystems that are filling up, restarting applications that go down, and so on.

Predefined conditions and predefined responses are included with CSM, and you can customize these conditions and responses to fit their own needs.

For more information about monitoring with CSM, see the *CSM for Linux: Administration Guide*.

Controlling cluster hardware

The hardware control software of CSM allows an administrator to power on, power off, reboot, bring up the remote hardware console, and query the nodes of the cluster from a single point-of-control; the CSM management server. Cluster commands are run from the management server using the command line interface. For more information about hardware control with CSM, see the *CSM for Linux: Hardware Control Guide*.

Managing node groups

As a system administrator, you can create node groups within the cluster that can be managed and monitored as distinct entities. You can define node groups as a static set of nodes or as a dynamic set of nodes. Static node groups are created by explicitly specifying node names, node group names, or both. When you define a dynamic node group, you can designate a particular characteristic for those nodes. For example, you can create a node group for a specific type of hardware and then monitor that node group. If a new machine of that hardware type is added to the cluster, monitoring will automatically start for that machine. For more information about creating and using node groups, see the *CSM for Linux: Administration Guide*

Running diagnostic tools

CSM includes a set of **diagnostic probes** that administrators can use to check the health of specific software functions and identify the cause of system problems. You can set up these probes to run periodically, or automatically as a response to a condition occurring in the system. CSM also allows you to write their own probes. For more information about using the CSM probes, see *CSM for Linux: Administration Guide*.

Communicating with CSM

CSM offers you several options for issuing commands to the cluster:

- Command line interface
- IBM Director Console for xSeries, IntelliStation, or BladeCenter Linux nodes
- Distributed Command Execution Manager (DCEM) for xSeries, IntelliStation, or BladeCenter Linux nodes

Command line interface

CSM includes command line interfaces for all CSM functions. The command line interface allows you to access all the resources in the system, the attributes of those resources, and state values. It also allows you to query and control the nodes, file systems, CPU and memory statistics, global cluster parameters, and so on. For more information about the CSM commands, see the *CSM for Linux: Command and Technical Reference*.

IBM Director Console (xSeries, IntelliStation, or BladeCenter)

IBM Director is a separate systems management solution designed for managing a complex environment of Intel-based servers, desktop systems, workstations, mobile computers, and assorted devices running a variety of operating systems. The IBM Director Console is the graphical user interface from which the administrative tasks are performed. CSM includes an optional IBM Director extension that gives you access to some CSM functionality from the IBM Director Console. For more information about CSM support for IBM Director, see the “Linux Cluster Support extension for IBM Director (for Linux on xSeries, IntelliStation, or BladeCenter only)” on page 20.

What’s new or changed in CSM 1.3.2

Additional hardware for cluster nodes

Additional hardware is supported in this release. For a list of the new hardware servers that CSM supports, see “Cluster node requirements” on page 6.

Linux on pSeries support

CSM now supports certain IBM Cluster pSeries hardware models for Linux nodes. Only pSeries hardware can be used in such a cluster. CSM does not support a mixture of pSeries hardware and other hardware platforms.

Red Hat Linux 9

CSM for Linux 1.3.2 adds support for Red Hat Linux 9. For hardware support, see Table 1 on page 8.

Use of AutoYaST for installation of SuSE and SuSE SLES

CSM no longer supports the use of System Installation Suite (SIS) to install the operating system for SuSE and SuSE SLES nodes. CSM now supports AutoYaST, part of the SuSE and SuSE SLES operating system, to install the operating system on SuSE and SuSE SLES nodes. A new CSM command **csmsetupyast** now performs the installation. See “Configuring a SuSE or SuSE SLES installation” on page 65.

Enhanced backup and restore features

CSM provides two new commands for backing up and restoring CSM:

- The **csmbackup** command copies vital CSM data from the management server and stores the data in a specified directory. The command backs up a CSM management server in case of a hardware problem, or if you are setting up the management server on another machine.
- The **csmrestore** command restores the files that are copied by **csmbackup** into the specified directory.

See Chapter 11, “Backing up and restoring CSM and ERRM data,” on page 89.

Note: These features are not supported for Linux on pSeries.

Chapter 2. Planning for Cluster Systems Management

The Cluster Systems Management (CSM) planning and installation process helps you as a system administrator set up the IBM Cluster Systems Management for Linux.

Read this chapter before you install CSM.

Installing CSM: The CSM application is available for Linux as an installation image in a directory or on the CSM CD-ROM. There are two different approaches you can take to installing CSM, depending on your cluster environment. In either case you must first install the Linux operating system on the machine defined as your cluster management server.

- Install CSM on nodes that already have the Linux operating system installed, OR
- From the management server, define nodes and add them to the CSM cluster as well as install the Linux operating system.

Hardware control: CSM allows you to set up a cluster with or without *hardware control*. Some typical CSM hardware functions you can perform from the management server include:

- Power nodes on and off
- Reboot nodes
- Query the power status of nodes
- Open a console to a cluster node.

This chapter provides an overview of some of the hardware requirements for hardware control. It assumes that your hardware has already been set up. For detailed information about hardware control, see the *CSM for Linux: Hardware Control Guide*.

Understanding CSM hardware requirements

The following topics describe hardware requirements for the management server, cluster nodes, and hardware control.

Management server requirements

The machine you use for your management server must have a CD-ROM drive or equivalent (for example, a DVD-ROM or DVD-RAM drive).

- For Linux on xSeries, IntelliStation, or BladeCenter, the management server must be one of the machines listed in “xSeries, IntelliStation, and BladeCenter nodes hardware” on page 6 with the following restrictions: the management server cannot be the IBM @server xSeries 360 (x360) server or IntelliStation.
- For Linux on pSeries, the management server must be one of the pSeries machines listed in “Linux on pSeries hardware” on page 8 with the following restrictions: the management server cannot be the IBM @server Cluster pSeries 655 (p655).

If you are using CSM as part of a prepackaged eServer Cluster 1350 solution that you purchased from IBM or an IBM solutions provider, all of the prerequisite hardware is included. Cluster 1350 hardware and networking are delivered preconfigured for using CSM

Management server and managed nodes: The hardware and operating system installed on the management server and the managed nodes can only be one of the following:

- Linux on pSeries. The Linux operating system for all nodes must be the following:
 - SuSE SLES
- Linux on xSeries, which includes xSeries, IntelliStation, or BladeCenter hardware. You can mix xSeries, IntelliStation, or BladeCenter hardware, but you cannot mix different types of Linux operating systems in the cluster. The Linux operating system for all nodes can only be one of the following:
 - Red Hat
 - Red Hat AS
 - SuSE
 - SuSE SLES

You cannot mix pSeries hardware and xSeries, IntelliStation, or BladeCenter hardware in the same cluster. For supported levels of Linux in a CSM cluster, see Table 1 on page 8 and Table 2 on page 8.

Memory and disk space

On the management server, a minimum of 128MB of memory and 120MB of disk space is required for installing CSM.

- For each version of the Red Hat Linux operating system that is installed on the nodes, an additional 2.0GB of disk space is required on the management server.
- For each version of the SuSE or SuSE SLES Linux operating system installed on the nodes an additional 2.0GB of disk space is required on the management server.

Network requirements

IBM suggests creating one virtual local area network (VLAN) for the CSM management server and hardware control points, and a separate VLAN for the CSM management server and cluster nodes. Although cluster hardware control points and nodes can be on the same VLAN, limiting access to the management VLAN reduces security exposure for IP traffic on the management VLAN and access to hardware control points. For more information about network requirements, see *CSM for Linux: Hardware Control Guide*

Limitations

See the CSM for Linux *Read This First* document for the most recent scalability information.

Cluster node requirements

xSeries, IntelliStation, and BladeCenter nodes hardware

xSeries nodes for Linux

- IBM xSeries 330 (x330)
- IBM xSeries 335 (x335)
- IBM xSeries 342 (x342)
- IBM xSeries 345 (x345)
- IBM xSeries 360 (x360)
- IBM xSeries 440 (x440)
- IBM xSeries 445 (x445)

- IntelliStation 6221. Hardware is controlled for the IntelliStation 6221 through the APC® MasterSwitch™.

eServer BladeCenter for Linux

- BladeCenter: HS20-8677 Blade Server.
- BladeCenter: HS20-8678 Blade Server
- BladeCenter: HS20-8832 Blade Server

eServer 325 (e325) for Linux

- IBM eServer 325

Note: The eServer 325 is planned to be supported in CSM 1.3.2 but is not fully documented in this initial release of the book.

IBM @server xSeries 360 (x360) servers can be included in CSM clusters as managed nodes running Linux. To use remote console with x360s, you must configure the Serial Port Cable for the x360: part #59P6881. To order an x360 Serial Port Cable, retrieve the serial number from your x360 server and call 1-800-IBM-SERV. For product details on the x360, see the following web site:

<http://www.pc.ibm.com/us/eserver/xseries/x360.html>

To download the latest device drivers for the x360, go to the following web site:

<http://www.pc.ibm.com/qtechinfo/MIGR-4JTS2T.html>

and scroll down to the **Server Device Driver File Matrices** section.

IBM IntelliStation 6221 (Intel®-based) workstations can be included in CSM clusters as managed nodes running xSeries Linux. IntelliStations use the Automated Power Control (APC) switch for power, so the CSM *PowerMethod* attribute for nodes on IntelliStations must be set to **apc**. APC enables you to turn on power remotely through a modem or other RS-232 device for initialization in recovery situations. For details on IntelliStation workstations, see http://www.pc.ibm.com/us/intellistation/tech_library.html.

IBM BladeCenter servers can be included in CSM clusters as managed nodes running xSeries Linux. The server model supported with CSM is the IBM BladeCenter HS20 blade server. For details on BladeCenter, including the *IBM BladeCenter Planning and Installation Guide*, see the following web site:

http://www.pc.ibm.com/us/eserver/xseries/bladecenter_family.html

To download the latest device drivers for BladeCenter, go to the following web site:

<http://www.pc.ibm.com/qtechinfo/MIGR-4JTS2T.html>

and scroll down to the **Server Device Driver File Matrices** section.

Linux distribution packages and xSeries hardware

The following table shows the distributions and xSeries, IntelliStation, or BladeCenter hardware supported by CSM for Linux 1.3.1 and later. At the time this document has become available, Red Hat 9 has only been tested for compatibility. For BladeCenter 8678 and 8832 models, see the following web site:

http://www.pc.ibm.com/us/eserver/xseries/bladecenter_family.html

An X means it is supported and a blank means that it is not supported.

Table 1. Linux distributions and supported xSeries, IntelliStation, or BladeCenter hardware

Linux Distribution	x330	x335	x342	x345	x360	x440	x445	BladeCenter (8677)	IntelliStation Model 6221
Red Hat 7.2	X		X	X					
Red Hat 7.3	X	X	X	X	X			X	X
Red Hat AS 2.1	X	X	X	X	X	X	X	X	
Red Hat 8.0		X		X	X			X	X
Red Hat 9		X		X				X	
SuSE 8.0		X		X		X		X	
SuSE 8.1		X		X	X	X		X	
SuSE SLES 7 (7.2)	X	X	X	X		X			
SuSE SLES 8 (8.1)	X	X		X	X	X	X	X	

Restrictions:

- You must manually install SuSE SLES 7 or SuSE 8.0 operating systems on the nodes. You cannot use CSM to install these operating systems.

Linux on pSeries hardware

Both the management server for CSM hardware control and the Linux nodes in the cluster can run on one of the following pSeries hardware:

- IBM Cluster pSeries™ 615 (p615)
- IBM Cluster pSeries™ 630 (p630)
- IBM Cluster pSeries™ 650 (p650)

You can use the following pSeries hardware as a node in the cluster but not as a management server:

- IBM @server Cluster pSeries™ 655 (p655)

Restrictions:

- You cannot mix xSeries, IntelliStation, or BladeCenter hardware with pSeries hardware in a single Linux cluster.
- CSM does not support the p655 as a management server in the Linux on pSeries cluster.

For information about Linux on pSeries hardware, see the following web site http://publib16.boulder.ibm.com/pseries/en_US/infocenter/base/hardware.htm

Linux distribution packages and pSeries hardware

The following table shows the distributions and pSeries hardware supported by CSM for Linux 1.3.2. An X means it is supported and a blank means that it is not supported.

Table 2. Linux distributions and supported pSeries hardware

Linux Distribution	p615	p630	p650	p655
SuSE SLES 8 (8.1)	X	X	X	X

Memory and disk space for nodes

On each managed node a minimum of 128MB of memory and 20MB of disk space is required for CSM and the required amount of additional disk space for the operating system and RPM™ packages that you choose to install.

Hardware installation

It is assumed that your hardware is already set up before you begin the installation process. If you have not set up your hardware, see the *CSM for Linux: Hardware Control Guide* for the hardware requirements and set up tasks. You can also find additional tools at <http://www.alphaworks.ibm.com/tech/ect4linux> to help with your hardware set up including remote bios upgrades, and console and hardware control set up.

Hardware control requirements

CSM hardware control software provides remote hardware control functions for CSM cluster nodes from a single point of control.

The management server can be connected to cluster nodes and external networks using various configurations of IBM and non-IBM hardware and software that meet the CSM hardware control architecture requirements. You can use commands to request node power status, reboot, power on and off functions, and perform other functions.

You can also use commands to communicate with console server hardware to open a console window for a node on the CSM management server. Console servers should be on the management virtual LAN (VLAN), which connects the management server to the cluster hardware, and connected to node serial ports.

Depending on the type of hardware, the hardware control point for the management server is one of the following:

- IBM Hardware Management Console (HMC) for pSeries hardware (also depends on the firmware supported for HMC)
- Remote Supervisor Adapter (RSA) for xSeries hardware
- APC MasterSwitch for IntelliStation
- Management Module for BladeCenter
- Baseboard Management Controller on eServer 325 hardware

For more details about the hardware and networking requirements for CSM hardware control, see the *CSM for Linux: Hardware Control Guide*.

Understanding CSM licensing requirements

The following topics describe options for CSM licensing requirements.

CSM Try and Buy option

You can try CSM and clustering at no charge for 60 days under the Try & Buy option. You can use all functions of CSM for 60 days, after which CSM will no longer function. When you purchase and receive a full production license and key for CSM, and accept its IPLA License Agreement, you can use CSM for production purposes. CSM configuration data stored during Try & Buy will remain available for later production use.

CSM full license

To use CSM for production purposes, you'll need to purchase a full CSM production license and key, and accept its IPLA License Agreement. CSM configuration data stored during your Try & Buy period, will remain available for production use. Orders can be placed by calling IBM.COM, Americas at 1-800-IBM-CALL 1-800-426-2255.

For procedural information about licensing options for CSM, see “Step 13. Accept the CSM license” on page 33.

Understanding CSM software requirements

IBM Cluster Systems Management has requirements for non-IBM software as well as IBM-developed software. As a convenience, some of the required non-IBM software for Linux that is not part of a Red Hat or SuSE distribution is included on the CSM CD-ROM. Unless otherwise specified, the software listed here is required on both the management server and the nodes.

See the README file on the CD-ROM or in the tar file for additional or service requirements (`/opt/csm/README/csm.README`).

Linux on xSeries including IntelliStation and BladeCenter

Before you install CSM, you must install one of the following Linux distribution packages on the management server:

- Red Hat Linux 7.2, 7.3, 8.0, or 9
- Red Hat Linux AS 2.1
- SuSE Linux 8.0 or 8.1
- SuSE SLES Linux 7 (7.2) or 8 (8.1)

Restrictions for IBM Director

If you plan to put IBM Director Agent software on your management server for xSeries, IntelliStation, or BladeCenter Linux, you can only use the following Linux distributions levels:

- Red Hat 7.2 or 7.3
- Red Hat AS 2.1
- SuSE 8.0
- SuSE SLES 8 (8.1)

Linux distribution in the cluster

Consider the following Linux restrictions in a CSM cluster:

- The management server and each node in your cluster must be installed with the same Linux distribution: all running Red Hat, Red Hat AS, SuSE, or SuSE SLES.
- The management server must be the same level or higher than the nodes. For example, the management server can not use Red Hat Linux 7.2 if the nodes use Red Hat Linux 7.3.
- If you plan to put IBM Director Server or Console software on your management server, you can only use the following Linux distributions levels:
 - Red Hat Linux 7.3
 - SuSE Linux 8.0

Linux on pSeries

Before you install CSM, you must install the following Linux distribution package on the management server:

- SuSE (SLES) 8 (8.1)

All managed nodes in the cluster must also use SuSE SLES (8.1) as the Linux operating system.

CSM packages

CSM for xSeries: The following packages comprise the CSM for xSeries, IntelliStation, or BladeCenter Linux CD-ROMs. The levels shown here are applicable at the time this product became available.

- csm.client 1.3.2 (required on the managed nodes only)
- csm.core 1.3.2
- csm.diagnostics 1.3.2
- csm.director.agent 1.3.2 (optional on the management server and managed nodes)
- csm.director.server 1.3.2 (optional on IBM Director servers)
- csm.dsh 1.3.2 (required on the management server only)
- csm.gui.dcem 1.3.2 (installed on the management server)
- csm.server 1.3 .2 (required on the management server only)
- rsct.basic 2.3.1
- rsct.core 2.3.1
- rsct.core.utils 2.3.1
- src 1.2.0.3

Note: CSM does not use **rsct.basic**, but if you have a downlevel version, CSM automatically updates it to the correct level.

CSM for Linux on pSeries: The following packages comprise the CSM for Linux on pSeries CD-ROMs. The levels shown here are applicable at the time this product became available.

- csm.client 1.3.2
- csm.core 1.3.2
- csm.dsh 1.3.2
- csm.server 1.3.2
- csm.diagnostics 1.3.2
- rsct.basic 2.3.1
- rsct.core 2.3.1
- rsct.core.utils 2.3.1
- src 1.2.0.2

CSM packages needed for GPFS and CSM coexistence

Because GPFS and CSM rely on common enabling technologies in Reliable Scalable Cluster Technology (RSCT) and SRC, it is important when you use GPFS and CSM together that you install the latest RSCT and SRC RPM images. Select and install the latest RSCT and SRC RPM images from either the GPFS or CSM distribution.

For example, if the CSM distribution contains the following:

- rsct.basic-2.3.1*
- rsct.core-2.3.1*
- rsct.core.utils-2.3.1*
- src-1.2.1*

and GPFS distribution contains the following:

- rsct.basic-2.2.1*

- rsct.core-2.2.1*
- rsct.core.utils-2.2.1*
- src-1.1.1*

select and install the RSCT and SRC images from the CSM distribution.

Note: GPFS requires specific kernel levels. See the GPFS documentation for more information.

Required IBM non-CSM software

IBM provides the following required non-CSM software on the CSM CD-ROM:

- IBMJava2-JRE 1.3.1

Optional IBM non-CSM software (xSeries, IntelliStation, or BladeCenter only)

IBM also provides the following optional non-CSM software on the CSM CD-ROM:

- ITDAgent-4.10-1 (xSeries only)
- DirAgent-4.10-1 (xSeries only)
- MPAAgent-4.10-1 (xSeries only)
- RAIDLxAg-4.10-1 (xSeries only)

Required non-IBM software

Linux on xSeries, IntelliStation, or BladeCenter: One of the following Linux distributions is required:

- Red Hat Linux 7.2
- Red Hat Linux 7.3
- Red Hat Linux 8.0
- Red Hat Linux 9
- Red Hat Linux AS 2.1
- SuSE Linux 8.0
- SuSE Linux 8.1
- SuSE SLES Linux 7 (7.2)
- SuSE SLES Linux 8 (8.1)

Linux on pSeries: The following Linux distribution is required:

- SuSE SLES Linux 8 (8.1)

Red Hat Linux software

Red Hat Linux 7.2: The following required non-IBM software is available on the Red Hat Linux 7.2 CDs and is used by CSM:

- XFree86-libs-4.1*
- dhcp-*
- expect-5.32*
- freetype-2.0*
- nfs-utils-*
- pdksh-*
- perl-5*
- perl-libnet-1.07*

- rdist-6*
- tcl-8.3*
- tk-8.3*

Red Hat Linux 7.3: The following required non-IBM software is available on the Red Hat Linux 7.3 CDs and is used by CSM:

- XFree86-libs-4.2*
- dhcp-*
- expect-5.32*
- freetype-2.0*
- nfs-utils-*
- pdksh-*
- perl-5*
- perl-libnet-1.09*
- rdist-6*
- tcl-8.3*
- tk-8.3*

Red Hat Linux 8.0: The following required non-IBM software is available on the Red Hat Linux 8.0 CDs and is used by CSM:

- XFree86-libs-4.2*
- dhcp-3*
- expect-5.38*
- freetype-2.1*
- nfs-utils-*
- pdksh-*
- perl-5*
- rdist-6*
- syslinux-*
- tcl-8.3*
- tk-8.3*

Note: To install CSM on x335 and x345 nodes, you must download additional drivers that are not included with the standard Red Hat distributions. CSM needs these drivers for performing automatic MAC address collection and installing the operating system. Go to:
<http://techsupport.services.ibm.com/server/\cluster2/fixes/csmdriverdownload.html> to download them.

Red Hat Linux 9: The following required non-IBM software is available on the Red Hat Linux 9 CDs and is used by CSM:

- XFree86-libs-4.3*
- compat-libstdc++-*
- dhcp-3*
- expect-5.38*
- freetype-2.1*
- nfs-utils-*
- pdksh-*

- perl-5*
- rdist-6*
- syslinux-*
- tcl-8.3*
- tk-8.3*

Red Hat Linux AS software

Red Hat Linux AS 2.1: The following required non-IBM software is available on the Red Hat Linux AS 2.1 CDs and is used by CSM:

- XFree86-libs-4.1*
- dhcp-*
- expect-5.32*
- freetype-2.0*
- nfs-utils-*
- pdksh-*
- perl-5*
- perl-libnet-1.07*
- rdist-6*
- tcl-8.3*
- tk-8.3*

In order to install CSM on x335 and x345 nodes, you need to download additional drivers that are not included with the standard Red Hat distributions. CSM needs these drivers for performing automatic MAC address collection and installing the operating system. Go to the following website to download:

<http://techsupport.services.ibm.com/server/cluster2/fixes/csmdriverdownload.html>

SuSE Linux software

SuSE Linux 8.0: The following required non-IBM software is available on the SuSE Linux 8.0 CDs and is used by CSM:

- dhcp-base-*
- dhcp-server-*
- expect-5.34-63*
- freetype2*
- gppshare-*
- nfs-utils-*
- pdksh-*
- perl-5*
- perl-libnet-1.09*
- rdist-6.1.5-429*
- rsh-server-*
- tcl-8*
- tk-8*
- xf86*

SuSE Linux 8.1: The following required non-IBM software is available on the SuSE Linux 8.1 CDs and is used by CSM:

- dhcp-base-*
- dhcp-server-*

- expat-*
- expect-5.34-178*
- freetype2*
- nfs-utils-*
- pdksh-*
- perl-5*
- perl-HTML-Parser-*
- perl-HTML-Tagset-*
- perl-URI-*
- perl-XML-DOM-*
- perl-XML-Parser-*
- perl-XML-RegExp-*
- perl-libwww-perl-*
- rdist-6.1.5-524*
- rsh-server-*
- tcl-8*
- telnet-server-*
- termcap-*
- tk-8*
- xf86*

SuSE SLES Linux software

SuSE SLES 7 (7.2): The following required non-IBM software is available on the SuSE SLES 7 (7.2) CDs and is used by CSM:

- dhcp-*
- dosfstools-*
- freetype2*
- gppshare-*
- nfs-utils-*
- pdksh-*
- perl-5*
- tcl-8*
- termcap-*
- tk-8*
- xf86*

SuSE SLES Linux 8 (8.1) for xSeries Linux: The following required non-IBM software is available on the SuSE SLES Linux 8 (8.1) for xSeries Linux CDs and is used by CSM:

- dhcp-base-*
- dhcp-server-*
- expat-*
- expect-5.34-192*
- freetype2*
- nfs-utils-*
- pdksh-*
- perl-5*

- perl-HTML-Parser-*
- perl-HTML-Tagset-*
- perl-URI-* perl-XML-DOM-*
- perl-XML-Parser-*
- perl-libwww-perl-*
- rdist-6.1.5-543*
- rsh-server-*
- tcl-8*
- termcap-*
- tk-8* xf86*

SuSE SLES Linux 8 (8.1) Linux on pSeries: The following required non-IBM software is available on the SuSE SLES Linux 8 (8.1) Linux on pSeries CDs and is used by CSM:

- dhcp-base*
- dhcp-server*
- expect-5*
- freetype2*
- nfs-utils-*
- pdksh-*
- perl-5*
- perl-XML-RegExp-*
- rdist-6*
- rsh-server-*
- rsync-*
- tcl-8*
- termcap-*
- tk-8*
- xf86*

Required non-IBM software provided by IBM

Linux on xSeries, IntelliStation, or BladeCenter: IBM provides the following required non-IBM software on the CSM CD-ROM:

- tftp-hpa 0.34*
- syslinux 1.64*
- conserver 7.2*
- expect 5.34* (only for SLES 7(7.2))
- rdist 6.1.5* (only for SLES 7(7.2))
- tcl-8.4*
- tk-8.4*

Linux on pSeries: IBM provides the following required non-IBM software either on the CSM CD-ROM or from the website as indicated:

- tftp-hpa 0.34*
- conserver 7.2* (available from the CD-ROM)
- OpenCIMOM (available from the following web site:)

https://techsupport.services.ibm.com/server/cluster/csmplinux_1.3.2.0down.html

You can also find an "International License Agreement for Non-Warranted Programs" on the CD-ROM. You can download the license text from the following web site:

<ftp://ftp.software.ibm.com/aix/freeSoftware/aixtoolbox/LICENSES/openldap.txt>

Required non-IBM software you will need to download

For Red Hat and Red Hat AS clusters for Linux on xSeries, IntelliStation, or BladeCenter:

Table 3. Autoupdate for Red Hat and Red Hat AS

Open Source Software	Purpose
Autoupdate 4.3.4 or higher	Required for software maintenance: installation and upgrades of non-CSM RPMs
Go to this site to download: http://freshmeat.net/projects/autoupdate	

For SuSE and SuSE SLES clusters on xSeries, IntelliStation, or BladeCenter Linux:

Table 4. Autoupdate and AutoYaST software for non-pSeries SuSE and SuSE SLES

Open Source Software	Purpose
Autoupdate 4.3.4 or higher	Required for software maintenance: installation and upgrades of non-CSM RPMs
Go to this site to download: http://freshmeat.net/projects/autoupdate	
Open Source Software	Purpose
perl-XML-RegExp	AutoYaST
Go to this site to download: <ul style="list-style-type: none">• SLES 8 only ftp://ftp.suse.com/pub/suse/i386/8.1/suse/i586/perl-XML-RegExp-0.03-227rpm	

For SuSE SLES clusters on Linux on pSeries:

Table 5. Autoupdate for Linux on pSeries SuSE SLES

Open Source Software	Purpose
Autoupdate 4.3.4 or higher	Required for software maintenance: installation and upgrades of non-CSM RPMs
Go to this site to download: http://freshmeat.net/projects/autoupdate	

RPM Packages to update for Red Hat 8.0 clusters on xSeries, IntelliStation, or BladeCenter Linux:

Table 6. RPM Packages to update for Red Hat 8.0 clusters on xSeries, IntelliStation, or BladeCenter Linux

Open Source Software	Go to this site to download:
glibc-2.3.2-4.80, glibc-common-2.3.2-4.80, glibc-debug-2.3.2-4.80 (optional), glibc-devel-2.3.2-4.80 (optional), glibc-utils-2.3.2-4.80 (optional), glibc-profile-2.3.2-4.80 (optional)	http://rhn.redhat.com/errata/RHSA-2003-089.html .
<p>Note: Open Source Software syslinux-2.04 or higher is required if any of your nodes is x335. Go to the following site to download the software:</p> <p>http://www.freshmeat.net/projects/syslinux</p>	

RPM Packages to update for Red Hat 9 clusters for Linux on xSeries, IntelliStation, or BladeCenter:

Table 7. RPM Packages to update for Red Hat 9 clusters for Linux on xSeries, IntelliStation, or BladeCenter

Open Source Software	Go to this site to download:
glibc-2.3.2-27.9.i686 glibc-devel-2.3.2-27.9.i386 (optional) nptl-devel-2.3.2-27.9.i686(optional) glibc-profile-2.3.2-27.9.i386 (optional) glibc-common-2.3.2-27.9.i386(optional) glibc-utils-2.3.2-27.9.i386(optional) glibc-debug-2.3.2-27.9.i386(optional)	http://rhn.redhat.com/errata/RHBA-2003-136.html

RPM Packages to update for SUSE 8.1 on xSeries Linux:

Table 8. RPM Packages to Update for SuSE 8.1 for Linux on xSeries, IntelliStation, or BladeCenter

RPM Name
openssh-3.4p1-215.i586.rpm
Go to this site to download:
ftp://ftp.suse.com/pub/suse/i386/update/8.1/rpm/i586/openssh-3.4p1-215.i586.rpm
RPM Name
openssh-askpass-3.4p1-215.i586.rpm
Go to this site to download:
/csminstall/Linux/SuSE/8.1/i386 ftp://ftp.suse.com/pub/suse/i386/update/8.1/rpm/i586/openssh-askpass-3.4p1-215.i586.rpm
RPM Name
update-mkinitrd.gz
ftp://ftp.suse.com/pub/suse/i386/update/8.1/disks/update-mkinitrd.gz

Kernel requirements for SuSE SLES clusters on Linux on pSeries:

Table 9. Kernel Requirements for SuSE SLES clusters on Linux on pSeries

Open Source Name	Go to this site to download:
kernel-ppc64-2.4.19-228.ppc.rpm or greater	http://support.suse.de/psdb/

Hardware control software

Hardware management console (hmc) for pSeries: For updates to the hmc, see the following website:

<https://techsupport.services.ibm.com/server/hmc>

ESP software for remote console (for Linux on xSeries, IntelliStation, or BladeCenter only): The Equinox ESP (Ethernet Serial Provider) console device requires the installation of software and drivers that are shipped with the device. Once these are installed, the device can be configured using the **espcfg** command. See the ESP device installation instructions for details at the following web site:

http://www.equinox.com/Hardware_Manuals192.html

To successfully build the ESP RPM packages for the ESP console server, obtain the current version of your distribution CD and ensure that you have the following RPM packages installed:

- gcc
- glibc-devel
- kernel-headers (exact RPM is dependent on the installed kernel)
- libgcc
- cpp
- kernel-source
- ncurses-devel

ESP console and Red Hat: When using the Equinox ESP console attached to a Management Server that runs Red Hat or Red Hat AS, you need to install the following packages to run the **rconsole** command with ESP. From the Red Hat or Red Hat AS CD-ROM, or the Red Hat Web site, obtain the following packages:

- uucp
- lockdev
- lockdev-devel

The **rconsole** command communicates with console server hardware to open a console window for a node on the CSM management server. In addition, the sources and headers kernel versions must match the kernel version you are running. For example, if the current running kernel returned by the **uname -r** command is 2.4.7-10, then the kernel sources RPM package **kernel-source-2.4.7-10.i386.rpm** must be installed.

ESP console server restrictions for SuSE and SuSE SLES: CSM support for the ESP console server is limited for SuSE, SuSE SLES, and Red Hat 9. CSM does not support the ESP console server if you are using a SuSE or SuSE SLES or Red Hat 9 management server. If you are using a SuSE, SuSE SLES, or Red Hat 9 management server and any nodes in the cluster have an ESP console server connected, you need to disable the CSM serial port redirection for each node by specifying NONE for the node attribute *ConsoleSerialDevice*. To specify the attribute for the node, issue the following command:

```
chnode -a ConsoleSerialDevice=NONE
```

Host name resolution

When you define nodes, general attributes define the host name of the network to which the management server is connected. CSM uses the host name for network communications among the nodes in the CSM cluster. You can use a short host name or a long host name with CSM, but you must make sure that the resolution of the host name for the CSM cluster complies with the following guidelines:

- If the *Hostname* resolves to the short host name, all hosts must be configured so that the short name is returned from the **gethostname** application programming

interface (API) and the **hostname** command. All IP addresses must resolve to the short host name first. All references to the nodes in the CSM database must make use of the short host name.

- If the *Hostname* resolves to the long host name, all hosts must be configured so that the long name is returned from the **gethostname** API and the **hostname** command. All IP addresses must resolve to the long host name. All references to the nodes in the CSM database must make use of the long host name.

If you switch between using short host names or long host names, you must ensure that all host names comply with these guidelines.

Avoiding problems with the installation

Before installing CSM, see Appendix C, “Avoiding problems with hardware and network setup,” on page 99 for the details of some installation problems that might occur.

Linux Cluster Support extension for IBM Director (for Linux on xSeries, IntelliStation, or BladeCenter only)

If you plan to use both IBM Director and CSM to manage the systems in your Linux cluster, you might want to install the Linux Cluster Support extension that is included with CSM. With the Linux Cluster Support extension installed, CSM clusters and their member nodes appear as manageable objects in the IBM Director Console to allow you to integrate certain IBM Director and CSM functions. For example, CSM node attribute data becomes available through the IBM Director Console’s Inventory Query Browser, and IBM Director Event Action Plans can be built around RMC events in your Linux cluster.

As of this initial release of CSM 1.3.2, the Linux Cluster Support extension supports IBM Director 4.1 and the IBM Director 4.10-2 patch. If you use CSM to install IBM Director Agent code on your management server and nodes, the IBM Director 4.1 Agent is installed. If you want to apply the IBM Director 4.10-2 patch, download the necessary files from the following website and follow the instructions that you receive with the patch:

http://www.pc.ibm.com/us/eserver/xseries/systems_management/dwn1.html

If newer versions of IBM Director have been released since the initial publication of this release, check the CSM FAQ to see if they are supported by the Linux Cluster Support extension.

This book includes information about how to install the Linux Cluster Support extension. For information on how to use CSM with IBM Director, see the *CSM for Linux: Administration Guide*.

Installing Linux nodes without CSM

To maximize node performance, the CSM minimal installation option installs the Linux operating system on the specified nodes without CSM or RSCT code. This option provides nodes with limited management capability.

The following operations or functions are supported for Minimally Managed nodes:

- Listing nodes and node information
- Creating node groups
- Using dsh

- Using DCEM (not supported for Linux on pSeries)
- Automatic setup of **rsh/ssh** (required for dsh)
- Using limited function of **updatenode** to set up the remote shell environment only
- Monitoring conditions and responses on the management server only
- Running user customization scripts during installation
- Full operating system installation of nodes
- Using probes on the management server only
- Minimal heartbeating through fping
- Managing mixed clusters of Minimally Managed nodes and fully-managed CSM nodes
- Using Install servers as Minimally Managed nodes

For Minimally Managed nodes, the following operations or functions are not supported:

1. CFM
2. SMS
3. Monitoring conditions and responses on the node
4. Installation of CSM and RSCT RPMs
5. Full RMC heartbeating
6. Linux Cluster Support extension for IBM Director

Chapter 3. Understanding how to create a CSM cluster

Use these basic steps to create a CSM cluster:

1. Step 1: Set up the management server.
2. Step 2: Define the nodes in the cluster.
3. Step 3: Install CSM on each node.

You must use the **installms** command to install CSM on the management server. The **installms** command creates the required CSM directories and files, and installs CSM, the Open Source, and Red Hat, Red Hat AS, SuSE, or SuSE SLES software. See Chapter 4, “Installing the Management Server,” on page 25.

Defining nodes and installing CSM

Depending on your software configuration, after you have set up the management server, you have two choices for defining and installing CSM on a node in the cluster:

- Define and install CSM on the node that already has the Linux operating system installed. For an overview, see “Overview of CSM-only installation.”
- Define and install CSM on the node as well as install the Linux operating system. For an overview, see “Overview of operating system and CSM installation.”

Before you start: Before you begin your installation, read the procedures in the chapters referenced in each step. For CSM command information, see *CSM for Linux: Command and Technical Reference*. For a list of CSM books, see “Bibliography” on page 111.

Overview of CSM-only installation

A CSM-only installation involves installing only CSM on the nodes of your cluster. It is assumed that your nodes already have a supported version of the Linux operating system installed. Among other tasks, a CSM-only installation involves defining the nodes of the cluster and then installing CSM on each node.

Consider the following CSM commands when you define Linux nodes:

- After you determine the hardware and software attributes for each node, use the **definenode** command to define the nodes.
- Use the **updatenode** command to perform the CSM installation on each node.

For information about CSM-only installation, see Chapter 6, “Adding nodes to a cluster,” on page 49.

Overview of operating system and CSM installation

This type of installation involves installing both Linux and CSM on the nodes of the cluster. After you determine the hardware and software attributes for each node, use the **definenode** command to define the nodes.

After you define the node, you need to configure how the node is to be installed in the cluster. For Red Hat or Red Hat AS installations, use Kickstart, and run the **csmssetupks** command. For SuSE and SuSE SLES installs, use AutoYaST, and run

| the **csmsetupyast** command. The **csmsetupks** and **csmsetupyast** commands
| configure the install process, collect MAC addresses, and configure the network
| boot of the nodes.

The last part of the process involves installing the software on the nodes. You use
the **installnode** command to install both CSM and the operating system on the
nodes.

| For information about installing CSM as well as installing Linux on the node, see
| Chapter 7, “Installing CSM and the operating system on the nodes,” on page 57.

| **Migrating to a new CSM release**

| Chapter 10, “Migrating to the latest level of CSM for xSeries, IntelliStation, and
| BladeCenter,” on page 83 contains information for migrating from one level of CSM
| to another. If you are migrating your system, start with that chapter.

Chapter 4. Installing the Management Server

This chapter provides step-by-step instructions for installing a CSM management server.

Before you install the management server

Ensure that you have a Linux operating system installed on the machine that you plan to use as your management server. Read these procedures carefully before you begin the installation and set up tasks.

For details about the commands for the installation process, see *CSM for Linux: Command and Technical Reference*. For information about installing the management server on an x440 or x445 node, see “Installing CSM on an x440 or x445 management server that runs Red Hat AS” on page 35.

Summary of the installation steps

- ___ 1. “Step 1. Prepare for installation”
- ___ 2. “Step 2. Download the non-IBM software” on page 26
- ___ 3. “Step 3. Register host names of nodes and management server” on page 27
- ___ 4. “Step 4. Create the /csminstall partition” on page 27
- ___ 5. “Step 5. Download CSM packages from the website” on page 28
- ___ 6. “Step 6. Install the csm.core package” on page 28
- ___ 7. “Step 7. Update glibc on the management server (required for Red Hat 8.0 and 9)” on page 29
- ___ 8. “Step 8. Update syslinux on the management server (required for Red Hat 8.0)” on page 29
- ___ 9. “Step 9. Update the openssh package on the management server (required for non-pSeries SuSE 8.1)” on page 29
- ___ 10. “Step 10. Install the CSM software” on page 30
- ___ 11. “Step 11. Decide which remote shell to use” on page 32
- ___ 12. “Step 12. Apply updates” on page 33
- ___ 13. “Step 13. Accept the CSM license” on page 33
- ___ 14. “Step 14. Install the Linux Cluster Support extension for IBM Director (optional for non pSeries)” on page 34
- ___ 15. “Step 15. Verifying and troubleshooting the installation” on page 34

Step 1. Prepare for installation

1. For **xSeries Linux including IntelliStation and BladeCenter**, ensure that you are running one of the following operating systems on the management server. If you are using IBM Director software, see “Understanding CSM software requirements” on page 10 for software restrictions:
 - Red Hat Linux 7.2.
 - Red Hat Linux 7.3.
 - Red Hat Linux 8.0. (Make sure you have downloaded the RPM packages. See “Required non-IBM software you will need to download” on page 17.)

- Red Hat Linux 9. (Make sure you have downloaded the RPM packages. See “Required non-IBM software you will need to download” on page 17.)
- Red Hat Linux AS 2.1.
- SuSE Linux 8.0.
- SuSE Linux 8.1.
- SuSE SLES Linux 7 (7.2).
- SuSE SLES Linux 8 (8.1). (For nodes, this is the only supported Linux distribution package.)

For **Linux on pSeries**, ensure that you are running the following operating system on the management server:

- SuSE SLES Linux 8 (8.1).

For information about installing Red Hat AS on x440 and x445 nodes, see “Installing CSM on an x440 or x445 management server that runs Red Hat AS” on page 35.

2. Ensure you have read the management server software requirements in Chapter 2, “Planning for Cluster Systems Management,” on page 5.

Step 2. Download the non-IBM software

For the following downloads, create a temporary directory where you can store the packages. For example, create a temporary directory like the following:

```
/temp/csmreqs
```

Download required non-IBM software that IBM provides (non pSeries)

Download required non-IBM software for xSeries, IntelliStation, and BladeCenter from “Linux on xSeries, IntelliStation, or BladeCenter” on page 16 into the temporary directory.

Download required non-IBM software that IBM provides (Linux on pSeries)

Download required non-IBM software for Linux on pSeries, including **OpenCIMOM**, from “Linux on pSeries” on page 16 into the temporary directory.

Download Autoupdate for Red Hat and Red Hat AS

If you are using Red Hat or Red Hat AS for xSeries, IntelliStation, or BladeCenter on your management server, download **Autoupdate** packages from Table 3 on page 17 into the temporary directory.

Download GLIBC RPM packages for Red Hat

If you are using Red Hat 8.0 or 9 on your management server, download GLIBC RPM packages from Table 6 on page 18 or Table 7 on page 18 into the temporary directory.

Download syslinux updates for x335 Red Hat 8.0 node

If you are using x335 Red Hat 8.0 node, download the **syslinux** RPM packages from Table 6 on page 18 into the temporary directory:

Download mkinitrd updates for SuSE 8.1 (non pSeries)

If you are using SuSE 8.1, download the RPM packages from Table 8 on page 18 into the temporary directory:

Download Autoupdate for SuSE or SuSE SLES (non pSeries)

If you are using SuSE or SuSE SLES for xSeries, IntelliStation, or BladeCenter on your management server, download **Autoupdate** packages from Table 4 on page 17 into the temporary directory.

Download Autoupdate for SuSE SLES for Linux on pSeries

If you are using SuSE SLES for Linux on pSeries, on your management server, download **Autoupdate** packages from Table 5 on page 17 into the temporary directory.

Download the SuSE 8.1 management server openssh (non pSeries)

If you are using **Openssh** for Linux on zSeries, Intellistation, or BladeCenter SuSE 8.1, download the RPM packages from Table 8 on page 18 into the temporary directory:

Download kernel updates as needed

If you are using Linux on pSeries SuSE SLES 8.1 on your management server, download the required kernel updates into the temporary directory. See Table 9 on page 18.

Step 3. Register host names of nodes and management server

Register the host names of the following with the nameserver, or add them to the **/etc/hosts** file on the management server.

- Management server
- Nodes that are being defined to the cluster
- Hardware Control:
 - HMC host name for pSeries hardware
 - Remote Supervisor Adapter (RSA) host name for xSeries hardware
 - APC MasterSwitch host name for IntelliStation
 - Management module host name for BladeCenter

Step 4. Create the /csminstall partition

IBM recommends that you create a separate partition called **/csminstall**, on the management server, to hold the required CSM packages. The size of this partition will depend on how you plan to use the cluster and the software it will contain. The elements of your system require approximately the following space:

- CSM-only installation – 100 MB
- Linux operating system – 2.5 GB per version of Linux installed depending on the distribution packages that you install

For examples of how to create partitions, see your Red Hat, SuSE, or SLES documentation.

Step 5. Download CSM packages from the website

If you plan to install CSM from the CD-ROM, you do not need to download software from the website. Skip this step and go directly to “Step 6. Install the `csm.core` package.”

If you do not plan to install CSM from the CD-ROM, you need to download CSM and other required software from the website and place the files in a directory. This option allows you only to try the CSM software through the Try and Buy license for 60 days. See “Understanding CSM licensing requirements” on page 9 for more information about the CSM licenses.

For xSeries Linux CSM packages:

1. Go to the following *IBM Cluster software corrective service* website:
`http://techsupport.services.ibm.com/server/cluster/fixes`
2. Click on CSM for Linux 1.3.2 download link in *Cluster systems Management for xSeries Linux* and download the CSM tarball to a temporary directory (for example, `/tmp/csm`):
3. Untar the CSM tarball:

```
cd /tmp/csm
tar -xzvf csm-linux-1.3.2.0.i386.tar.gz
```

For Linux on pSeries CSM packages:

1. Go to the following *IBM Cluster software corrective service* website:
`http://techsupport.services.ibm.com/server/cluster/fixes`
2. Click on CSM for Linux 1.3.2 download link in *Cluster systems Management for pSeries Linux* and download the CSM tarball to a temporary directory (for example, `/tmp/csm`):
3. Untar the CSM tarball:

```
cd /tmp/csm
tar -xzvf csm-linux-1.3.2.0.ppc64.tar.gz
```

Note: Download the **OpenCIMOM** RPM from the CSM website.

Step 6. Install the `csm.core` package

Follow these procedures to install CSM directly from the CD-ROM:

1. Mount the CSM CD ROM.
2. Install the **`csm.core`** package.

To mount and install **`csm.core`** for Red Hat or Red Hat AS, do the following:

```
mount /dev/cdrom /mnt/cdrom
rpm -i /mnt/cdrom/csm.core-*
```

To mount and install **`csm.core`** for SuSE or SuSE SLES, do the following:

```
mount /dev/cdrom /media/cdrom
rpm -i /media/cdrom/csm.core-*
```

To install CSM from a directory, do the following:

1. If you have not already downloaded the CSM packages, follow the instructions in “Step 5. Download CSM packages from the website.”
2. Run the **`rpm`** command to install the **`csm.core`** package from the `/tmp/csmreqs` directory, as follows:


```
rpm -i /tmp/csmreqs/csm.core-*
```

Step 7. Update glibc on the management server (required for Red Hat 8.0 and 9)

If you are using a Red Hat 8.0 or 9 management server, you need to update the **glibc**. To update these packages on the management server do the following:

1. Ensure that you have downloaded the files into a temporary directory. For a list of required **glibc** RPM packages, see Table 6 on page 18 for Red Hat 8.0 or Table 7 on page 18 for Red Hat 9.
2. Use the **rpm** command to update Red Hat packages. For RedHat 8.0, update the packages as follows:

```
rpm -Fvh /tmp/glibc/glibc-*2.3.2-4.80*rpm
```

For RedHat 9, update the packages as follows:

```
rpm -Fvh /tmp/glibc/glibc-*2.3.2-27*rpm
```

If you have **nptl-devel*rpm** on your system, use the following command:

```
rpm -Fvh /tmp/csm/req-rpms/nptl-devel-2.3.2-27.9.i686.rpm glibc-*2.3.2-27*rpm
```

Step 8. Update syslinux on the management server (required for Red Hat 8.0)

If you are using a Red Hat 8.0 management server, and any of the nodes in your cluster is an x335 machine with BIOS level 1.04 or higher, you need to update the **syslinux** RPM on the management server to version 2.04 or higher. To update this package on the management server, do the following:

1. Ensure that you have downloaded the RPM package into a temporary directory. See Table 3 on page 18 for the download location.
2. Update the syslinux package as follows:

```
rpm -U /tmp/syslinux-*.rpm
```

In “Step 10. Install the CSM software” on page 30, the **installms** command copies the **pxelinux.0** file to **/tftpboot**. If **syslinux** is updated after CSM has been installed on the management server, you must rerun **installms** (see “Step 10. Install the CSM software” on page 30) to ensure that the command copies the updated **pxelinux.0** file to **/tftpboot**.

Step 9. Update the openssh package on the management server (required for non-pSeries SuSE 8.1)

In “Step 2. Download the non-IBM software” on page 26, you downloaded **openssh** packages from Table 8 on page 18 into a temporary directory. To avoid delay problems with the openssh RPM on the base SuSE 8.1 CD for xSeries, IntelliStation, or BladeCenter, issue the following command to update the **openssh** packages. In the following example, the **openssh** updates are in the temporary directory **/tmp/csmreqs/openssh**:

```
rpm -U /tmp/csmreqs/openssh
```

Step 10. Install the CSM software

Running installms from the management server: Because you are prompted for the Linux operating system CD-ROMs during the installation process, be sure to run the **installms** command from the management server.

The **installms** command performs the tasks that are necessary to make the system a management server and installs the required software. If the software is not installed, or if the software is at a previous level, the command installs the prerequisites from the Linux distribution and IBM software on the management server. You can run the **installms** command multiple times after the management server is already set up.

The **installms** command is located in **/opt/csm/bin**.

Setting up the /csminstall partition

IBM suggests that you set up the **/csminstall** partition before you run the **installms** command. See “Step 4. Create the /csminstall partition” on page 27. If you do not set up the **/csminstall** partition before you run the **installms** command, the command creates the **/csminstall** directory in the root (/) partition.

Installing CSM software

Ensure that **csm.core** is installed on the management server. If you are installing CSM from the CD-ROM, ensure that the CD-ROM is mounted. See the instructions in “Step 6. Install the csm.core package” on page 28.

Perform the installation as follows:

1. Log in as root to the machine that is to become the management server.
2. If you are installing CSM from a directory instead of the CD-ROM, and if you have not already downloaded the required non-IBM packages, follow the instructions in “Step 5. Download CSM packages from the website” on page 28.
3. Run the **installms** command with the **-p** (pkg_path) option, followed by a list of paths with each path separated by colons. This path list consists of the mount point of the CD-ROM or directory in which the CSM packages reside, and the directory containing any downloaded RPM packages. If you’ve copied the Linux distribution CDs to a directory, that directory is in the path (optional).

First put the directories containing the newest versions of RPM packages in the **p** path. For example, first specify the directory containing downloaded packages, then the CSM directory. If the contents of the Linux distribution CDs are in a directory, specify that directory last.

Examples:

1. For SuSE or SuSE SLES, if the CSM packages are on a CD-ROM, and the other downloaded RPMs (such as Autoupdate) are in a directory called **/tmp/csmreqs**, run the **installms** command as follows:

```
installms -p /tmp/csmreqs:/media/cdrom
```

2. For Red Hat and Red Hat AS packages, if the CSM packages are on a CD-ROM, and the other downloaded RPMs (such as Autoupdate) are in a directory called **/tmp/csmreqs**, run the **installms** command as follows:

```
installms -p /tmp/csmreqs:/mnt/cdrom
```

3. If the CSM packages are in a directory called **/tmp/csm**, and the other downloaded RPMs (such as Autoupdate) are in a directory called **/tmp/csmreqs**, run the **installms** command as follows:

```
installms -p /tmp/csmreqs:/tmp/csm
```

The program asks you to insert the Linux distribution CD-ROMs into the drive. The program automatically mounts and unmounts the CD-ROMs, as needed, and copies the Linux RPMs that are required to the **/csminstall** directory.

The CSM, Linux distribution, and Open Source packages are used to install the management server, and some of the packages are used later to install the nodes. The **installms** command determines whether the code needs to be installed (if it is missing or back level), and then installs or replaces the required packages, as necessary.

Note: If the CSM packages, open source packages, or Linux distribution packages are in directories, be sure to specify each directory with the **-p** option.

The **installms** command establishes the CSM directories and the required files when it is run from the management server. For more information about these files and directories, see Appendix A, “Understanding the installation directories and files,” on page 93.

For more information about the **installms** command, see the man page or the *CSM for Linux: Command and Technical Reference*.

Diagnosing installms command errors

This section contains some of the common errors that may occur when you run the **installms** command, as well as some possible solutions. If errors occur when you run the **installms** command, verify that all necessary software updates (or fixes) have been installed. You must install updates for the **csm.core**, **csm.client**, or **csm.dsh** packages before running any CSM commands. See Chapter 10, “Migrating to the latest level of CSM for xSeries, IntelliStation, and BladeCenter,” on page 83 for more information.

Device busy: If you get a device–busy message while running the **installms** command, ensure that your current directory is not **/cdrom** or **/media/cdrom**. Running the **installms** command while in these directories causes a device–busy condition because it interferes with the mounting and unmounting of Linux distribution CD-ROMs.

Command not found: If the **installms** command is not found, make sure your PATH includes **/opt/csm/bin** and check for the existence of the **installms** command in that directory. If it does not exist in **/opt/csm/bin**, make sure that the **csm.core** package has been installed. If it is not installed, see “Step 6. Install the csm.core package” on page 28.

Prerequisite software not copied: After running the **installms** command, if the CSM packages and prerequisite software are not copied to the **/csminstall** subdirectories, CSM displays an error message. Verify that the files are in the path that you passed to the **installms** command. If they are not in the path, gather the missing files, put them in a directory with the rest of the files, and run the **installms** command again. Also, check the command usage to verify that you used the command correctly.

Errors with the Korn Shell (ksh): CSM uses the **pdksh** distribution of **ksh** (Korn Shell). If you already have a different distribution of **ksh** on your machine, the **installms** command exits with a **conflicts** error. Uninstall the non-**pdksh** distribution) of **ksh** and run the **installms** command again.

If you get a **conflicts** error, uninstall the package that the message specifies.

If other errors occur, check the log file for the **installms** command **/var/log/csm/installms.log**. The log file contains error and informational messages that are useful when debugging problems.

Step 11. Decide which remote shell to use

A distributed shell program (**dsh**) is used to issue remote commands from the management server to the nodes. It is contained in the **csm.dsh** RPM.

The **dsh** program uses a remote shell of your choice to issue remote commands to the managed nodes. The default remote shell is **/usr/bin/ssh**, but you can specify a different remote shell (**/usr/bin/rsh**) by running the **csmconfig** command with attribute value pairs.

Attributes for the remote shell: Two **csmconfig** attributes affect the remote shell:

csmconfig attribute

RemoteShell

Stores the pathname of the executable that dsh uses to run remote commands.

SetupRemoteShell

Indicates to CSM that you want the remote shell to be automatically configured (1 = yes, 0= no).

CSM can automatically configure OpenSSH during both operating system and CSM-only installations. However, CSM can only configure **rsh** during an operating system installation or when the root directory is able to issue **rexec** commands to the nodes. In any other situation, you need to manually configure **rsh**. For information. (See “Setting up remote access manually” on page 75.)

Run the **csmconfig** command to display the current values for the *RemoteShell* and *SetupRemoteShell* attributes. You can set the *RemoteShell* and *SetupRemoteShell* attributes to other values. For example, the following command sets the remote shell to **rsh** and instructs CSM not to automatically set it up:

```
csmconfig RemoteShell=/usr/bin/rsh SetupRemoteShell=0
```

You can also temporarily change the remote shell setting with the **DSH_REMOTE_CMD** environment variable. For example, to switch from the default **rsh** shell to **ssh**, specify the **DSH_REMOTE_CMD** environment variable with the full path name of the remote shell command:

```
export DSH_REMOTE_CMD=/usr/bin/ssh
```

For more information about using the *RemoteShell* attribute, see the **csmconfig** and **dsh** man pages or the *CSM for Linux: Command and Technical Reference*.

RPM updates for base SuSE 8.1 CD: A problem with the **openssh** RPM shipped on the base SuSE 8.1 CD can lead to long delays during connection establishment

in the SSH protocol. To fix the problem, ensure that you update the **openssh** RPM packages on the management server. See Table 8 on page 18.

Step 12. Apply updates

If you have any CSM software updates to apply, see Chapter 10, “Migrating to the latest level of CSM for xSeries, IntelliStation, and BladeCenter,” on page 83 for instructions and apply them now.

Step 13. Accept the CSM license

CSM is available in two forms. You can either purchase a *full production* license and license key for CSM, or you can use a 60-day *try-and-buy* license option, at no charge. The *try-and-buy* license is included with the CSM product code.

Accepting the full production license

1. The license key you need is located on the CSM CD-ROM. It is called **csmlum.full**. You will use the key file as input for the **csmconfig** command, in the next step.

2. Accept the license and activate the license key, using the **mount** and **csmconfig** commands. For SuSE or SuSE SLES, enter the following commands.

```
mount /dev/cdrom /media/cdrom
csmconfig -L /mnt/cdrom/csmlum.full
```

For all other Linux distributions, enter the following commands:

```
mount /dev/cdrom /mnt/cdrom
csmconfig -L /mnt/cdrom/csmlum.full
```

At the prompt, follow the directions to accept the CSM license.

3. Check the success of the **csmconfig** command, by running it with no options, and then checking the output:

```
csmconfig
```

The following is sample output of the **csmconfig** command:

```
AddUnrecognizedNodes = 0(no)
ClusterSNum = 654BN5011
ClusterTM = 9078-160
ExpDate =
HeartbeatFrequency = 12
HeartbeatSensitivity = 8
MaxNumNodesInDomain = -1 (unlimited)
PowerstatusMode = 0(Mixed)
RegSyncDelay = 1
RemoteShell = /usr/bin/ssh
SetupRemoteShell = 1(yes)
```

Accepting the try-and-buy license

To accept the 60-day try-and-buy license agreement, issue the **csmconfig** command, as follows:

```
csmconfig -L
```

You can check the success of the **csmconfig** command, by running it with no options, and then checking the output:

```
csmconfig
```

The **csmconfig** command returns sample output like the following. Because you accepted the try-and-buy license, you see a date in the *ExpDate* field.

```
AddUnrecognizedNodes = 0(no)
ClusterSNum = 654BN5011
ClusterTM = 9078-160
ExpDate = Sat Nov 30 18:59:59 2003
HeartbeatFrequency = 12
HeartbeatSensitivity = 8
MaxNumNodesInDomain = -1 (unlimited)
PowerstatusMode = 0(Mixed)
RegSyncDelay = 1
RemoteShell = /usr/bin/ssh
SetupRemoteShell = 1(yes)
```

Step 14. Install the Linux Cluster Support extension for IBM Director (optional for non pSeries)

You need to complete this step only if you plan to use IBM Director and CSM together to manage your Linux cluster. If you do not plan on using IBM Director, or do not want to take advantage of the integration between CSM and IBM Director that the Linux Cluster Support extension provides, skip this step. (You can always complete this step at a later time.) For information about IBM Director, see “Linux Cluster Support extension for IBM Director (for Linux on xSeries, IntelliStation, or BladeCenter only)” on page 20.

To use IBM Director and CSM together to manage your Linux cluster, you must add the Linux Cluster Support extension components to your IBM Director Server, and to your CSM management server and each managed node. (The Linux Cluster Support extension components and the tools for installing them are part of CSM.) This step describes how to add the appropriate extension components to your management server. Appendix B, “Using CSM with IBM Director (non pSeries only),” on page 97 describes how to add the appropriate extension components to your other systems.

This step assumes that you have a CSM management server already installed.

Adding Linux Cluster Support extension components to your CSM management server

To add the appropriate Linux Cluster Support extension components to your CSM management server, run the following command:

```
/opt/csm/bin/addlcsext -A
```

This command installs the IBM Director Agent, if it is not already present, and the appropriate Linux Cluster Support extension components for an IBM Director Agent system. Whenever you later issue **installnode** or **updatenode**, the commands automatically run **addlcsext** on the target nodes. This means that once the management server has the IBM Director Agent and Linux Cluster Support extension, the nodes that the management server installs or updates automatically receive the IBM Director Agent and Linux Cluster Support extensions.

Step 15. Verifying and troubleshooting the installation

To verify that the management server has installed correctly and is ready for use, you can run the **ibm.csm.ms** probe, which is shipped with CSM. To run the probe issue the following command.

```
probemgr -p ibm.csm.ms -l 0
```

For information about CSM support for probes, see *CSM for Linux: Administration Guide*.

Installing CSM on an x440 or x445 management server that runs Red Hat AS

You can use this procedure to install CSM on the x440 or x445 management server that runs Red Hat AS 2.1.

In order to use Red Hat AS 2.1 on the x440 or x445, you need to use the updated Red Hat AS 2.1 2.4.9-e.24summit kernel, which incorporates non-uniform memory access (NUMA) support. This NUMA support allows you to see the correct number of processors on the machine. The updated summit kernel is shipped with the **Red Hat Enterprise Linux AS (v. 2.1 for i386) Update 2 CDs**, which is available from the Red Hat Network at the following website:

https://rhn.redhat.com/network/software/download_isos.pxt.

For information on installing CSM on x440 or x445 nodes, see “Installing CSM on x440 or x445 nodes with the Red Hat AS 2.1 operating system already installed” on page 54.

For information on installing CSM and Red Hat AS 2.1 on x440 or x445 nodes, see “Installing CSM and the Red Hat operating system on x440 and x445 nodes” on page 70.

For software consistency, IBM recommends that you install the management server with the Red Hat AS 2.1 Updates CDs. Because versions 2.96-116 and higher of the libstdc++ libraries are not compatible with CSM or RSCT, you must downgrade the libstdc++ RPM package. After installation of Red Hat AS on the management server, but before you install CSM and RSCT, do the following:

1. Go to the following website to download the libstdc++-2.96-108.1.i386.rpm from the base Red Hat AS 2.1 CDs:

<https://rhn.redhat.com/network/software/packages/details.pxt?pid=28552>

2. Use the following commands on the management server to replace the existing version of libstdc++ with the download version:

```
rpm -e --nodeps libstdc++
rpm -i --nodeps libstdc++-2.96-108.1.i386.rpm
```

Chapter 5. Defining nodes for the cluster

Before you can add or update a node, you must define the node attributes. Use the following steps as a guide:

1. Determine the node attributes.
2. Collect the information about the nodes.
3. Define the nodes.

Determining node attributes

As part of the CSM cluster installation process, gather information that will be used to define the cluster nodes. The pieces of information that make up a node definition are referred to as *node attributes*. The complete list of node attributes and descriptions are documented in the **nodeattributes** man page.

This section provides information about the attributes that are needed when you define nodes and how to determine which values to use.

The information is divided into three categories; general attributes, hardware control information, and information about installation software.

General attributes

Hostname

The host name of the network to which the management server is connected. **Hostname** is always required and must be specified when you define the node.

ManagementServer

The host name of the network to which the management server is connected. **ManagementServer** is always required. If a network route to the node exists at the time the node is defined, the attribute is set by default. If a route to the node does not exist, then the name must be the host name of the management server on the network that installs the node.

UserComment

Any useful information concerning this node. Not required.

Mode

The node's current phase in the install process. Set this attribute to **MinManaged** or run the **definemode** command with the **--minmanaged** option when you are defining a node to be minimally managed. See "Installing Linux nodes without CSM" on page 20. If you don't set the node's **Mode** attribute, CSM sets it automatically during the different phases of the installation.

Hardware control attributes

You must define the hardware-related attributes for Linux nodes. In some cases default values are provided. If these defaults are acceptable, you do not need to provide the attribute values when you define the node.

For a complete description of the meaning and use of these attributes, see *CSM for Linux: Hardware Control Guide*.

For pSeries Linux nodes:

| *PowerMethod*

| The power method that is to perform hardware control. For pSeries nodes
| that are controlled by a Hardware Management Console (HMC), this value
| is **hmc**.

| *HWControlPoint*

| The host name of the hardware control point. For pSeries nodes, this value
| is the host name of the HMC.

| *HWControlNodeId*

| The identifier used for power control that is associated with the node. For
| pSeries nodes, this is the partition name of the LPAR or CEC name of the
| CEC in SMP mode.

| *ConsoleMethod*

| The console method that is to open a node console. For pSeries nodes that
| are controlled by a Hardware Management Console (HMC), this value is
| **hmc**. If the *PowerMethod* attribute is set to **hmc**, this value is set by
| default.

| *ConsoleServerName*

| The host name of the network adapter for the console server. For pSeries
| nodes that are controlled by a Hardware Management Console (HMC) this
| value is host name of the HMC. If the *PowerMethod* attribute is set to **hmc**,
| this value is set by default to the host name of the HMC.

| *InstallAdapterDuplex*

| The duplex value of the network adapter that is used to install the node.
| Valid values are: **auto**, **half**, or **full**.

| *InstallAdapterMacaddr*

| The machine address of the Ethernet adapter that is to install the node.

| *InstallAdapterSpeed*

| The speed of the network adapter that is to install the node. Valid values
| are: **auto**, **10**, **100**, or **1000**.

| *InstallAdapterType*

| The type of the network adapter that is to install the node. Valid values are:
| **ent** (Ethernet) or **tok** (token ring).

| **For xSeries Linux nodes, IntelliStation, and eServer 325 nodes:**

| *PowerMethod*

| The power method that is used to perform hardware control. For xSeries
| nodes, the value must be set to **xseries**. For IntelliStation nodes, the value
| must be set to **apc**. For eServer 325 nodes, the value must be set to **bmc**.

| *HWControlPoint*

| The host name of the network interface for the hardware control point. For
| xSeries nodes, use the host name of the IBM Remote Supervisor Adapter
| (RSA). For IntelliStation nodes, use the host name of the APC
| MasterSwitch into which the node is plugged. For eServer 325 nodes, use
| the host name or IP address of the Baseboard Management Controller
| (BMC).

| *HWControlNodeId*

| The power control identifier that is associated with the node. For xSeries
| nodes, use the **TextID** associated with the node's Internal System

Management Processor (ISMP). For IntelliStation nodes, use the APC MasterSwitch outlet number the node is plugged into. For eServer 325 nodes, use the node host name.

ConsoleMethod

The console method that is to open a node console. Valid values are: **mrv**, **esp**, **els**, **computone**, and **cps**.

ConsoleSerialDevice

The device name of the console serial port on the node. This attribute is an option when you define the resource and can be edited. Valid values are: **ttyS0**, **ttyS1**, and **NONE**. If no value is specified for this attribute when the node is created with the `definnode` command, a default value of **ttyS0** is set. If the system has no serial port defined, or if you do not want console output redirected to the serial port, the *ConsoleSerialDevice* attribute value must be set to **NONE**.

ConsoleServerName

The host name of the network adapter for the console server.

ConsoleServerNumber

The number associated with the ESP console server. This attribute is only required if you are using ESP console servers.

ConsolePortNum

The number associated with the console port for this node. The valid MRV console port numbers range from 1 through 40 depending on the model. Valid ESP port numbers are: 0,1,2,3,4,5,6,7,8,9,a,b,c,d,e, and f. The valid CPS, ELS and Computone console numbers range from 1 through 16 (decimal).

For BladeCenter nodes

PowerMethod

The power method that is used to perform hardware control. For BladeCenter nodes, the value must be set to **xseries**.

HWControlPoint

The host name of the network interface for the hardware control point. For BladeCenter nodes, use the **hostname** of the BladeCenter Management Module.

HWControlNodeId

The power control identifier that is associated with the node. For BladeCenter nodes, use the blade Advanced System Management (ASM) name.

ConsoleMethod

The console method that is to open a node console. For SP Nodes and p660 servers, this value must be set to **cps**.

The following console attributes are only valid if the BladeCenter is part of an eServer Cluster 1350, and the optional Serial Port Module (SPM) components have been installed. If the SPM components have not been installed, set the *ConsoleSerialDevice* attribute for all blades to **NONE**, and leave the *ConsoleMethod*, *ConsoleServerName*, *ConsoleServerNumber*, and *ConsolePortNum* attributes blank.

ConsoleSerialDevice

For BladeCenter nodes, this value must be set to **mrv**.

ConsoleServerName

For BladeCenter nodes, use the host name of the MRV Console Server the blade to which it is connected.

ConsoleServerNumber

Leave this field blank.

ConsolePortNum

For BladeCenter nodes, use the MRV console server port number the blade to which it is connected.

Installation software information for nodes

The following topic describes the software-related attributes that you must define for xSeries, and Linux on pSeries nodes. Note that all of these values use the characteristics of the management server as defaults. If these values are acceptable, you do not need to specify any of the attributes when you define the node.

InstallCSMVersion

The version of CSM that is to be installed on the node. This value must be in the format *version.release.modification*, (for example, 1.3.2). When you define a node, the default is the version of CSM that is installed on the management server.

InstallOSName

The name of the operating system to install. When you define a node, the default is the name of the operating system that is installed on the management server. For Linux nodes the value must be **Linux**.

InstallDisk

The specific disk to install. This value is set to **/dev/sda**, **/dev/hda**, **/dev/hdb**, etc. If *InstallDisk* is set, *InstallDiskType* is ignored. *InstallDisk* is only used for SuSE or SuSE SLES nodes.

InstallDiskType

Type of disk to be used for node installation. This value should be set to "ide" for nodes that contain an ide disk in a SuSE or SuSE SLES cluster. This attribute does not need to be set for nodes that contain a scsi disk in a SuSE or SuSE SLES cluster, or for nodes in a Red Hat or Red Hat AS cluster. If *InstallDisk* is set, the attribute is ignored.

InstallDistributionName

The name of the operating system distribution. The valid values are **RedHat**, **RedHatAS**, **SuSE**, and **SLES**. For pSeries nodes, only **SLES** is valid. When you define a node, the default is the distribution name installed on the management server. For Linux on pSeries nodes, only **SLES** is valid.

InstallDistributionVersion

The name of the distribution version to be installed. For Linux, the format is *version.release*, (for example, 8.0). When you define a node, the default is the distribution version installed on the management server. The valid values are

- For Red Hat Linux: **7.2**, **7.3**, **8.0**, or **9**
- For Red Hat Linux AS: **2.1**
- For SuSE Linux: **8.0**, or **8.1**
- For SuSE SLES Linux: **7.2** or **8.1**

InstallPkgArchitecture

The machine architecture of the node. For xSeries, IntelliStation, or BladeCenter nodes, the only valid attribute value is **i386**. This value represents any machine whose architecture is **i386**, **i486**, **i586**, or **i686**. For pSeries nodes, the only valid attribute value is **ppc64**. When you define a node, the default is the machine architecture of the management server.

InstallServer

The host name of the desired install server and optionally, a user specified directory where the CSM repository should be stored. These values are separated by a colon. If no directory is specified, **/csmsserver** is used. In order to have enough space for the CSM repository, administrators may wish to create the **/csmsserver** directory in a separate file system. It will have size requirements similar to **/csminstall** on the management server.

If the *InstallServer* attribute is blank, the management server's **/csminstall** directory is used to serve the install files.

The CSM code will copy the Linux and csm directories into the specified install server directory. You should not store other data in the install server directory. This is valid only for Red Hat and Red Hat AS clusters.

InstallTemplate

The template file that is used to install this node. For kickstart installs, this value defaults to the following:

```
/opt/csm/install/kscfg.tmpl.InstallDistributionNameInstallDistributionVersion
```

For AutoYaST installs, this value defaults to the following:

```
/opt/csm/install/yastcfg.InstallDistributionNameInstallDistributionVersion-Architecture.xml
```

Collecting node attribute values

At this point, you have identified what attributes are required for your node definitions. The next step is to collect the actual values you need for the attributes.

You can do this as a manual task. You can make decisions about the hostnames, networks, adapters, and so on during the planning process, and record the information for use when you actually define the nodes in the CSM database.

An alternative to creating a hard copy template for each node would be to create a node definition stanza file. This is a file that contains information for each node, and you can pass this file directly to the **definenode** command during the CSM installation process. See “Creating a node definition file” on page 43 for details.

Defining the nodes

You run the **definenode** command on the CSM management server to define all the nodes in a CSM cluster. The command creates node definitions in the CSM database. Note that the **definenode** command simply creates definitions for the nodes in the cluster (**premanaged** node).

The **definenode** command provides several options for creating cluster node definitions:

1. Create one definition at a time.
2. Use a node definition file as input to the command to define multiple nodes.

3. Use the **-M** flag to automatically define nodes that are listed in a host name mapping file.
4. Use *starting_node* and *count* values to automatically generate a set of node definitions with consecutive IP addresses.
5. Create a node definition file (use the **-s** flag and redirect the output to a file) that you can modify and use as input to the **definnode** command.

Note that you can pass null values for any of the attributes with the **definnode** command by not specifying anything for the attribute value. In the following example, the values for the *PowerMethod* and *ConsoleMethod* attributes are specified as null:

```
definnode -n clsn01 PowerMethod= ConsoleMethod=
```

See the man page or *CSM for Linux: Command and Technical Reference* for details on **definnode** command line syntax.

Defining a single node

The information required to define a node may differ depending on such things as the type of node to be defined, and whether or not hardware control is supported on the node. The host name or IP address of the node is always required. The specific information about a node is stored in the CSM database and is usually referred to as node *attributes*. For a complete list of attributes that you can set when issuing the **definnode** command see the **nodeattributes** man page.

Note: If you are not using hardware control in the cluster, the only required attribute for a node is the host name.

Linux on xSeries, IntelliStation, or BladeCenter nodes

The following information is required if you are using hardware control:

- The resolvable host name or IP address of the node. This is the nodes' network interface, as known by the management server.
- The *PowerMethod* attribute set to **xseries** for xSeries nodes and **apc** for IntelliStation nodes..
- The *HWControlPoint* and *HWControlNodeId* attribute values. *HWControlNodeId* must be unique per node.
- The *ConsoleMethod* attribute set to **mrsv**, **esp**, **computone**, **conserver**, **els**, or **cps**.
- The *ConsoleServerName*, *ConsoleServerNumber*, and *ConsolePortNum*, and *ConsoleSerialDevice* attribute values.
- The *InstallCSMVersion*, *InstallOSName*, *InstallDistributionName*, *InstallDistributionVersion* and *InstallPkgArchitecture* attributes must be set to appropriate values.

For example, to define a node whose hardware control point is defined as an RSA adapter on a Linux node, issue the **definnode** command. In this example, the service process of the node is defined as the short host name, and the node uses an MRV console server (*ConsoleMethod=mrsv*):

```
definnode -n node1.pok.ibm.com -H rsa01.pok.ibm.com -C mrsv01.pok.ibm.com \
PowerMethod=xseries ConsoleMethod=mrsv
```

Linux on pSeries nodes

The following information is required if you are using hardware control:

- The resolvable host name or IP address of the node. This is the node's network interface, as known by the management server.
- The *PowerMethod* attribute value set to **hmc**.
- The *HWControlPoint* and either the *LParID* or *HWControlNodeID* attribute values. *HWControlNodeID* must be unique per node.
- The *InstallCSMVersion*, *InstallOSName*, *InstallDistributionName*, *InstallDistributionVersion* and *InstallPkgArchitecture* attributes must be set to appropriate values.

For example, the following command defines a pSeries node with host name *node1.pok.ibm.com*.

```
definenode -n node1.pok.ibm.com -H hmc12 PowerMethod=hmc \
  InstallCSMVersion=1.3.2
```

If values are not provided for some attributes on the command line, default values are set. For example, the default values for the *InstallOSName* and *InstallCSMVersion* attributes are set to the operating system name and the CSM version that is installed on the management server. Also, for nodes with a *PowerMethod* of **hmc**, the *ConsoleMethod* and *ConsoleServerName* can be set automatically.

To view the values that are set by the **definenode** command, without actually creating the definition, use the **-s** option. If **-s** is specified on the command line, the **definenode** command displays the list of attributes and values that would be set for the node.

Creating a node definition file

A node definition file contains a stanza of information for each node to be defined. You can pass this file to the **definenode** command to create the node definitions in the CSM database.

This section contains rules for the format of the node definition file and examples of stanzas for Linux nodes. Note that the examples contain attributes that have default values. If the default values are acceptable, you do not have to include them in the stanzas.

The information in this section is also provided in the CSM **nodedef** man page.

Node definition file rules

- A stanza header consists of the node name followed by a colon (:).
- Attribute lines must take the form of *Attribute=Value*.
- If a line is not blank, a comment, a header, or an attribute=value pair, then the command will skip to the next valid header.
- A warning message is issued for attributes that are not valid, but the code will continue.
- Each line of the file may have only one header or attribute definition.
- Only one stanza may exist for each node.
- If the header keyword is *default* then the attribute values in the stanza are considered default values for subsequent node definitions.

- Default stanzas may be specified multiple times and at any point in a definition file. The values apply to all definitions following it in the file. The default values are cumulative. That is, a default attribute value will remain set until it is explicitly unset or changed.
- To turn off a default value, set the attribute to nothing (blank).
- When a specific value for an attribute is provided in the node stanza, it will take priority over any default value that had been set.
- Comments beginning with the pound sign (#) may be added to the file. Comments must be on a separate line.
- When parsing the file, tab characters and spaces are ignored.
- Some attribute values is set by default by the **definenode** command when this file is used as input. This applies to attributes that you do not include in the node definition file (if you do not set them in the node definition file, the default value is used).

Linux examples without default stanzas

```
nfnode01:
  ManagementServer=c5bs.ppd.ibm.com
  InstallCSMVersion=1.3.2
  InstallOSName=Linux
  InstallDistributionName=RedHat
  InstallDistributionVersion=7.3
  InstallPkgArchitecture=i386
  InstallAdapterMacaddr=00:05:AB:6E:05:16
  PowerMethod=xseries
  HWControlPoint=rsa05
  HWControlNodeId=frame01
  ConsoleMethod=mrv
  ConsoleSerialDevice=ttyS0
  ConsoleServerName=mrv15
  ConsolePortNum=1
```

```
nfnode02:
  ManagementServer=c5bs.ppd.ibm.com
  InstallCSMVersion=1.3.2
  InstallOSName=Linux
  InstallDistributionName=RedHat
  InstallDistributionVersion=7.3
  InstallPkgArchitecture=i386
  InstallAdapterMacaddr=00:07:AB:6D:05:7E
  PowerMethod=xseries
  HWControlPoint=rsa04
  HWControlNodeId=frame02
  ConsoleMethod=mrv
  ConsoleSerialDevice=ttyS0
  ConsoleServerName=mrv15
  ConsolePortNum=2
```

Linux examples with a default stanza

```
default:
  PowerMethod=xseries
  ConsoleMethod=esp
  ConsoleServerName=esp15
  ConsoleServerNumber=2
  ConsolePortNum=0
  InstallOSName=Linux
  InstallCSMVersion=1.3.2
  HWControlPoint=asm03
  ManagementServer=c5bs.ppd.xyz.com
  InstallDistributionVersion=7.3
```

```
nfnode11:
  HWControlNodeId=nfnode11
```



```
nfnode12:
  ConsolePortNum=2
  HWControlNodeId=nfnode12

nfnode13:
  HWControlPoint=asm05
  HWControlNodeId=nfnode13
  ConsolePortNum=3
```

Using a node definition file

You can use a node definition (nodedef) file to define multiple nodes. This file consists of stanzas containing node attribute values for each node to be defined. To use a node definition file, you should start by looking at the sample file provided with CSM. The `/opt/csm/install/nodedef.sample` file contains information on the format that must be used and also provides examples.

You can create this file manually and pass it to the **definnode** command using the `-f` option. The **definnode** command uses information in the **nodedef** file to create node definitions. When possible, default values are set for attributes that are not specified in the file. The **definnode** command does not allow you to specify additional attributes on the command line when using the `-f` option.

Another way to create a nodedef file is to use the **definnode -s** option. The `-s` option tells the **definnode** command to send a list of the nodes and their attributes to standard output. The information includes what you provided on the command line in addition to whatever default values would be set. The nodes are not defined in the CSM database if you use the `-s` option. You can redirect the output of the **definnode -s** command to a file. This file is created in the correct format to be used as a node definition file. Check this file to be sure it is correct and complete, and edit the file, if necessary, before using it to define the nodes.

See the **nodedef** man page or *CSM for Linux: Command and Technical Reference* for more details about the node definition file.

Also see “Creating a node definition file” on page 43 for an example of a typical node definition file.

To define a set of cluster nodes, as specified in a node definition file, issue the **definnode** command. For example:

```
definnode -f /tmp/mynodedefs
```

Using a hostname mapping file

Using the `-M` option and specifying a host name mapping file with the **definnode** command is a convenient way to define large numbers of CSM cluster nodes. The host name mapping (hostmap) file contains a list of host names and associated hardware control information. The **definnode** command uses the information in the file to create CSM node definitions. Any other required attribute values can be specified on the command line.

A hostmap file can be created by running the **lshwinfo** command, redirecting the output to a file, and editing the file to add the host names for each machine.

Note: The **lshwinfo** command is not available for the apc PowerMethod.

The **lshwinfo** command may not always be able to return information for all the columns listed in the output. In most cases, except for the host name, the information left out will not be required. Missing fields could be added manually, if necessary.

Linux on xSeries node example

For example, to create a hostmap file that lists the nodes associated with hardware control points *frame10* and *frame11* and a *PowerMethod* of **xseries** to a file called **/tmp/hcp_out**:

1. Issue the **lshwinfo** command, as follows:

```
lshwinfo -p xseries -c frame10,frame11 -o /tmp/hcp_out
```

The output file **/tmp/hcp_out** would look similar to this:

```
# Hostname::PowerMethod::HWControlPoint::HWControlNodeID::LParId: \
:HWType::HWModel::HWSerialNum
no_hostname::xseries::frame10.acme.com::node01:::
no_hostname::xseries::frame10.acme.com::node02:::
no_hostname::xseries::frame10.acme.com::node03:::
no_hostname::xseries::frame10.acme.com::node04:::
no_hostname::xseries::frame11.acme.com::node01:::
no_hostname::xseries::frame11.acme.com::node02:::
no_hostname::xseries::frame11.acme.com::node03:::
no_hostname::xseries::frame11.acme.com::node04:::
```

2. Edit the hostmap file to add the host names for each node. For example:

```
# Hostname::PowerMethod::HWControlPoint::HWControlNodeID::LParId: \
:HWType::HWModel::HWSerialNum
clsn01::xseries::frame10.acme.com::node01:::
clsn02::xseries::frame10.acme.com::node02:::
clsn03::xseries::frame10.acme.com::node03:::
clsn04::xseries::frame10.acme.com::node04:::
clsn05::xseries::frame11.acme.com::node01:::
clsn06::xseries::frame11.acme.com::node02:::
clsn07::xseries::frame11.acme.com::node03:::
clsn08::xseries::frame11.acme.com::node04:::
```

When using xSeries systems the file could contain information about the nodes that have been defined. You can use this information to create CSM node definitions through the **definnode** command. For example:

```
definnode -M /mydir/mymapfile -C mrv1:1:0:12 ConsoleMethod=mrv /
InstallCSMVersion=1.3.2 InstallOSName=Linux
```

Linux on pSeries node example

The following example shows how to create a host name mapping file that lists the nodes associated with hardware control point *hmc01*, has a *PowerMethod* of **hmc**, and is redirected to a file called **/tmp/mymapfile**:

1. Create the hostmap file, by issuing the following command:

```
lshwinfo -p hmc -c hmc01 -o /tmp/mymapfile
```

The output file **/tmp/mymapfile** would look like the following:

```
# Hostname::PowerMethod::HWControlPoint::HWControlNodeID::LParId::HWType: \
:HWModel::HWSerialNum
no_hostname::hmc::hmc01.kav.opn.com::lpar01::001::7040::681::7017-S9
no_hostname::hmc::hmc01.kav.opn.com::lpar02::002::7040::681::7017-S9
no_hostname::hmc::hmc01.kav.opn.com::lpar03::003::7040::681::7017-S9
no_hostname::hmc::hmc01.kav.opn.com::lpar04::004::7040::681::7017-S9
```

2. Edit the hostmap file to add the host names for each node. For example:

```
# Hostname::PowerMethod::HWControlPoint::HWControlNodeID::LParId::HWType: \
:HWModel::HWSerialNum
clstrn01::hmc::hmc01.kav.opn.com::lpar01::001::7040::681::7017-S9
```

```
c1strn02::hmc:hmc01.kav.opn.com::lpar02::002::7040::681::7017-S9
c1strn03::hmc:hmc01.kav.opn.com::lpar03::003::7040::681::7017-S9
c1strn04::hmc:hmc01.kav.opn.com::lpar04::004::7040::681::7017-S9
```

Note that if the nodes you are defining are pSeries LPARS, the value of the *HWControlNodeId* is the name that was assigned to the LPAR when it was defined. If the host name that you intend to use for that LPAR is used as the LPAR name, it is easier to add the host names to the hostmap file. In this case, the host name would be the same as the *HWControlNodeId*.

For example, the first line in step 2 above would be:

```
c1strn01::hmc:hmc10.acme.com::c1strn01::001::7040::681::7017-S9
```

The **lshwinfo** command might not always be able to return information for all the columns listed above. In most cases, except for the host name, the information left out is not required. You can add missing fields manually, if necessary.

For pSeries systems, the file can contain information about the LPARs that have been defined. This information allows you to create CSM node definitions, by issuing the following command:

```
definenode -M /tmp/mymapfile InstallCSMVersion=1.3.2 InstallOSName=Linux
```

Verifying node information

To verify the information that will be used to define the nodes, use the **-s** option described above. That is, you could use the **-M** option with the **-s** option and redirect the output to a file. You could check this file for accuracy, edit it if necessary, and then use this file as a node definition file with the **-f** option.

Defining multiple nodes simultaneously

Multiple nodes can be defined simultaneously, by providing a starting_node and count or by providing one or more node ranges. Using a starting_node and count defines the starting node and increments the node's IP address to determine the value for the next node. IP addresses are incremented up to the count — the total number of nodes. The values for node hardware control and remote console attributes must be specified with the **-H** and **-C** options.

Using a list of node ranges allows greater flexibility in specifying the list of nodes to define. All the nodes in the list of node ranges are defined, and the values for node hardware control, and remote console attributes must be specified with the **-H** and **-C** options. See the **noderange** man page for details on specifying node ranges.

When defining multiple nodes simultaneously, it is assumed that the hardware has been configured in a way that facilitates the use of this method. The mapping of IP address to node hardware and console servers can range in complexity, depending on the type of hardware being used and the cluster environment. Initial planning is required for cluster installation and configuration to be automated as much as possible.

When defining multiple nodes at once, the following is required

- Short host names to be assigned to the nodes are resolvable.
- If using a starting_node and count, there must be a set of valid consecutive IP addresses that can be assigned to a particular set of nodes.
- The hardware text ID on the ISMP must be set to the short host name of the node. The ISMP (IBM Integrated System Management Processor) device

provides monitoring and remote power control for xSeries, IntelliStation, or BladeCenter nodes. ISMPs are also referred to as ASMs.

- A consecutive set of console port numbers must be connected to nodes with consecutive IP addresses. For example, the first port number connects to the first IP address, the second port number connects to the second IP address, and so on.

To define Linux nodes, the *HWControlNodeId* attribute values must be set to the node short host names. The following command would define 30 nodes with consecutive IP addresses as *HWControlNodeId* values *node1* — *node30*:

```
definode -n node1 -c 30 -s -H rsa1:10,rsa2:10,rsa3:10 -C mrv1::1:20,mrv2::1:20 \  
PowerMethod=xseries ConsoleMethod=mrv InstallCSMVersion=1.3.2 \  
InstallDistributionName=RedHat InstallDistributionVersion=7.3
```

Here is the same example using a node range:

```
definode -n node1+30 -s -H rsa1:10,rsa2:10,rsa3:10 -C mrv1::1:20,mrv2::1:20 \  
PowerMethod=xseries ConsoleMethod=mrv InstallCSMVersion=1.3.2 \  
InstallDistributionName=RedHat InstallDistributionVersion=7.3
```

Note: The difference between the above examples is that the node range increments by host names, while the starting_node and count increments by IP address. Depending on the host name resolution, this may result in a different list of nodes being defined.

The nodes are assigned to hardware control points in order up to the total number of nodes for each hardware control point. In the example, there are 10 nodes connected to each hardware control point. The first hardware control point (*rsa1*) is assigned to the first 10 nodes (*node1* - *node10*); the second hardware control point (*rsa2*) is assigned to the next 10 nodes (*node11* - *node20*); the third hardware control point (*rsa3*) is assigned to the last 10 nodes (*node21* - *node30*). The *HWControlNodeId* attributes are set to the node's host names, which should be the same as their ISMP hardware text IDs.

The nodes are assigned to the console servers in order up to the number of ports for each console server. In the example, the first console server (*mrv1*) is assigned to the first 20 nodes (*node1* - *node20*), and the second console server (*mrv2*) is assigned to the next 10 nodes (*node21* - *node30*). The number of console ports must be greater than or equal to the number of nodes being defined. In this case there are only 30 nodes being defined so the last console server is left with some unassigned ports.

In the example, the console port numbers are assigned in consecutive order starting with 1. Port 1 is assigned to the node with the first IP address, port 2 to the next IP address, and so on.

When defining multiple nodes at once, it is important to redirect output to a file and check the file for accuracy before actually creating the node definitions. You can do this using the **-s** option as described earlier.

Chapter 6. Adding nodes to a cluster

This chapter tells you how to install CSM on the nodes of the cluster.

For information about installing Red Hat AS on x440 and x445 nodes, see “Installing CSM on x440 or x445 nodes with the Red Hat AS 2.1 operating system already installed” on page 54.

Before you install CSM Linux nodes

Before you begin the installation steps, consider the following prerequisites:

- The operating system has already been installed on the nodes.
- The operating system and CSM have already been installed on the management server.
- You have defined the node attributes, (See Chapter 5, “Defining nodes for the cluster,” on page 37.)
- You have set up the hardware control points and console servers for your system. (See *CSM for Linux: Hardware Control Guide*.)

Before you begin the procedures, be sure that you have completed the required planning in Chapter 2, “Planning for Cluster Systems Management,” on page 5. Run the commands that are described in the chapter from the management server. For information about the installation commands, see *CSM for Linux: Command and Technical Reference* or the man pages.

Summary of the steps for installing CSM on cluster nodes

- ___ • “Step 1. Check node software requirements”
- ___ • “Step 2. Store hardware control point user IDs and passwords”
- ___ • “Step 3. Verify the node definitions” on page 50
- ___ • “Step 4. Define install servers (optional for Linux on xSeries, IntelliStation, or BladeCenter)” on page 51
- ___ • “Step 5. Using user-provided customization scripts” on page 51
- ___ • “Step 6. Create configuration files and RPM updates for the nodes (optional)” on page 51
- ___ • “Step 7. Update glibc on Red Hat nodes (required for Red Hat)” on page 52
- ___ • “Step 8. Update openssh package on SuSE 8.1 node” on page 52
- ___ • “Step 9. Install CSM on the nodes” on page 52
- ___ • “Step 10. Reboot the nodes (optional)” on page 54
- ___ • “Step 11. Verify the installation” on page 55

Step 1. Check node software requirements

Before continuing with the installation, see Chapter 2, “Planning for Cluster Systems Management,” on page 5 for information about cluster node software requirements.

Step 2. Store hardware control point user IDs and passwords

You must store the user IDs and passwords that are required for remote hardware control points. For information about hardware control points, IDs, and passwords, see *CSM for Linux: Hardware Control Guide*.

| **xSeries hardware:** You need to define the user IDs and passwords that are
| required to access each RSA (Remote Supervisor Adapter) and ISMP (IBM
| Integrated System Management Processor). To configure xSeries servers, IBM
| recommends changing the default hardware control point user IDs and passwords
| using the utility disks and documentation provided with the hardware. For xSeries
| RSAs the default user ID is "USERID" and the default password is "PASSWORD"
| (P-A-S-S-W-zero-R-D).

| **HMC-attached pSeries hardware:** Issue the **systemid** command. For example, if
| the host name of the HMC is **hmc1** and the user ID is **hscroot**, issue the following
| command:

```
| systemid hmc1 hscroot
```

| You will be prompted for a password for the user ID you specified.

| **IntelliStation:** Issue the **systemid** command. For example, if the APC
| MasterSwitch name is **apc01.pok.com**, issue the following command:

```
| systemid apc01.pok.ibm.com apc
```

| You will be prompted for a password for the user ID you specified.

| The **systemid** command stores the user ID and password for remote hardware.

Step 3. Verify the node definitions

This step describes, how to verify and customize the cluster node definitions before the nodes are installed. Because you have not yet installed the node, you can make changes to any of the node definitions at this time. If a node has not been defined, it will not be installed.

To determine whether the nodes have been defined, issue the **lsnode** command from the management server:

```
| lsnode
```

The system responds with a line for each node that was successfully defined. If a node has not been defined, it will not appear in the output for the **lsnode** command.

To display all the information about each node, use the **lsnode** command, from the management server, with the **-l** (lowercase L, not uppercase i) option:

```
| lsnode -l
```

The system responds with a list (output), containing extended information, for each node that was successfully defined. If a node has not been defined, it will not appear in the output for the **lsnode** command. Note that some of the attributes for a node might have null values at this point.

| If something needs to be corrected, you can change the attributes of the nodes by
| either running the **chnode** command, or by rerunning the **definnode** command
| with the **-m** (modify) flag. The **definnode -m** command accepts a new **nodedef**
| file or a new command line and only modifies the nodes that have changed
| attributes.

To remove a node before redefining it, use the **rmnode** command on the management server:

```
| rmnode hostname
```

To change the attributes of a node, use the **chnode** command from the management server:

```
chnode hostname attr=value
```

See the man pages or the *CSM for Linux: Command and Technical Reference* for more information about the **lsnode**, **chnode**, and **rmnode** commands.

Step 4. Define install servers (optional for Linux on xSeries, IntelliStation, or BladeCenter)

Multiple install servers can be used to serve CSM files during installation of Linux on xSeries, IntelliStation, or BladeCenter nodes. CSM install servers are remote machines that serve the NFS files used to install CSM on the nodes. Using install servers allows you to increase the *CSM_FANOUT* environment variable (see the **updatenode** man page), and reduces the amount of file transfers from the management server.

You should increase the *CSM_FANOUT* variable by no more than 16 nodes per install server. Install servers are only supported in xSeries, IntelliStation, or BladeCenter Linux clusters; they are not supported for Linux on pSeries. See Appendix E, “Creating multiple install servers for CSM Installs (Linux on xSeries, IntelliStation, and BladeCenter only),” on page 107 for information on setting up the install servers.

Step 5. Using user-provided customization scripts

The **updatenode** command runs any user-provided customization scripts that have been placed in the */csminstall/csm/scripts/update* directory. The command checks this directory and runs each script on the node when it is being updated. Subdirectories are not checked. If multiple scripts exist in a directory, they are run in alphabetical order, as determined by the **ls** command on the management server. The naming convention for the scripts is as follows:

```
scriptname[._target]
```

The “.” following the script name is required if the script is to be used only for a specific node or node group. The target value must be a single node name or group name that has been defined in the CSM database. If the target extension is not used, then the script runs on all nodes. If a script exists and additional multiple versions for subsets of nodes (for example, *myscript*, *myscript._groupA*, *myscript._groupB*) also exist, the script with no target extension runs only for those nodes that are not included in one of the specific groups (for example, not in *groupA* or *groupB*). For more information on CSM support for user-provided customization scripts, see the *CSM for Linux: Administration Guide*.

Step 6. Create configuration files and RPM updates for the nodes (optional)

During the operating system installation of the node, CSM installs both the Configuration File Manager (CFM) configuration files and Software Maintenance System (SMS) RPMs on the nodes. Setting up these utilities before installing your nodes can save you from needing to customize the nodes later. For information on configuring CFM and SMS, see the *CSM for Linux: Administration Guide*.

The CFM configuration files are distributed to the node when the *Mode* changes to **Managed** on the management server. CFM uses the following condition and response, which are installed and set by CSM, to accomplish this task:

```
NodeFullInstallComplete RunCFMToNode
```

The response triggers the following:

```
cfmupdatenode -n node_name
```

After the node becomes **Managed**, the SMS RPMs are also updated and installed on the node. This action is triggered by CSM scripts that run on the node. First SMS installs any RPMs stored in the following directory:

```
/csminstall/Linux/InstallDistributionName/InstallDistributionVersion/InstallPkgArchitecture/install
```

Then SMS updates any RPMs in the following directory:

```
/csminstall/Linux/InstallDistributionName/InstallDistributionVersion/InstallPkgArchitecture/updates
```

Step 7. Update glibc on Red Hat nodes (required for Red Hat)

If you are using a Red Hat 8.0 or RedHat 9 management server, you need to update the **glibc** version. The list of **glibc** packages can be found in “Required non-IBM software you will need to download” on page 17. To update these packages on the management server:

1. Download the files and put them in a directory (for example, **/tmp/glibc**). The list of **glibc** packages can be found in “Required non-IBM software you will need to download” on page 17.
2. Update the packages. For RedHat 8.0 run:

```
rpm -U /tmp/glibc/glibc-*2.3.2-4.80*rpm"
```

For RedHat 9 run:

```
rpm -U /tmp/glibc/glibc-*2.3.2-4.*rpm"
```

When the **update** command runs in “Step 9. Install CSM on the nodes,” it automatically updates the kernel on your nodes.

Step 8. Update openssh package on SuSE 8.1 node

To avoid delay problems with the **openssh** RPM on the base SuSE 8.1 CD on xSeries Linux, do the following:

1. Move the **openssh** packages that you have downloaded from Table 8 on page 18 to the nodes.
2. Issue the following command to install the openssh packages on the nodes:

```
rpm -U /openssh
```

Step 9. Install CSM on the nodes

Before you run the **updatenode** command, ensure that the **installms** and **definnode** commands have been run successfully on the management server.

The **updatenode** command installs and updates the CSM software and files on the nodes of the cluster. The nodes on which you run the **updatenode** command must already have the operating system installed.

The **updatenode** command does the following for a Linux node:

- Installs the CSM software and configures the node so that the management server can manage it (changes the node attribute mode from **PreManaged** to **Managed**).
- If remote shell authentication is not already set up, automatically sets up remote shell authentication for OpenSSH or **rsh**. See “Remote shell attributes.”
- Distributes the CFM configuration files if CFM is set up.
- Distributes the SMS RPMs if SMS set up
- Runs any user customization scripts. See “Step 5. Using user-provided customization scripts” on page 51.

If the *Mode* attribute for a node is set to **MinManaged**, then **updatenode** does not install CSM on the node; however, the command does set up the remote shell and runs customization scripts for the **MinManaged** node.

Note: When you use the **updatenode** command with SuSE SLES 7 an NFS error might occur. If you are using SLES 7, see Appendix D, “Understanding error messages from SuSE, SLES, and Red Hat,” on page 105 for error message information.

Mode attributes and the updatenode command

Premanaged and managed nodes: When a node has only been defined, but has not actually been installed with CSM, its *Mode* attribute value is **PreManaged**. You run the **updatenode** command on nodes that have already been defined to the system. After the **updatenode** command installs CSM on the node, its *Mode* attribute value changes to **Managed**. If the **updatenode** command is not successful, the node’s *Mode* attribute remains **PreManaged** and the *UpdatenodeFailed* attribute is set to **1** (true) for the node.

MinManaged nodes: If the *Mode* attribute is **MinManaged**, **updatenode** does not alter the value. The value remains **MinManaged** after you run the **updatenode** command, and CSM sets the *UpdatenodeFailed* attribute to **1** (true) for the node.

Remote shell attributes

When you set up the management server, you already specified the *RemoteShell* and *SetupRemoteShell* attributes through the **csmconfig** command (see “Step 11. Decide which remote shell to use” on page 32). The **updatenode** command behaves differently, depending on the values that you specify.

- If you specified *RemoteShell=/usr/bin/ssh* and *SetupRemoteShell=1* (yes), and OpenSSH is installed on the management server and all of the nodes, the **updatenode** command sets up secure shell access to all **PreManaged** nodes. This is also true for all nodes in the cluster if you used the **-k** option with the **updatenode** command, which prompts you for the root password. If OpenSSH is not already set up, the **updatenode** command automatically sets up the remote shell authentication for OpenSSH. In this case, the **updatenode** command will prompt you for the root password for the target nodes. As a result, you must either make the root password common to all the target nodes, or run the **updatenode** command to each node, or group of nodes, and provide the related passwords.
- If you specified *RemoteShell=/usr/bin/rsh* you need to set up **rsh** manually on each node. If the root is able to issue **rexec** commands to the nodes, you can use **updatenode** to set up OpenSSH. See the instructions in “Setting up remote access manually” on page 75.

- If you specified `SetupRemoteShell=0` (no), the **updatenode** command does not set up remote access for any of the nodes.

Installing CSM on x440 or x445 nodes with the Red Hat AS 2.1 operating system already installed

If you already have Red Hat AS 2.1 installed on x440 or x445 nodes, you can install CSM on the nodes. Before you run **updatenode** to install CSM on the nodes, you must downgrade **libstdc++** to the 2.96-108 version that is shipped on the original Red Hat AS 2.1 CDs:

1. Copy the **libstdc++-2.96-108.1.i386.rpm** to all the x440 or x445 nodes.
2. Run the following on all of the x440 or x445 nodes:

```
rpm -e --nodeps libstdc++
rpm -i --nodeps libstdc++-2.96-108.1.i386.rpm
```

3. Install CSM on the nodes with the **updatenode** command.

For information on installing CSM on an x440 or x445 management server that runs Red Hat AS, see “Installing CSM on an x440 or x445 management server that runs Red Hat AS” on page 35.

For information on installing CSM and Red Hat AS 2.1 on x440 or x445 nodes, see “Installing CSM and the Red Hat operating system on x440 and x445 nodes” on page 70.

Installing CSM on the nodes

To install the **PreManaged** nodes of your cluster and change them to **Managed** nodes, issue the **updatenode** command as follows:

```
updatenode -P
```

The **updatenode** command installs CSM packages, distributes configuration files to the nodes, and updates other software that is installed on the nodes. For more information, see the man page or the *CSM for Linux: Command and Technical Reference*.

Step 10. Reboot the nodes (optional)

Note: If your node hardware does not support remote console (like Blade Center) or if you are not using remote console, this step is not required. If you are using remote console, this step is required.

To enable the remote console for the node, you must reboot the nodes after installing CSM. You can perform this step now, or you can do it later, when you want to use the remote console.

To reboot the xSeries, IntelliStation, or BladeCenter nodes, you use the **rpower** command. For example, if you just installed *node1* for an xSeries node, use the **rpower** command as follows:

```
rpower -n node1 reboot
```

If you just installed *node1* for a pSeries node that uses the hmc, you cannot reboot the node. Instead, use the **rpower** commands as follows to power on the hmc for the node:

```
rpower -n node1 off
rpower -n node1 on
```

Step 11. Verify the installation

To verify the CSM-only installation, issue the **lsnode** command, specifying the name of the node. In this example, the name of the node is *cls01*.

```
lsnode -n cls01 -a Mode,UpdatenodeFailed
```

The output of the **lsnode** command should consist of the name of the node, followed by the values for these two attributes. For example:

```
cls01: Managed, 0
```

If the *Mode* is not **Managed** or **MinManaged**, or if the *UpdatenodeFailed* attribute is equal to **1**, then the node was not successfully updated. Here are some things you can do:

- Check the log files for error and informational messages. Check **/var/log/csm/updatenode.log** on the management server and **/var/log/csm/install.log** on the cluster node.
- If the log indicates that the **mgmtsvr** command failed, Issue the **updatenode** command, specifying the **-k** option and the name of the node. For example:

```
updatenode -k -n cls01
```

- If you are running the **updatenode** command to a large number of nodes, you may be overloading the NFS server. If there are errors like *Bad UMNT RPC: RPC: Timed out* in **updatenode.log**, try reducing the **updatenode** fanout. To do this, set the **CSM_FANOUT** environment variable to a low value, such as 16, then run the **updatenode** command again.
- Issue a remote command on the node. For example, issue the **dsh** command, specifying the name of the node:

```
dsh -n cls01 -s date
```

If the **dsh** command returns an error, see the *CSM for Linux: Administration Guide* for information on diagnosing **dsh** problems.

Chapter 7. Installing CSM and the operating system on the nodes

This chapter tells you how to install both the operating system and CSM on your cluster. If your nodes already have a supported version of the operating system installed, consider using the procedure in Chapter 6, “Adding nodes to a cluster,” on page 49.

For information about installing CSM and RedHat AS on x440 and x445 nodes, see “Installing CSM and the Red Hat operating system on x440 and x445 nodes” on page 70.

Before you perform the installation

Before you begin the installation steps, ensure the following:

- The operating system and CSM have already been installed on the management server.
- You have defined the node attributes, (See Chapter 5, “Defining nodes for the cluster,” on page 37.)
- You have set up the hardware control points and console servers for your system. (See *CSM for Linux: Hardware Control Guide*.)

Avoiding problems with hardware and network setup

This section points to some problems you may encounter during installation. see Appendix C, “Avoiding problems with hardware and network setup,” on page 99 for details.

Avoiding DHCP-related installation problems

Problems can arise with DHCP (Dynamic Host Configuration Protocol) that can cause an **installnode** command error. For more information about this problem, see Appendix C, “Avoiding problems with hardware and network setup,” on page 99.

Configuring your switch for multiple VLANs

If you have multiple network interfaces on a management server that are attached to the same VLAN, you may see some unexpected side effects due to the fact that broadcast traffic on the VLAN is seen on multiple interfaces.

Avoiding problems with externally attached SCSI devices

If your system has external storage attached to either a secondary SCSI device or FiberChannel PCI adapter, it should be powered off or disconnected when you install the operating system.

Avoiding problems with pSeries and SuSE SLES nodes

When you use AutoYaST to install SuSE SLES 8.1 on pSeries nodes with the CD-ROM, you might need to obtain the kernel update to prevent the system from hanging. See “Kernel requirements for SuSE SLES clusters on Linux on pSeries” on page 18.

For Linux on pSeries, perform the following steps:

1. Download the kernel update (**kernel-ppc64-2.4.19-228.ppc.rpm** or greater) from the following website:

<http://support.suse.de/psdb/>

2. Place the kernel in the following directory:

```
/csminstall/InstallOSName/InstallDistributionName/InstallDistributionVersion/InstallPkgArchitecture/updates/kernel/
```

Summary of the steps for installing both the operating system and CSM on cluster nodes

- “Step 1. Check node software requirements”
- “Step 2. Set the node boot order (for Linux on xSeries, IntelliStation, or BladeCenter only)”
- “Step 2a. Disable the Virus Detection for x360 nodes” on page 59
- “Step 3. Store hardware control point user IDs and passwords” on page 59
- “Step 4. Verify the node definitions” on page 59
- “Step 5. Define install servers (optional for Linux on xSeries, IntelliStation, or BladeCenter only)” on page 60
- “Step 6. Validate rpower and rconsole” on page 60
- “Step 7. Modify the installation node configuration template (optional)” on page 61
- “Step 8. Configure the installation” on page 63
- “Step 9. Verify the node configuration” on page 66
- “Step 10. Create configuration files and RPM updates for the nodes (optional)” on page 67
- “Step 11. Using installnode with user-provided customization scripts” on page 67
- “Step 12. Create a script to update openssh packages on SuSE 8.1 nodes (required for non-pSeries SuSE 8.1)” on page 68
- “Step 13. Install the operating system and CSM on the nodes” on page 68
- “Step 14. Download update-mkinitrd.gz for full installation of SuSE SLES 8.1 (optional)” on page 69
- “Step 15. Monitor and verify the installation” on page 69

Step 1. Check node software requirements

Before continuing with the installation, see Chapter 2, “Planning for Cluster Systems Management,” on page 5 for information about cluster node software requirements.

Step 2. Set the node boot order (for Linux on xSeries, IntelliStation, or BladeCenter only)

Note: If you have a Cluster 1350 system, the boot order is already set, so you can skip this step. If you do not have a Cluster 1350 system, you need to complete this step.

You must set the boot order for each node in your cluster, and you must set it in the BIOS (Basic Input/Output System). During booting, press the F1 key when you are prompted. The boot order should be set as follows:

1. Diskette
2. CD-ROM
3. Network
4. Hard disk

Step 2a. Disable the Virus Detection for x360 nodes

If you have x360 nodes in your cluster, you might want to change the Virus Detection from "Enabled" to "Disabled" for each x360 node to avoid the Virus Warning message that might occur during the first boot after the full installation.

Step 3. Store hardware control point user IDs and passwords

You must store the user IDs and passwords that are required for remote hardware control points. For information about hardware control points, IDs, and passwords, see *CSM for Linux: Hardware Control Guide*.

xSeries hardware: You need to define the user IDs and passwords that are required to access each RSA (Remote Supervisor Adapter) and ISMP (IBM Integrated System Management Processor). To configure xSeries servers, IBM recommends changing the default hardware control point user IDs and passwords using the utility disks and documentation provided with the hardware. For xSeries RSAs the default user ID is "USERID" and the default password is "PASSWORD" (P-A-S-S-W-zero-R-D).

HMC-attached pSeries hardware: Issue the **systemid** command. For example, if the host name of the HMC is **hmc1** and the user ID is **hscroot**, issue the following command:

```
systemid hmc1 hscroot
```

You will be prompted for a password for the user ID you specified.

IntelliStation: Issue the **systemid** command. For example, if the APC MasterSwitch name is **apc01.pok.com**, issue the following command:

```
systemid apc01.pok.ibm.com apc
```

You will be prompted for a password for the user ID you specified.

The **systemid** command stores the user ID and password for remote hardware.

Step 4. Verify the node definitions

After **definnode** has run, the management server has been set up with all the node information for CSM, and you are now ready to verify the node definitions. This section tells you how to verify and customize the cluster node definitions before the nodes are installed. Since the actual node installation has not happened yet, you can make changes to any of the node definitions at this time.

To determine whether the nodes have been defined, issue the **lsnode** command from the management server:

```
lsnode
```

The system responds with a line for each node that was successfully defined. If a node has not been defined, it will not appear in the output for the **lsnode** command.

To display all the information about each node, use the **lsnode** command, from the management server, with the `-l` (lowercase L) option:

```
lsnode -l
```

The system responds with a list (output), containing extended information, for each node that was successfully defined. If a node has not been defined, it will not appear in the output for the **lsnode** command. Note that some of the attributes for a node might have null values at this point.

Note: If a node has not been defined, it will not be installed.

If you must correct information, you can change the attributes of the nodes either by running the **chnode** command, or by rerunning the **definnode** command with the **-m** (modify) flag. The **definnode -m** command accepts a new **nodedef** file or a new command line and only modifies nodes that have changed attributes.

To remove a node before redefining it, use the **rmnode** command on the management server:

```
rmnode hostname
```

To change attribute values of a node, issue the **chnode** command from the management server:

```
chnode hostname attr=value
```

See the man pages or the *CSM for Linux: Command and Technical Reference* for more information about the **lsnode**, **chnode**, and **rmnode** commands.

Step 5. Define install servers (optional for Linux on xSeries, IntelliStation, or BladeCenter only)

Multiple install servers can be used to serve CSM files during install of the nodes. CSM install servers are remote machines that serve the NFS files used to install CSM on the nodes. Using install servers will allow you to increase the **CSM_FANOUT** environment variable (see the **updatenode** man page), and will reduce the amount of file transfers from the management server. You should increase the **CSM_FANOUT** variable by no more than 16 nodes per install server. Currently install servers are only supported in xSeries, IntelliStation, or BladeCenter Linux clusters. See Appendix E, “Creating multiple install servers for CSM Installs (Linux on xSeries, IntelliStation, and BladeCenter only),” on page 107 for information on setting up the install servers.

Note: After defining any install servers, run **csmssetupks** for the Red Hat or Red Hat AS nodes or **csmssetupyast** for SuSE or SuSE SLES nodes that use install servers. These commands allow the nodes to get their installation files from the correct machine.

See Appendix E, “Creating multiple install servers for CSM Installs (Linux on xSeries, IntelliStation, and BladeCenter only),” on page 107 for information on setting up the install servers.

Step 6. Validate rpower and rconsole

Before installing the nodes, test remote power (**rpower**) and remote console (**rconsole**) to make sure they are configured.

Remote power is used to network boot the nodes in order to collect the MAC addresses and install the nodes. To test **rpower**, issue the following:

```
rpower -a query
```

The output from the **rpower** command lists of all the nodes and their status. For example:

```
root@c5n71:/u/build # rpower -a query
c5n72.clusters.com on
c5n73.clusters.com on
c5n74.clusters.com off
c5n75.clusters.com off
```

To perform the installation, nodes may be in either the **on** or **off** state. If you get errors as a result of running the **rpower** command, see the *CSM for Linux: Hardware Control Guide* to diagnose the problem. Nodes with errors will not be installed.

Remote console is required to obtain MAC addresses. To test **rconsole**, issue the following:

```
rconsole -a
```

The **rconsole -a** command opens console windows for all the nodes. If there are a large number of nodes in your cluster, you might want to test only a subset of the nodes.

Notes:

1. For BladeCenter, the MAC addresses are obtained from the node's vital product data (VPD). Remote console is not required.
2. If you use an incorrect MAC address **dhcp** errors can occur when a node boots during the **installnode** process.
3. ESP Terminal servers require a device driver. When a new operating system level is installed that overwrites the previous system, the device driver for terminal servers might need to be reinstalled. See *CSM for Linux: Hardware Control Guide* and FAQs for additional information.

Step 7. Modify the installation node configuration template (optional)

Before you proceed with the installation, you might want to alter the configuration template for your nodes, or provide additional data. Depending on the Linux distribution to install on the nodes, the configuration template differs. For Red Hat or Red Hat AS nodes, use the Kickstart configuration template. For SuSE or SuSE SLES nodes, use the AutoYaST configuration template.

Updating the Red Hat Kickstart node configuration template

Kickstart provides a basic node configuration template that you can either use as it is, or modify. For Red Hat, the template is as follows, where *Version* can be the Red Hat Version number:

```
/opt/csm/install/kscfg.tmp1.RedHatVersion
```

For example, the template name for RedHat 9 is as follows:

```
/opt/csm/install/kscfg.tmp1.RedHat9
```

For Red Hat AS, the template file is as follows, where *Version* can be the Red Hat AS Version number:

```
/opt/csm/install/kscfg.tmp1.RedHatASVersion
```

For example, the template name for RedHat AS2.1 is as follows:

```
/opt/csm/install/kscfg.tmpl.RedHatAS2.1
```

The Kickstart configuration template file contains the following information:

- Initial root password (defaults to **cluster**), plus an additional user ID called **admin** with a password of **cluster**.
- Disk partition table
A sample disk partition table is provided, which can be modified.
- RPMs to install
A standard list is provided; you can modify the list, or you can use your own list.
- Language and time zone
- Post-install script
This script does standard set up and CSM-specific set up. The script may be modified to suit your installation, provided the marked sections are not altered.

Note: Kickstart chooses a default disk type and size based on the hardware it finds. To specify a specific disk type and size, you can modify the kickstart configuration file. See the Red Hat customization guide for kickstart configuration file details.

You can create your own version of the configuration template by copying the Kickstart template, modifying it, and giving it a new name (make sure you keep the original template under its original name). You can use the **-k** option of the **csmsetupks** command (in a later step) to specify that the template you created should be used for each node in your cluster, or you can set each node's *InstallTemplate* attribute to the path name of the Kickstart template file. The default configuration template is the original (**/opt/csm/install/kscfg.tmpl.RedHatVersion**).

See the annotations in the **kscfg.tmpl** itself for instructions on how to modify the template. Instead of adding to the scripts in the configuration template file, consider using a customization script. For information, see “Step 11. Using installnode with user-provided customization scripts” on page 67.

Updating the AutoYaST node configuration template

CSM provides a basic AutoYaST node configuration template file in XML format that you can use as is or modify. The template file is as follows, where *InstallDistributionName**InstallDistributionVersion* can be SuSE or SuSE SLES:

```
/opt/csm/install/yastcfg.InstallDistributionNameInstallDistributionVersion-Arch.xml
```

For example, the template file name for SuSE 8.1 is as follows:

```
/opt/csm/install/yastcfg.SuSE8.1-i386.xml
```

The AutoYaST configuration template file contains the following information:

- Initial root password (defaults to **cluster**), plus an additional user ID called **admin** with a password of **cluster**.
- RPMs to install. A standard list is provided; you can modify the list, or you can use your own list.
- Language and time zone.

Disk partition table: The AutoYaST template file that is shipped with CSM does not contain a disk partition table. Instead, AutoYaST automatically determines the disk partitioning. It chooses the install device based on the attributes *InstallDisk* and *InstallDiskType* for the node, then creates the partition table based on the disk type and size. You can add your own disk partition table to the template to suit your configuration needs.

Post-install scripts: The **csmssetupyast** command adds post-install scripts to each AutoYaST template file that it generates. Templates for the scripts are in the following directories:

```
/opt/csm/install/autoyast.postscript.tpl.architecture  
/opt/csm/install/autoyast.chrootscript.tpl.architecture
```

You can modify the scripts to suit your installation needs; however, consider using a customization script. For information, see “Step 11. Using installnode with user-provided customization scripts” on page 67.

You can create your own version of the configuration template by copying the AutoYaST template, modifying it, and giving it a new name (make sure you keep the original template under its original name). You can use the **-k** option of the **csmssetupyast** command (see “Configuring a SuSE or SuSE SLES installation” on page 65) to specify that the created template is to be used for each node in your cluster, or you can set each node’s *InstallTemplate* attribute to the path name of the AutoYaST template file.

For information about AutoYaST, see the AutoYaST customization guide that is available from the following website:

```
http://www.suse.de/~nashif/autoinstall *
```

Step 8. Configure the installation

You need to use the Red Hat, Red Hat AS, SuSE, or SuSE SLES Linux distribution CD-ROMs in this step.

The tools run in this step sets up the */etc/dhcpd.conf* file for MAC address collection and full installation of the nodes. The first time **csmssetupks** or **csmssetupyast** runs, it replaces any existing */etc/dhcpd.conf* file. From then on, the **csmssetupks** or **csmssetupyast** command just updates the existing file. The original file is saved to */etc/dhcpd.conf.precsm*. After the **csmssetupks** or **csmssetupyast** command runs the first time, you can customize the */etc/dhcpd.conf* file provided you do not alter the sections marked with:

```
# CSM RANGE (DO NOT REMOVE THIS LINE)  
### CSM STATIC ENTRIES (DO NOT ERASE THIS LINE) ###
```

Configuring a Red Hat installation

After you have prepared your Kickstart configuration template, you use the **csmssetupks** command to create a Kickstart configuration file for each of the nodes in your cluster. The **csmssetupks** command uses the information from your Kickstart node configuration template to create the Kickstart configuration files. The **csmssetupks** command does the following:

- Copies Red Hat CD-ROMs to the **/csminstall** directory on the management server
- Creates the **/tftpboot** directory. Also creates the default PXE configuration files for xSeries, Blade Center, and IntelliStation hardware.
- Creates an **/etc/dhcpd.conf** file

- Checks the network and starts the DHCP, NFS, and TFTP daemons
- Creates the files necessary for the network boot into `/csminstall` and `/tftpboot`
- Collects MAC addresses, sets the `InstallAdapterMacaddr` attribute for all the nodes that were specified with the `csmsetupks` command, and adds entries to the `/etc/dhcpd.conf` file
- Creates a Kickstart configuration file for each node

If you do not use hardware control, the `csmsetupks` command cannot automatically collect the node MAC addresses. As a result, if you are not using hardware control, you need to manually set the `InstallAdapterMacaddr` attribute for each node before running the `csmsetupks` command. To do this, use the `chnode` command. In the following example, `00:00:00:00:00:00` is the node's MAC address.

```
chnode hostname InstallAdapterMacaddr=00:00:00:00:00:00
```

Finding the MAC address: You can find a node's MAC address by running the `ifconfig` command on the node. If the node is not installed, you can find the MAC address by looking at the node's console when it does a network boot and broadcasts the MAC address. The address is the MAC address of the first adapter for the installed node returned by `ifconfig`, or from the console display when you boot the node. You can also check the BIOS (basic input/output system) for the MAC address. For information about the `ifconfig` command, see the man page.

Before you run csmsetupks: Before you run the `csmsetupks` command on Red Hat, you need to modify the `/etc/sysconfig/dhcpd` file to only listen for `dhcp` requests on specific interfaces. For example, if `eth0` connects to the management VLAN, `eth1` connects to the cluster VLAN, and `eth2` connects to the public VLAN, you probably do not want the public VLAN (`eth2`) to accept `dhcp` requests. In this case, if you only want to listen to `eth0` and `eth1`, ensure that the `/etc/sysconfig/dhcpd` file contains the following line:

```
DHCPDARGS="eth0 eth1"
```

To run the `csmsetupks` command for all the **PreManaged** nodes of your cluster, type the following commands. (The `lsnode` command indicates if the node is valid for installation.)

```
lsnode -l | egrep "Hostname|InstallStatus"
csmsetupks -P
```

You will be prompted to insert the Red Hat CD-ROMs.

The `csmsetupks` command saves the output to the following log file:

```
/var/log/csm/csmsetupks.1log
```

Notes:

1. If you are installing a Red Hat 8.0 node, you must copy all of the **glibc** packages to the following directory:
`/csminstall/Linux/Redhat/8.0/i386/updates/`
2. If you are installing a Red Hat 9 node, you must copy all of the **glibc** packages to the following directory:
`/csminstall/Linux/Redhat/9/i386/updates/`

The list of **glibc** packages and their URLs can be found in "Required non-IBM software you will need to download" on page 17.

3. **dhcp** sometimes holds on to the IP lease resulting in problems with the installation. This problem can be detected by looking for NOACKS, or "no free leases" entries in the `/var/log/messages` file. Erase the `/var/lib/dhcp/dhcpd.leases` file and restart **dhcp** as follows:
- ```
/etc/init.d/dhcpd restart
```

## Configuring a SuSE or SuSE SLES installation

If you have existing SIS configuration files for SuSE or SuSE SLES nodes, you can use the following migration tool to convert the SIS files to AutoYaST files:

```
csmsis2yast
```

For information, see Chapter 10, "Migrating to the latest level of CSM for xSeries, IntelliStation, and BladeCenter," on page 83.

After you have prepared your AutoYaST configuration template, use the **csmsetupyast** command to create a AutoYaST configuration file for each of the nodes in your cluster. The **csmsetupyast** command uses the information from your AutoYaST node configuration template to create the AutoYaST configuration files. The **csmsetupyast** command does the following:

- Copies SuSE or SuSE SLES CD-ROMs to the `/csminstall` directory on the management server
- Creates the `/tftpboot` directory and the default PXE configuration files
- Creates an `/etc/dhcpd.conf` file
- Checks the network and starts the DHCP, NFS, and TFTP daemons
- Creates the files necessary for the network boot into `/csminstall` and `/tftpboot`
- Collects MAC addresses, sets the `InstallAdapterMacaddr` attribute for all the nodes that were specified with the **csmsetupyast** command, and adds entries to the `/etc/dhcpd.conf` file
- Creates an AutoYaST configuration file for each node

If you do not use hardware control, the **csmsetupyast** command cannot automatically collect the node MAC addresses. If you are not using hardware control, you need to manually set the `InstallAdapterMacaddr` attribute for each node before running the **csmsetupyast** command. To do this, use the **chnode** command.

**Finding the MAC address:** You can find a node's MAC address by running the **ifconfig** command on the node. If the node is not installed, you can find the MAC address by looking at the node's console when it does a network boot and broadcasts the MAC address. The address is the MAC address of the first adapter for the installed node returned by **ifconfig**, or from the console display when you boot the node. You can also check the BIOS (basic input/output system) for the MAC address. For information about the **ifconfig** command, see the man page.

**Before you run csmsetupyast:** Before you run the **csmsetupyast** command on SuSE or SuSE SLES, you need to modify the `/etc/sysconfig/dhcpd` file to only listen for **dhcp** requests on specific interfaces. For example, if eth0 connects to the management VLAN, eth1 connects to the cluster VLAN, and eth2 connects to the public VLAN, you probably do not want the public VLAN (eth2) to accept **dhcp** requests. In this case, if you only want to listen to eth0 and eth1, ensure that the `/etc/sysconfig/dhcpd` file contains the following line:

```
DHCPDARGS="eth0 eth1"
```

For SuSE SLES on pSeries nodes, if the *InstallAdapterMacaddress* is not set, make sure that the console for that node is closed before running **csmsetupyast**.

To run the **csmsetupyast** command for all the **PreManaged** nodes of your cluster, enter the following command:

```
csmsetupyast -P
```

You are prompted to insert the SuSE or SuSE SLES 8 CD-ROMs.

The **csmsetupyast** command saves the output to the following log file:

```
/var/log/csm/csmsetupyast.log
```

---

## Step 9. Verify the node configuration

To verify the node configuration, look at the */etc/dhcpd.conf* file to make sure there is a static entry for each node in the cluster. After you run the **csmsetupks** or **csmsetupyast** command, if a node does not have a static entry in the */etc/dhcpd.conf* file, the node's MAC address could not be found; you must manually set the *InstallAdapterMacaddr* attribute for the node to its MAC address (see "Step 8. Configure the installation" on page 63), and re-run **csmsetupks** or **csmsetupyast** to ensure the static entry is added in */etc/dhcpd.conf* file.

If you are using Red Hat Linux, you can modify the Kickstart configuration file that the **csmsetupks** command generates for each node. The Kickstart configuration file is called:

```
/csminstall/csm/CSMVersion/kickstart.DistributionNameDistributionVersion/node-ip-address-kickstart
```

For example, the file for RedHat 9 is the following:

```
/csminstall/csm/1.3.2/kickstart.RedHat9/9.117.241.32-kickstart
```

Modify this file after running the **csmsetupks** command. Modifying the file affects only the settings on the specific node. If you rerun **csmsetupks**, you overwrite the file, so use care when you modify a generated file.

If you are using SuSE or SuSE SLES Linux, you can modify the AutoYaST configuration file that the **csmsetyast** command generates for each node. The AutoYaST configuration file is called:

```
/csminstall/csm/CSMVersion/autoyast.DistributionNameDistributionVersion/node-ip-address-autoyast.xml
```

For example, the file for SuSE 8.1 is the following:

```
/csminstall/csm/1.3.2/autoyastSuSE8.1/9.117.241.32-autoyast.xml
```

Modify this file after running the **csmsetyast** command. Modifying the file affects only the settings on the specific node. If you rerun **csmsetyast**, you overwrite the file, so use care when you modify a generated file.

---

## Step 10. Create configuration files and RPM updates for the nodes (optional)

During the operating system installation of the node, CSM installs both the Configuration File Manager (CFM) configuration files and Software Maintenance System (SMS) RPMs on the nodes. Setting up these utilities before installing your nodes means that you do not need to customize the nodes later. For information on configuring CFM and SMS, see the *CSM for Linux: Administration Guide*.

The CFM configuration files are distributed to the node when the *Mode* changes to **Managed** on the management server. CFM uses the following condition and response, which is installed and set by CSM, to accomplish this task:

```
NodeFullInstallComplete RunCFMToNode
```

The response triggers the following:

```
cfmupdatenode -n node_name
```

After the node becomes **Managed**, the SMS RPMs are also updated and installed on the node. This action is triggered by CSM scripts that run on the node. First SMS installs any RPMs stored in the following directory:

```
/csminstall/Linux/InstallDistributionName/InstallDistributionVersion/InstallPkgArchitecture/install
```

Then SMS updates any RPMs in the following directory:

```
/csminstall/Linux/InstallDistributionName/InstallDistributionVersion/InstallPkgArchitecture/updates/
```

---

## Step 11. Using `installnode` with user-provided customization scripts

The `installnode` command will run any user-provided customization scripts that have been placed in in the following two directories:

1. These scripts will be executed after the node has been installed, but prior to the reboot of the node:

```
/csminstall/csm/scripts/installprereboot
```

2. These scripts will be executed after the first reboot of the node, and after CSM has been installed::

```
/csminstall/csm/scripts/installpostreboot
```

This command will check these directories and run each script on the node at the appropriate time. Subdirectories will not be checked. If there are multiple scripts in a directory, they will be run in alphabetical order, as determined by the `ls` command on the management server.

The naming convention for the scripts is:

```
scriptname[._target]
```

The `._` following the script name is required if the script is to only be used for a specific node or node group. The target value must be a single node name or group name that has been defined in the CSM database. If the target extension is not used, then the script will be run on all nodes. If there is a script and additional multiple versions for subsets of nodes (for example, `myscript`, `myscript._groupA`, `myscript._groupB`), then the script with no target extension will be run only for those nodes that are not included in one of the specific groups (for example, not in

groupA or groupB). For more information on CSM support for user-provided customization scripts, see the *CSM for Linux: Administration Guide*.

---

## Step 12. Create a script to update openssh packages on SuSE 8.1 nodes (required for non-pSeries SuSE 8.1)

After the first reboot, CSM configures openssh communication between the management server and the node. You must first update openssh RPMs for successful remote shell configuration. To avoid delay problems with the openssh RPM on the base SuSE 8.1 CD, download the openssh RPM packages and configure a customization script to install the openssh RPMs as follows:

1. Download the openssh RPMs from Table 8 on page 18 to the following directory:

```
/csminstall/csm/scripts/data/
```

2. Create the customization script

```
/csminstall/csm/scripts/installprereboot/updatessh._SuSE81Nodes:
```

```
#!/bin/sh
/bin/rpm -U ../data/openssh*
```

---

## Step 13. Install the operating system and CSM on the nodes

When a node is only defined, but not installed, its *Mode* attribute value is **PreManaged**. After you install the node through the **installnode** command, the *Mode* attribute value is changed to **Managed**. Before you run **installnode**, if a node's *Mode* attribute value is **MinManaged**, after the node completes the installation, the attribute value of the node remains **MinManaged**

**Note:** When you use the **installnode** command with SuSE SLES nodes, NFS error messages might occur. You can ignore these error messages.

Run the **installnode** command on defined nodes on which you have already run the **csmsetupks** or **csmsetupyast** command. When you run **installnode** each **PreManaged** node becomes a **Managed** node of the cluster. If the **installnode** command fails for a **PreManaged** node, the node's attribute value remains **PreManaged** or **Installing**. If the **installnode** command fails for a **MinManaged** node, the node's attribute value remains **MinManaged** or **MinManaged-Installing**.

To install **PreManaged** nodes, issue the following command:

```
installnode -P
```

After installing the operating system and CSM, the **installnode** command automatically distributes the configuration files in **/cfmroot** to the nodes and installs the SMS RPMs on the nodes.

The installation runs asynchronously. Immediately after the installation process is initiated (that is, when the node is rebooted), the **installnode** command exits, even though the installation might not be complete.

In addition to installing CSM on the nodes, the **installnode** command installs the operating system, using Kickstart or AutoYaST. The **installnode** command also installs the appropriate software listed in "Understanding CSM software requirements" on page 10 on the nodes.



After a full installation, the boot order in the BIOS of the node (non-pSeries) can remain in this order:

1. diskette
2. CD-ROM
3. network
4. hard disk

Every time the node boots, it uses **dhcp** (Dynamic Host Configuration Protocol) to contact the management server, which uses **pxelinux** to boot the node from its hard drive. Alternately, after the full installation is complete, you can change the boot order in the BIOS to the following:

1. diskette
2. CD-ROM
3. hard disk
4. network

---

## Step 14. Download update-mkinitrd.gz for full installation of SuSE SLES 8.1 (optional)

To complete the installation of SuSE SLES 8.1 nodes, you must download **update-mkinitrd.gz** to the following directory:

```
/csminstall/Linux/SuSE/8.1/i386
```

For downloading SuSE SLES 8.1 information, see Table 8 on page 18.

---

## Step 15. Monitor and verify the installation

**Note:** When running the full installation on an x360 node, after the full installation is complete and the node starts the first reboot, be sure to select "Change is expected" if you get the Virus Warning window popup on the console. To avoid this, you can perform "Step 2a. Disable the Virus Detection for x360 nodes" on page 59 in advance. Also, note that this Virus Warning message can only occur when the x360 nodes is fully installed with a different OS.

For a full installation, you can use the **rconsole** command to view the progress of the installation on each node. To run the **rconsole** command on all the nodes, type the following:

```
rconsole -a
```

The **rconsole** command displays a console for each node in the cluster.

You can monitor the messages when you boot the node to help identify problems. For example, you might receive the following message that indicates a problem with the MAC address:

```
Receiving PXE-E51 No dhcp or bootp offeres received
```

To check the results of the installation, you can use the **monitorinstall** command. The **monitorinstall** command starts the installation monitor tool, which displays the status of the installation on each of the nodes. It returns the following types of status:

- installed
- not installed

- failed install
- Starting **makenode** to install CSM RPMs

To run the **monitorinstall** command, type the following:

```
monitorinstall
```

The **monitorinstall** command writes output like the following:

| Node               | Mode       | Status        |
|--------------------|------------|---------------|
| clsn02.cluster.com | Managed    | Installed     |
| clsn03.cluster.com | Managed    | Installed     |
| clsn04.cluster.com | MinManaged | Installed     |
| clsn05.cluster.com | MinManaged | Installed     |
| clsn06.cluster.com | MinManaged | Installed     |
| clsn07.cluster.com | Managed    | Installed     |
| clsn08.cluster.com | PreManaged | Not Installed |

All nodes should be listed as *Installed* when their installation is complete. Any other status values that appear in the output represent the progress of the installation. Installation errors are indicated with a status code. The nodes will eventually reach the *Installed* state.

To continuously display the output of the **monitorinstall** command, enter:

```
watch monitorinstall
```

If there is a problem, see **/var/log/csm/installnode.log** on the management server or **/var/log/csm/install.log** on the managed node for the installation log file.

To check the installation of the management server nodes, you can also use the **lsnode** command, as follows:

```
lsnode -a Mode
```

The **lsnode** command returns a list of the active nodes in the cluster, along with their *Mode* attributes values. Nodes that were successfully installed are set to **Managed** or **MinManaged**.

To verify that Remote Monitoring and Control (RMC) is working, use the **lsnode** command with the **-H** option, as follows:

```
lsnode -H -l
```

**Note:** The **lsnode -H -l** command can only be used with nodes whose *Mode* attribute is **Managed**.

The **lsnode** command retrieves information about the attributes from each node.

To check that dsh is working, issue a simple **dsh** command. For example:

```
dsh -as date
```

A list of the nodes in the cluster is returned, with a date for each node.

---

## Installing CSM and the Red Hat operating system on x440 and x445 nodes

You can use this procedure to install CSM and the RedHat AS operating system on x440 or x445 nodes.

In order to use Red Hat AS 2.1 on the x440 or x445, you need to use the updated Red Hat AS 2.1 2.4.9-e.24summit kernel, which incorporates non-uniform memory access (NUMA) support. This NUMA support allows you to see the correct number of processors on the machine. The updated summit kernel is shipped with the **Red Hat Enterprise Linux AS (v. 2.1 for i386) Update 2 CDs**, which are available from the Red Hat Network at the following website:

[https://rhn.redhat.com/network/software/download\\_isos.pxt](https://rhn.redhat.com/network/software/download_isos.pxt).

In order to automatically gather MAC addresses on x445 nodes (either with **csmsetupks** or **getadapters**), the updated summit kernel needs to be installed on the CSM management server.

**Note:** Note: Automatic MAC address collection is not supported for the x440 nodes because **userconsole** is not supported on those machines. To do an operating system install on x440 nodes, you must manually enter the *InstallAdapterMacaddr* attribute for each node.

For information on installing CSM on an x440 or x445 management server that runs Red Hat AS, see “Installing CSM on an x440 or x445 management server that runs Red Hat AS” on page 35.

For information on installing CSM on x440 or x445 nodes, see “Installing CSM on x440 or x445 nodes with the Red Hat AS 2.1 operating system already installed” on page 54.

Once you have the management server installed, define the x440 or x445 nodes with the normal CSM procedures. When you run **csmsetupks**, insert the Red Hat AS 2.1 Updates CDs that you downloaded to ensure that the nodes get installed with a working version of the kernel. However, you need to use a customization script to downgrade **libstdc++** on the nodes before CSM is installed.

CSM provides a sample script:

`/opt/csm/install/sample_scripts/libstdc++._RedHatAS21Nodes` to perform the task.

1. Set up the script as follows so that you can run it when the nodes are installed (in step 2 use the **libstdc++** RPM that you downloaded):

```
cp /opt/csm/install/sample_scripts/libstdc++._RedHatAS21Nodes /csminstall/csm/scripts/installprereboot/
cp libstdc++-2.96-108.1.i386.rpm /csminstall/csm/scripts/data/
```

2. To install the x440 and x445 nodes with Red Hat AS 2.1 and CSM, run **installnode**.



---

## Chapter 8. CSM post-installation tasks

This chapter contains information on the tasks you might need to perform after you've installed CSM. For information about other CSM tasks, see the *CSM for Linux: Administration Guide*.

---

### Getting started with the newly installed cluster

This section tells you how you can determine whether the installation was successful. It also gives you some suggestions on how to get started using CSM. After installation is successfully completed, remote RMC and CSM commands are enabled. To verify that the installation was successful, follow the directions in the sections below.

#### Step 1. Logging into the nodes

This task only applies to you if you used CSM to install the operating system on the node.

To log into your nodes:

1. Log in as **admin**.
2. Enter **cluster** as the password. This password should be used for both the *admin* and *root* user.
3. Switch user to root (**su – root**).

For Red Hat and Red Hat AS clusters, the user IDs and passwords are set in the Kickstart node configuration file.

#### Step 2. Verifying that dsh is working on the nodes

To verify that **dsh** is working on all of the nodes, run the **dsh** command with the **date** option, as follows:

```
dsh -as date
```

A list of nodes with the date on each node is returned. If you get other output, see the diagnostics chapter in the *CSM for Linux: Administration Guide*.

#### Step 3. Checking the status of the nodes

To see the status of all the nodes, you can use the **monitorinstall**, **lsnode**, or **nodegrp** command. To use the **monitorinstall** command, enter:

```
monitorinstall
```

The **monitorinstall** command writes output similar to:

| Node               | Mode       | Status        |
|--------------------|------------|---------------|
| clsn02.cluster.com | Managed    | Installed     |
| clsn03.cluster.com | Managed    | Installed     |
| clsn04.cluster.com | MinManaged | Installed     |
| clsn05.cluster.com | MinManaged | Installed     |
| clsn06.cluster.com | MinManaged | Installed     |
| clsn07.cluster.com | Managed    | Installed     |
| clsn08.cluster.com | PreManaged | Not Installed |

All nodes should be listed as *Installed* when their installation is complete. Any other status values that appear in the output represent the progress of the installation. Installation errors are indicated with a status code. The nodes will eventually reach the *Installed* state.

To see the installation status of the nodes in your cluster using the **lsnode** command, enter:

```
lsnode -a Mode
```

The result shows you the *Mode* of each node. The mode for all the nodes should be **Managed** or **Premanaged**.

To see which of the nodes in your cluster are managed nodes using the **nodegrp** command, enter:

```
nodegrp ManagedNodes
```

The command displays a list of all the nodes in the cluster that are considered Managed (defined and installed).

#### Step 4. Verifying the power status of the nodes

To verify the power status of the nodes (whether they are on or off), enter:

```
rpower -a query
```

A list of nodes with their associated power state is returned.

#### Step 5. Verifying reachability of the nodes

To verify whether the nodes are reachable, enter:

```
lsnode -p
```

The current accessibility status of the node is returned. Accessibility is defined as the ability to successfully communicate with the RMC subsystem on the node.

#### Step 6. Listing predefined conditions, responses, and dynamic node groups

CSM provides a set of predefined conditions, responses, and dynamic node groups. To see a list of the predefined conditions, use the RSCT **lscondition** command as follows:

```
lscondition
```

To see a list of the predefined responses, use the RSCT **lsresponse** command as follows:

```
lsresponse
```

To see a list of the predefined condition/response pairs, use the **lscondresp** command, as follows:

```
lscondresp
```

To see a list of the predefined dynamic node groups use the **nodegrp** command, as follows:

```
nodegrp
```

---

## Setting up remote access manually

A distributed shell program (**dsh**) is used to run commands on the nodes. It is contained in the **csm.dsh** package and is installed by the **installms** command. The **dsh** program uses the remote shell of your choice to issue remote commands to the managed nodes from the management server (**ssh** is the default, but “Step 11. Decide which remote shell to use” on page 32 showed you how choose another shell). To enable the remote shell, you must perform the following tasks on *each node* before **dsh** is used.

## Manually setting up rsh on the nodes

### Setting up rsh on Red Hat nodes

1. Turn the **rsh** daemon on using the **chkconfig** command, as follows:

```
chkconfig rsh on
```

To check the **rsh** daemon’s status, use the **chkconfig** command, as follows:

```
chkconfig --list rsh
```

2. Set up root access through the **rsh** daemon. To do this, make sure that either **rsh** is listed in the **/etc/securetty** file, or that the **/etc/securetty** file does not exist.
3. Add the management server’s host name and root to a new line in the **\$HOME/.rhosts** file. The line should look like this:

```
ms_hostname root
```

### Setting up rsh on SuSE or SLES nodes

1. Uncomment all the lines that start with *# shell* in the **/etc/inetd.conf** file.
2. Run **/etc/rc.d/inetd restart**.
3. Add the management server’s host name and root to a new line in the **\$HOME/.rhosts** file. The line should look like this:

```
ms_hostname root
```

## Manually setting up OpenSSH on the nodes

The following procedure is one way to set up OpenSSH on the nodes manually. You can configure OpenSSH according to your needs as long as you can run the **ssh node\_name date** command without having OpenSSH prompt for a password.

1. If OpenSSH was not automatically set up by CSM, complete the following tasks on the management server:
  - a. Ensure the **openssh** and **openssh-clients** packages are installed.
  - b. Run the **ssh-keygen** command to generate a public/private key pair. Save the key in the default location and, when prompted for a passphrase, press the Enter key (both times). It is important that the private key not be encrypted with a passphrase so that **dsh** can access the nodes without a prompt.
  - c. Edit the **ssh-config** file so that it contains the line *Protocol 1,2*. This instructs **openssh** to try to connect with **ssh** protocol 1, corresponding to the default key type generated by the **ssh-keygen** command.
2. Complete the following tasks on each node:
  - a. Ensure the **openssh** and **openssh-server** packages are installed. If you just installed the packages, check to see if **sshd** is up and running. If it is not, you may have to reboot (or run the correct init file) in order to start the daemon.

- b. If you generated an rsa1 public/private key pair on the management server (no command line options on the **ssh\_keygen** command), append the public key stored in **identity.pub** (in the management server's **\$HOME/.ssh** directory) to each node's **\$HOME/.ssh/authorized\_keys** file (you may have to create this file on each node).
3. Perform this last step on the management server:
  - a. Run an **ssh** command to each node's full host name (or the host name that the **lshnode** command reports) and accept the RSA key fingerprint for each node.

**Note:** The Distributed Command Execution Environment (DCEM) graphical user interface is provided to make it easy to use the **dsh** command functions. See the **dcem** man page and the *CSM for Linux: Command and Technical Reference* for information on using DCEM.

For more information on the **dsh** command, see the man page or the commands chapter of *CSM for Linux: Command and Technical Reference*.

---

## Using probes

You can use the following probe scripts to perform certain checking for CSM.

**Note: The management server probe and the Hardware control probe are not supported for Linux on pSeries.**

### Management server probe (ibm.csm.ms)

The management server probe checks for problems that occur when you install the management server. The probe is part of the **csm.diagnostics** fileset and is installed on the management server when you install CSM.

To run the management server probe, issue the following command:

```
probemgr -p ibm.csm.ms
```

### Hardware control probe (ibm.csm.HWCtrl)

The hardware control probe verifies that the hardware control points and console servers are available. It generates a list of hardware control point and conservers based on the attributes in the *ManagedNode* table for the specified set of nodes. The hardware control probe assumes that the configuration for the node might not be ready for an operating system installation. It does not check for installation requirements.

The probe is part of the **csm.diagnostics** package and is installed on the management server when you install CSM.

To run the pre-managed node probe, issue the following command:

```
probemgr -p ibm.csm.HWCtrl
```

---

## Understanding the installation and configuration log files

Several of the commands you run during the installation process create log files, which are placed in the **/var/log/csm** directory. These log files contain extended error and informational messages from the command.



The following log files are created:

Table 10. Log files that are created during installation

| Command                                                                                    | Log file                             | Location          |
|--------------------------------------------------------------------------------------------|--------------------------------------|-------------------|
| <b>installms</b>                                                                           | <b>/var/log/csm/installms.log</b>    | Management server |
| <b>installnode</b>                                                                         | <b>/var/log/csm/installnode.log</b>  | Management server |
| <b>updatenode</b>                                                                          | <b>/var/log/csm/updatenode.log</b>   | Management server |
| <b>installnode</b> and <b>updatenode</b> commands result in data being written to this log | <b>/var/log/csm/install.log</b>      | Cluster node      |
| <b>csmsetupks</b>                                                                          | <b>/var/log/csm/csmsetupks.log</b>   | Management Server |
| <b>csmsetupyast</b>                                                                        | <b>/var/log/csm/csmsetupyast.log</b> | Management Server |

For Linux on pSeries , the following node specific log files are also useful:

- **/var/log/csm/getadapters/getadapters..log**
- **/var/log/csm/installnode..log**

---

## Uninstalling CSM

Use the **uninstallms** command to uninstall CSM. However, for non-pSeries nodes, if you ran **addlcsext** on your management server at some point, be sure to run the following command before you run **uninstallms**:

```
rm1csext -A
```

To uninstall CSM on the management server, run the **uninstallms** command on the management server. To uninstall CSM on the management server and the managed nodes, run the **uninstallms** command on the management server as follows:

```
uninstallms -u
```

If the **-u** flag is specified, the command performs clean up on the node by running the **rmnode -u** command. The **rmnode -u** command performs clean up on nodes being removed from the CSM database. On Linux machines, the install logs and **/var/opt/csm/cfmlocal** files and directories are removed, and CSM packages are uninstalled from the nodes.

In addition, the **uninstallms** command does the following on the management server:

- Removes node group definitions.
- Removes cluster node definitions using the **rmnode** command
- Removes predefined conditions.
- Uninstalls CSM management server software.
- Removes CSM log files.

Normally, the **uninstallms** command removes the **rsct.core** and **rsct.core.utils** packages. However, if the **rsct.basic** package was installed, **uninstallms** will not uninstall the RSCT packages.

The **uninstallms** command does not uninstall any open source prerequisites that might be installed. The command does not remove any of the **/csminstall** directories because these directories might contain data that does not pertain to

| CSM. If the management server is also a node, that is, if it has **csm.client** or GPFS installed, **uninstallms** does not uninstall **csm.client**, **rsct.core**, **rsct.core.utils** or **src**.

For more information about using the **uninstallms** and **rmnode** commands, see the *CSM for Linux: Command and Technical Reference*.

---

## Chapter 9. Reconfiguring a cluster

This chapter contains information on the tasks for reconfiguring your cluster.

---

### Changing the host name or IP address of the management server

To change the host name or IP address of the management server, use the **chnode** and **updatenode** commands.

**Note:** This procedure only applies when changing the hostname/IP that corresponds to any of the Network Installation Cards (NICs) that attach the management server on the cluster VLAN. You must ensure that any change to the configuration of the NIC cards results in the management server still having access to all nodes (and node subnets).

To update the host name of the management server:

1. Run the **chnode** command from the management server, setting the *ManagementServer* attribute to the new host name, and specifying the **-a** option to apply the command to all the nodes:

```
chnode -a ManagementServer=newhostname
```

**Note:** The *ManagementServer* attribute specifies the network host name through which the node should try to reach the management server. If the nodes are partitioned into more than one subnet, with multiple network adapters on the management server, the *ManagementServer* setting needs to be different for the nodes in the different subnets.

2. Run the **updatenode** command, specifying the **-a** (apply the command to all the nodes) and **-k** (exchanges the new host name between the management server and the nodes) options:

```
updatenode -a -k
```

Because the management server name has now changed, you need to update the remote shell access files (for example, **.rhosts**) on the nodes. This may be done for you by **updatenode -k** if *SetupRemoteShell* is set to **1** in *csminf*. You also need to update DNS and/or **/etc/hosts** on all nodes in the cluster and the management server.

To update only the IP address of the management server, run the **updatenode -a -k** command, as shown in Step 2, above.

---

### Notifying CSM of a change to the host name of a managed node

To change the host name of a node:

1. Update the management server's DNS or **/etc/hosts** file with the new hostname of the node.
2. Run the **chnode** command from the management server, followed by the name of the node:

```
chnode old_node_name Hostname=new_host_name
```

3. Run the **updatenode** command, specifying the **-k** option (exchanges the new host name between the management server and the node), followed by the new name of the node:

```
updatenode -k newnodename
```

4. If you have distributed ERRM conditions monitoring specific nodes, including the one with the changed host name, you may need to change the select string of the condition to target the new host name.

---

## Removing a node from an existing cluster

You can remove a node from the cluster using the **rmnode** command. By default, the **rmnode** command does not uninstall CSM and its prerequisites from the node. Rather, it disassociates the node from its management server. The **rmnode** command removes the node from the database of the management server, and it informs the node that it is no longer attached to the management server.

Before you go any further, you should store the node information about the node you want to remove into a **nodedef** file, in case you want to re-establish it later. To do this, use the **lsnode** command, as follows:

```
lsnode -F hostname>filename
```

Once you have stored the node information, remove the node. To remove a node from the cluster, type:

```
rmnode hostname
```

A removed node can be redefined to the cluster by running the **definnode** command, then the **updatenode** command.

For more information about the **rmnode**, **definnode**, and **updatenode** commands, see *CSM for Linux: Command and Technical Reference*.

---

## Moving a node from one cluster to another

To move a node from one cluster to another:

1. Issue the **rmnode** command to remove the node from its current management server.
2. Issue the **definnode** command to add the node to its new management server.
3. Run the **updatenode -k** command to bring the nodes into the cluster.

**Note:** Two DHCP servers cannot be in the same subnet. If the two management servers are in the same DHCP domain, and you have previously done a full installation (the operating system and CSM) of the node from the first management server, you must remove the node from the first management server's **/etc/dhcpd.conf** file. If you do not do this, the two DHCP servers will both respond to the node's DHCP broadcast. Remove the stanza for that node, and then run the **service dhcpd restart** command.

---

## Cloning CSM nodes to other nodes

If you clone CSM to other nodes, using a third-party cloning tool, do the following to get the new nodes to be working nodes in the CSM cluster.

1. On each new node, run the **/usr/sbin/rsct/install/bin/recfgct** command. This causes RSCT to generate a new unique node ID.
2. On the management server, define the nodes by issuing the **definnode** command.
3. Run the **updatenode -k** command to bring the new nodes into the cluster. After the **updatenode** command completes, the *Status* of each node should be **1**.

---

## Changing an existing Managed node to a Minimally Managed node

To change an existing *Managed* node to a *MinManaged* node:

1. Save your node data to a **nodedef** file by running:

```
l snode -F <node> > /tmp/nodedef
```

2. Edit the **/tmp/nodedef** file, and change the *Mode* to **MinManaged**.

3. Remove and uninstall CSM and RSCT from the node by running:

```
l rmnode -u <node>
```

4. Set the **Mode** to **MinManaged** and redefine the node by running:

```
l definenode -f /tmp/nodedef
```

5. Run:

```
l updatenode -n <node>
```

See “Installing Linux nodes without CSM” on page 20 for more information.



---

## Chapter 10. Migrating to the latest level of CSM for xSeries, IntelliStation, and BladeCenter

This chapter provides instructions for upgrading a previous level of CSM to the most current level.

You can upgrade the version of CSM that is on either the management server or the nodes. However, the version of CSM on the management server must always be the same, or more recent, than any other version of CSM installed on a node.

CSM does not support migrating the operating system from one level of Linux to another. This chapter only describes upgrading the CSM software.

**Note:** Before you upgrade CSM, IBM suggests backing up your CSM data. If migration is unsuccessful, or to return to the previous level of CSM, you can restore the CSM data from your backup copy. For details, see Chapter 11, “Backing up and restoring CSM and ERRM data,” on page 89 in the CSM 1.3.1 version of this book.

---

### Migrating from CSM 1.2.0

You cannot migrate directly from CSM 1.2.0 to CSM 1.3.2. First, migrate to CSM 1.3.1, then migrate from 1.3.1 to 1.3.2.

---

### Step 1. Download the CSM packages and non-IBM software (optional)

If you are installing CSM using the CD-ROM, you can skip this step and go directly to “Step 2. Upgrade the `csm.core` package.” If you will not be installing CSM using the CD-ROM, do the following:

1. Download the CSM packages from the *IBM Cluster software corrective service* Web site (<http://techsupport.services.ibm.com/server/cluster/fixes>) and place them in a directory (for example, `/tmp/csm`).
2. Download any packages that are listed in “Required non-IBM software you will need to download” on page 17 and put them in a directory (for example, `/tmp/csmreqs`).

You will now be able to install CSM from the directories you just created.

If your distribution is SuSE/SLES, understand that CSM 1.3.2 no longer uses SIS packages for installation. Instead, use the AutoYaST installation procedure that is part of SuSE or SuSE SLES.:

---

### Step 2. Upgrade the `csm.core` package

This step must be performed if you are installing CSM from the CD-ROM or from a directory. If you are installing CSM from the CD-ROM, do the following:

1. Mount the CSM CD-ROM as follows:  

```
mount /dev/cdrom /mnt/cdrom
```
2. Upgrade the `csm.core` package as follows:  

```
rpm -U /mnt/cdrom/csm.core-*
```

**Note:** It is important that you do not unmount the CD-ROM after it has been mounted.

If you are installing CSM from a directory, do the following:

1. If you have not already downloaded the CSM packages, follow the instructions in “Step 1. Download the CSM packages and non-IBM software (optional)” on page 83.
2. Run the **rpm** command, as follows, to upgrade **csm.core** from the directory in which you placed the CSM packages. In the following example, it is the **/tmp/csm** directory.

```
rpm -U /tmp/csm/csm.core-*
```

---

### Step 3. Upgrade the CSM software on the management server

1. If you are installing CSM from a directory, and you not already downloaded the required non-IBM packages, follow the instructions in “Step 1. Download the CSM packages and non-IBM software (optional)” on page 83.
2. Run the **installms** command with the **-p** (pkg\_path) option, followed by the mount point of the CD-ROM or the directory in which the CSM packages reside. For example, if the CSM packages are on the CD-ROM and the other downloaded RPMs (such as Autoupdate) are in a directory called **/tmp/csmreqs**, you would run the **installms** command as follows:

```
installms -p /tmp/csmreqs:/mnt/cdrom
```

If the CSM packages are in a directory called **/tmp/csm** and the other downloaded RPMs (such as Autoupdate) are in a directory called **/tmp/csmreqs**, you would run the **installms** command as follows:

```
installms -p /tmp/csmreqs:/tmp/csm
```

3. If you have the optional Linux Cluster Support extension for IBM Director installed on your management server, upgrade it by running the following command:  

```
addlcsext -A
```
4. CSM 1.3 uses a conserver configuration file and expects the **conserver** daemon to be running. If you are migrating from CSM 1.2 to CSM 1.3, perform the following step to build the conserver configuration file so that it includes all the currently defined nodes and starts the **conserver** daemon:  

```
chrconsolecfg -a
rconsolerefresh
```
5. If you have modified any of the CSM Kickstart configuration template files, or created your own from the template file shipped in a previous version of CSM, you need to merge the changes from CSM’s new template file into thr modified template file. Replace the sections in your modified template file that are marked with “DO NOT ERASE THIS SECTION” with the updated sections in the new version of the template file that ships with CSM.

---

### Step 4. Upgrade the CSM software on the nodes

1. Change the *InstallCSMVersion* attribute to 1.3.2 on all the nodes to be upgraded. For example, to change all the nodes, run the **chnode** command as follows:

```
chnode -a InstallCSMVersion=1.3.2
```

**Note:** Only the first three digits of the version are stored in the *InstallCSMVersion* attribute. Therefore, if you are upgrading from 1.3.1 to 1.3.1.20, you don’t need to run the **chnode** command but you still need to run all other upgrade steps.



2. Run the **updatenode** command to upgrade all the CSM software on the nodes. For example, to upgrade all the nodes, run the **updatenode** command as follows:

```
updatenode -a
```

**Note:** If the Linux Cluster Support extension is installed on your management server, **updatenode** automatically installs the Linux Cluster Support extension on the target nodes. If you upgraded the Linux Cluster Support extension on your management server, **updatenode** automatically installs or upgrades the Linux Cluster Support extension on the target nodes.

**Migrating from CSM 1.2.0 to 1.3.1:** If the management server is running the SuSE or SuSE SLES distribution and if System Installation Suite (SIS) has been used for the OS network install for CSM 1.3.1, the existing **systemimager** RPMs for SIS need to be manually upgraded before you proceed to the next step:

```
rpm -U systemimager-*.rpm
```

---

## Step 5: Upgrade the CSM software on the IBM Director Server (optional for non-pSeries)

If you are using IBM Director and CSM and have the Linux Cluster Support extension installed, you need to upgrade the extension components on your IBM Director Server. Depending on your environment, perform one of the following actions.

### If your IBM Director Server is a Windows system

1. Use Add/Remove Programs of Windows to remove the CSM 1.3.1.0 Linux Cluster Support extension for IBM Director from your system.
2. Delete the following jar file:  

```
\Program Files\IBM\Director\classes\XCServer.jar
```
3. Insert the CSM 1.3.2.0 CD-ROM into the CD-ROM drive of the system.
4. If the install wizard does not start running automatically, issue the following command. In this example the CD-ROM drive is *h:*:

```
h:\lcsext\addlcsext.exe
```

### If your IBM Director Server is a Linux system separate from any of your CSM systems

1. Insert the CSM 1.3.2.0 CD-ROM into the CD-ROM drive 2 of the system.
2. Run the following script. In this example the CD-ROM drive is mounted on the directory */mnt/cdrom*:

```
/mnt/cdrom/lcsext/addlcsext -S
```

3. If your IBM Director Server is also your CSM management server: Run the following command:

```
addlcsext -S
```

### If your IBM Director Server is also a CSM managed node

- Insert the CSM 1.3.2.0 CD-ROM into the CD-ROM drive and run the following script. In this example the CD-ROM drive is mounted on the directory */mnt/cdrom*:

```
/mnt/cdrom/lcsext/addlcsext -S
```

- From the management server that controls the node, issue the following command, where *<hostname>* is the hostname of the system that is both your IBM Director Server and CSM managed node:

```
updatenode <hostname>
```

---

## Coexistence

Within a cluster, the version of the operating system that is installed on the management server must be the same or higher than the version of the operating system installed on the nodes. See “Understanding CSM software requirements” on page 10 for the supported operating system levels. Also, your entire cluster must be installed with the same Linux distribution. The management server and nodes must all be running either Red Hat, Red Hat AS, SuSE, or SuSE SLES.

If your management server and nodes are running different operating system levels, or if the nodes are running CSM 1.3.0 or 1.3.1 and the management server is running CSM 1.3.2, you need to set the following node attributes correctly for each node:

- InstallCSMVersion
- InstallDistributionName
- InstallDistributionVersion

You can set these attributes when you define the nodes with the **definenode** command, or you can change them with the **chnode** command.

Before installing CSM on any node whose operating system version or CSM version is different from that of the management server, you also need to run the **copycsmpkgs** command to copy the correct packages to **/csminstall**. For example, if your management server has Red Hat 8.0 and CSM 1.3.2 installed, and CSM 1.3.1 is to be installed on *node02*, which is running Red Hat 8.0, do the following:

1. Run the **chnode** command, as follows:

```
chnode -n node02 InstallDistributionVersion=7.2 InstallCSMVersion=1.3.2
InstallTemplate=/opt/csm/install/kscfg.tpl.RedHat8.0
```

2. Run the **copycsmpkgs** command, as follows:

```
copycsmpkgs -p directory_containing_csm1.2 InstallCSMVersion=1.3.1 \
InstallDistributionVersion=8.0
```

3. Run the **updatenode** command, as follows:

```
updatenode -n node02
```

If you are installing the operating system along with CSM, you only need to run the **copycsmpkgs** command if the node’s CSM level is different from the level of the management server. If the node’s Linux operating system level is lower than that of the management server, the **csmsetupks** or **csmsetupyast** command that is issued for the downlevel node copies all the operating system packages to **/csminstall**.

**Note:** If the nodes are running CSM 1.3.1 or lower, CSM cannot perform a full network installation of the following Linux distributions:

- SuSE SLES 7
- SuSE 8.0

If your management server has Red Hat 9 and CSM 1.3.2 installed, and *node02* is to be installed with Red Hat 8.0 and CSM 1.3.2, run the following commands:

1. Run the **chnode** command, as follows:  

```
chnode -n node02 InstallDistributionVersion=8.0
InstallTemplate=/opt/csm/install/kscfg.tpl.RedHat8.0
```
2. Run the **csmsetupks** command, as follows:  

```
csmsetupks -n node02
```
3. Run the **installnode** command, as follows:  

```
installnode -n node02
```

If your management server has Red Hat 9 and CSM 1.3.2, and *node02* is to be installed with Red Hat 8.0 and CSM 1.3.1, do the following:

1. Run the **chnode** command, as follows:  

```
chnode -n node02 InstallDistributionVersion=7.2 InstallCSMVersion=1.3.1
InstallTemplate=/opt/csm/install/kscfg.tpl.RedHat8.0
```
2. Run the **copycsmpkgs** command, as follows:  

```
copycsmpkgs -p directory_containing_csm1.2 InstallCSMVersion=1.3.1 \
InstallDistributionVersion=8.0
```
3. Run the **csmsetupks** command, specifying *node02* with the **-n** flag. For example:  

```
csmsetupks -n node02
```
4. Run the **installnode** command with the **-n** flag, as follows:  

```
installnode -n node02
```

See the **copycsmpkgs** man page or the *CSM for Linux: Command and Technical Reference* for more information.

## Converting the SIS node configuration template

As of CSM 1.3.2, SuSE and SuSE SLES no longer use SIS for installation of the operating system on the nodes. If you have existing SIS node configuration templates, you can use the **csmsis2yast** conversion tool. The **csmsis2yast** conversion tool merges the SIS disk partition table and the SIS package list into an AutoYaST configuration template (xml file).

For information, see the man page or the *CSM for Linux: Command and Technical Reference* for **csmsis2yast**.

## Coexistence with GPFS

If GPFS is installed on your management server or node, and the version of RSCT there is older than the version that comes with CSM, CSM will automatically update it. This causes HATS and HAGS on the GPFS nodes to be recycled, which then causes *machine down* and *machine up* events.

If you install GPFS after installing CSM, do not install the RPM packages that come with GPFS if they are older than the ones that were installed with CSM. If this is the case, you can get the latest **rsct.basic** RPM from the CSM CD-ROM.

The following table shows which versions of CSM and GPFS can co-exist in the same cluster:

|         | GPFS 1.2    | GPFS 1.2.2  | GPFS 1.3    |
|---------|-------------|-------------|-------------|
| CSM 1.1 | Yes         | Unsupported | Unsupported |
| CSM 1.2 | Yes         | Yes         | Yes         |
| CSM 1.3 | Unsupported | Yes         | Yes         |

|                  | <b>GPFS 1.2</b>  | <b>GPFS 1.2.2</b> | <b>GPFS 1.3</b>  |
|------------------|------------------|-------------------|------------------|
| <b>CSM 1.3.1</b> | See the CSM FAQ. | See the CSM FAQ.  | See the CSM FAQ. |
| <b>CSM 1.3.2</b> | See the CSM FAQ. | See the CSM FAQ.  | See the CSM FAQ. |

|

---

## Chapter 11. Backing up and restoring CSM and ERRM data

This chapter discusses how to back up and restore CSM and ERRM data. Perform these tasks if you plan to upgrade the operating system of your management server. The backup and restore procedures assume that you are restoring data on a machine that has the same host name as the machine on which you backed up the data.

Depending on your cluster environment, use the procedures as follows:

- For xSeries, Intellistation, or BladeCenter nodes that are running CSM 1.3.2 or later, see “Using `csmbackup` to back up CSM and ERRM data.”
- For versions of CSM that are earlier than CSM 1.3.2 or for Linux on pSeries cluster configurations, see “Backing up data on Linux for pSeries and for versions of CSM earlier than CSM 1.3.2” on page 90.

---

### Using `csmbackup` to back up CSM and ERRM data

You can use the script `csmbackup` to create a directory for backup files and backup information for nodes, csm data, and user specified files. Specify a tape or CD-ROM device and a directory where the backup files can be placed. If you do not specify a directory, the backup files are placed in the following directory:

```
/var/opt/csm/csmdata
```

The `csmbackup` command creates back up files and does the following tasks:

- Backs up node data in **lsnode.csmbak**
- Backs up node group definitions in **nodegrp.csmbak**
- Backs up the following:
  - ERRM conditions in **Condition.csmbak**
  - Responses in **EventResponse.csmbak**
  - Associations in **Association.csmbak**
  - Sensors in **Sensor.csmbak**
- Backs up ERRM Event Response scripts in **errm** directory
- Backs up user customization scripts used during CSM installations in **scripts.tgz**
- Backs up root users DCEM files from the \$HOME/dcem/ in **dcem.tgz**
- Backs up CSM configuration information in **config.csmbak**
- Backs up CSM password information in the **system\_config** directory
- Backs up CSM installation templates in the **installTemplate** directory
- Backs up any other user defined file or directory in **userbak**

In addition, `csmbackup` performs an `ls -R` command to list the contents of the following directories and each of their subdirectories:

- **/cfmroot** in **cfroot.contents**
- **/csminstall/Linux** in **csminstallLx**
- **/csminstall/AIX** in **csminstallAIX**

The command `csmbackup` also allows a user file to be backed up on each row. For example, if you wish for the files `/etc/dhcpd.conf` and `/etc/hosts` to be backed up along with the rest of the CSM data, you can create a file where the contents are a list of files on each row:

Invoke the following command to copy these files into the **userbak** subdirectory in the backup directory:

```
csmbackup -f myfile
```

If you wish to back up **csmdata** on an nfs mounted filesystem, issue the following commands:

```
[root@imaster1 root]# mount 10.0.0.1:/my/backup /mnt/etc/dhcpd.conf
[root@imaster1 root]# csmbackup -d /mnt -f myfile
```

The contents of myfile in addition to all the standard CSM data in the **/my/backup/** subdirectory is backed up on the 10.0.0.1 server.

The **-r** option of **csmbackup** allows the following parameters:

- Sensor
- EventResponse
- Condition
- Association
- ManagedNode
- NodeGroup
- DmsCtrl
- User file name

Each of these options backs up data associated with its resource class. You can create a condition that monitors when one of the resource classes changes by monitoring '**ConfigChanged >= 0**' on a specified resource class, then set up a response that runs the following script:

```
csmbackup -r <Resource_Class> -d <directory>
```

For information, see the MAN page for **csmbackup**.

---

## Using csmrestore to restore data

You can use the script **csmrestore** to restore data that you have backed up through the **csmbackup** script. The command **csmrestore** assumes that you have installed CSM on the management server where you want to restore data and that the CSM license has been accepted. Note that the management server might have a different hostname than the original management server. For the script to restore data to CSM, specify the directory where the back up files reside on the **csmrestore** command by using the **-f** option.

For more information, see the MAN page for **csmrestore**.

---

## Backing up data on Linux for pSeries and for versions of CSM earlier than CSM 1.3.2

The following directories on the management server should be backed up:

- /csminstall
- /etc/opt/csm
- /var/opt/csm

To back up node data, run the **lsnode -F** command and redirect the output to a file. For example:

```
lsnode -F > /csmbackup/node.data
```

To back up node group data, run the **nodegrp -L** command, and redirect the output to a file. For example:

```
nodegrp -L > /csmbackup/nodegrp.data
```

You also need to back up the IBM.Condition, IBM.EventResponse, and IBM.Association resource managers to save the ERRM data. To back up IBM.Condition and IBM.EventResponse, run the **lsrsrc -i** command, and redirect the output to a file. For example:

```
lsrsrc -i IBM.Condition > /csmbackup/errmconditions.data
lsrsrc -i IBM.EventResponse > /csmbackup/errmresponses.data
```

To back up IBM.Association, run the **lscondresp -lx** command, and redirect the output to a file. For example:

```
lscondresp -lx > /csmbackup/errmcondresp.data
```

---

## Restoring CSM and ERRM data

Copy the following directories from the backup media:

- /csminstall
- /etc/opt/csm
- /var/opt/csm

To restore the saved node data, run the **definenode -f** command. For example:

```
definenode -f /csmbackup/node.data
```

Note that the **definenode** command does not change the definitions of any of the existing nodes.

To restore the saved node group data, run the **nodegrp -f** command. For example:

```
nodegrp -f /csmbackup/nodegrp.data
```

When you restore the ERRM conditions and responses, make sure that none of the backed up conditions or responses already exist. To do this, you can remove all existing conditions and responses using the **rmrsrc** command. For example:

```
rmrsrc -s "Name LIKE '%" IBM.Condition
rmrsrc -s "Name LIKE '%" IBM.Response
```

After you have removed the existing conditions and responses, you can restore the original ones with the **mkrsrc -f** command. For example:

```
mkrsrc -f /csmbackup/errmconditions.data IBM.Condition
mkrsrc -f /csmbackup/errmresponses.data IBM.EventResponse
```

You must restore the associated conditions and responses manually. For each line in the **errmcondresp.data** file that ends in *Active*, run the **startcondresp** command with the first two entries from the line as arguments. Then, for any lines in the file that end with *Not active*, run the **mkcondresp** command with the first two entries as arguments. For example:

```
mkcondresp "NodeChanged" "rconsoleUpdateResponse"
```





---

## Appendix A. Understanding the installation directories and files

The **installms** command establishes the CSM directories and the required packages when it is run from the management server. The figure below illustrates the overall directory structure of CSM after it has been installed on your system.

**Notes:**

1. Not all directories listed below will be created on all systems (for example, SuSE and SLES and Red Hat AS directories cannot be on a Red Hat machine).
2. In the figure, xx for **RedHatxx** can be 7.2, 7.3, 8.0, 9, or AS2.1; xx for **SuSExx** or **SLESxx** can be 7.2, 8.0 or 8.1.

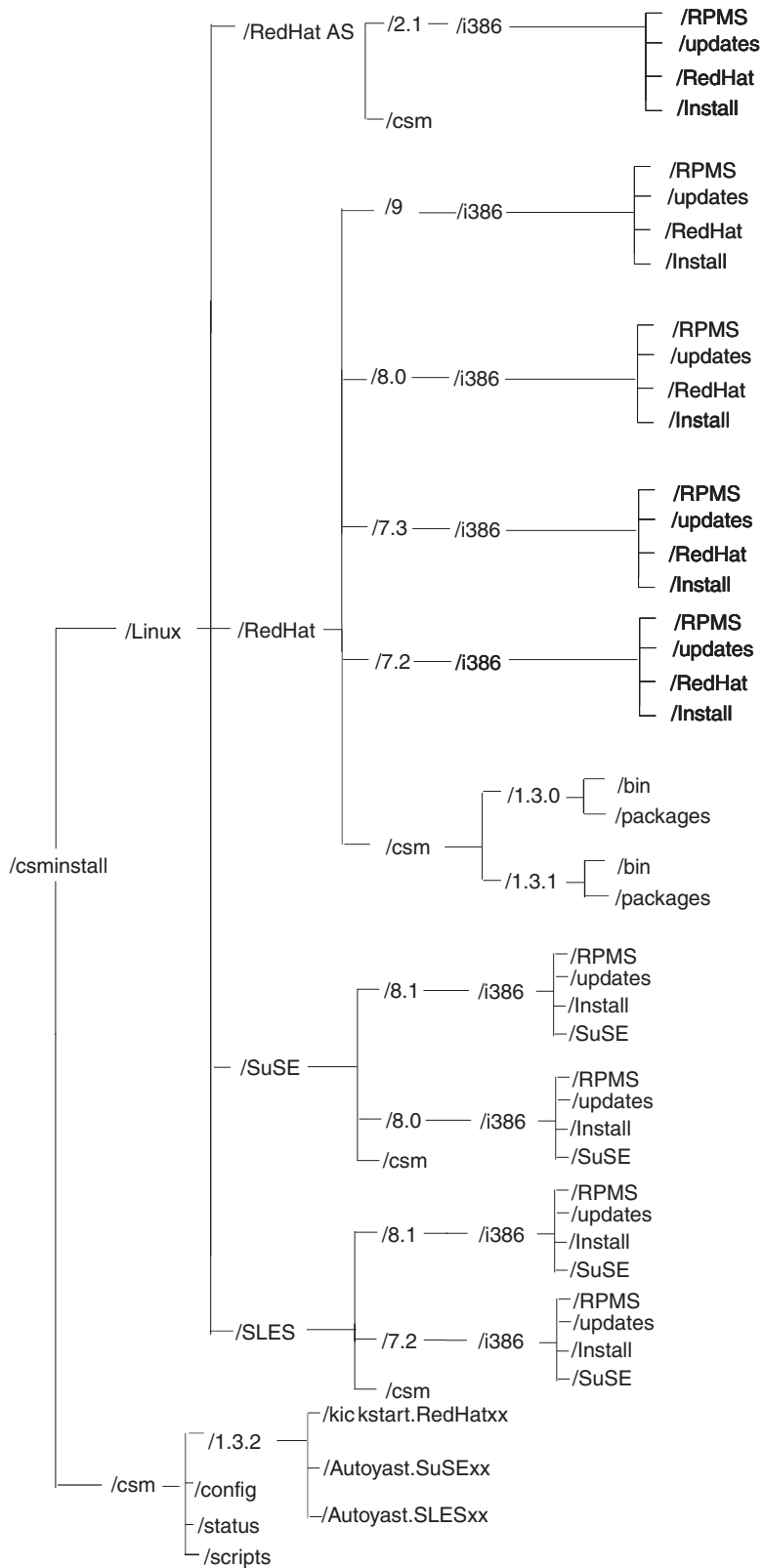


Figure 1. CSM installation directory structure

The table below describes some of the directories that may be of interest to you. The directory names may contain the following variables, which correspond to node attributes and must have the same values used during node definition.

- *InstallOSName* — Represents the operating system type. The valid operating system type is **Linux**. For example, `/csminstall/Linux`.
- *InstallDistributionName* — Represents the operating system distribution (**RedHat**, **RedHatAS**, **SuSE**, or **SLES** are the valid values). For example, `/csminstall/Linux/RedHat`.
- *InstallCSMVersion* — Represents the version, release, and modification of CSM (specify as *version.release.modification*). The valid values are **1.2.0**, **1.3.1**, and **1.3.2**. For example, `/csminstall/Linux/RedHat/csm/1.3.2`.
- *InstallDistributionVersion* — Represents the operating system version (specify as *version.release.modification*). For example, `/csminstall/Linux/SLES/8.1`.
- *InstallPkgArchitecture* — Represents the machine architecture. For xSeries, IntelliStation, and BladeCenter, the variable along with the directory name is **i386**. Although your machine architecture might actually be i486, i586, or i686, the default *InstallPkgArchitecture* attribute for any of these architectures is **i386**. For pSeries on Linux, the variable along with the directory name is **pp64**.

Table 11. CSM installation directories

| Directories/Files                                                                                                                  | Description                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>/csminstall</code>                                                                                                           | Main (parent) CSM install directory. <code>/csminstall</code> is mounted on the cluster nodes during both CSM-only and full installations.                                                                                                        |
| <code>/csminstall/csm</code>                                                                                                       | Contains tools and libraries required for CSM (for files that are not specific to a particular version of CSM).                                                                                                                                   |
| <code>/csminstall/csm/config</code>                                                                                                | Contains temporary node configuration files. Do not modify the contents of this directory.                                                                                                                                                        |
| <code>/csminstall/csm/status</code>                                                                                                | Status files of node installation.                                                                                                                                                                                                                |
| <code>/csminstall/csm/scripts</code>                                                                                               | The directory in which the user can place configuration scripts that are run during the installation. This directory contains the following subdirectories: <b>installprereboot</b> , <b>installpostreboot</b> , <b>updates</b> and <b>data</b> . |
| <code>/csminstall/csm/InstallCSMVersion</code>                                                                                     | Contains tools and libraries required for CSM (for files that are specific to a particular version of CSM).                                                                                                                                       |
| <code>/csminstall/csm/InstallCSMVersion/kickstart.InstallDistributionNameInstallDistributionVersion/node-ipaddr-kickstart</code>   | The Kickstart configuration file for each node.                                                                                                                                                                                                   |
| <code>/csminstall/csm/InstallCSMVersion/autoyast.InstallDistributionNameInstallDistributionVersion/node-ipaddr-autoyast.xml</code> | The AutoYaST configuration file for each node.                                                                                                                                                                                                    |
| <code>/csminstall/InstallOSName</code>                                                                                             | Contains files needed to install and configure nodes based on the operating system type.                                                                                                                                                          |

Table 11. CSM installation directories (continued)

| Directories/Files                                                                                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>/csminstall/InstallOSName/InstallDistributionName/csm/InstallCSMVersion/packages/*.rpm</code>                              | The directory in which the RPM packages, that will be installed on the management server and the nodes, are stored. <b>installms</b> copies the CSM RPMs from the CSM CD-ROM to this directory. RPMs of open source and IBM Java2 programs also get stored here.                                                                                                                                                                                     |
| <code>/csminstall/InstallOSName/InstallDistributionName/InstallPkgArchitecture/RPMS</code>                                       | The directory in which the RPM packages, that will be installed on the management server and the nodes, are stored. <b>installms</b> copies the RPMs that are needed to install CSM on the management server and the nodes to this directory. <b>csmsetupks</b> , <b>csmsetupsis</b> , and <b>smsupdatenode —copy</b> are all commands that copy the RPMs needed to install the operating system and perform software maintenance to this directory. |
| <code>/csminstall/InstallOSName /InstallDistributionName/InstallDistributionVersion/InstallPkgArchitecture /install/*.rpm</code> | The directory in which the user can place required CSM RPM packages that are not part of the base operating installation. <b>installms</b> , <b>copycsmppgs</b> , or <b>smsupdatenode</b> copies the RPMs from this directory to the nodes.                                                                                                                                                                                                          |
| <code>/csminstall/InstallOSName/InstallDistributionName/InstallPkgArchitecture/updates</code>                                    | The directory that contains software updates to be installed on the nodes. When you place RPMs in this directory, they are updated/installed on the nodes by the <b>smsupdatenode</b> and <b>updatenode</b> commands. See the <b>smsupdatenode</b> and <b>updatenode</b> man pages for more information.                                                                                                                                             |
| <code>/etc/dhcpd.conf</code>                                                                                                     | The system configuration file for the dhcp server.                                                                                                                                                                                                                                                                                                                                                                                                   |
| <code>/opt/csm/install/kscfg.tmpl.InstallDistName.InstallDistributionVersion</code>                                              | The default Kickstart configuration template file.                                                                                                                                                                                                                                                                                                                                                                                                   |
| <code>/opt/csm/install/yastcfg.InstallDistributionNameInstallDistttributionVersion-InstalPkgArchitecture.xml</code>              | The default AutoYaST configuration template file.                                                                                                                                                                                                                                                                                                                                                                                                    |

---

## Appendix B. Using CSM with IBM Director (non pSeries only)

This chapter describes how to add Linux cluster support extension components to the CSM cluster. IBM Director is only available on xSeries, IntelliStation, and BladeCenter Linux systems and is optional. It is not available for Linux on pSeries.

See “Linux Cluster Support extension for IBM Director (for Linux on xSeries, IntelliStation, or BladeCenter only)” on page 20.

To use IBM Director and CSM together to manage your Linux cluster, you must add the Linux Cluster Support extension components to your IBM Director Server, and to your CSM management server and each managed node. (The Linux Cluster Support extension components and the tools for installing them are part of CSM.)

---

### Adding Linux Cluster Support extension components to your CSM management server and managed nodes

Follow these steps:

1. Ensure that you have completed “Step 14. Install the Linux Cluster Support extension for IBM Director (optional for non pSeries)” on page 34.
2. Run **updatenode -a** on your management server to add the Linux Cluster Support extension to all your managed nodes.

---

### Adding Linux Cluster Support extension components to your IBM Director Server

To add the Linux Cluster Support extension components to your IBM Director Server, do one of the following depending on your environment:

#### **If your IBM Director Server is a Windows system:**

1. Insert the CSM CD-ROM into the CD-ROM drive on your IBM Director Server system.
2. If the install wizard does not start running automatically, issue the following command. In this example, the CD-ROM drive is *h:*, but you can specify whichever CD-ROM drive is valid on your system:

```
h:\lcsext\addlcsext.exe
```

#### **If your IBM Director Server is a Linux system separate and distinct from any of your CSM systems:**

1. Insert the CSM CD-ROM into the CD-ROM drive on your IBM Director Server system.
2. Run the following install script. In this example, the CD-ROM drive is mounted on the directory **/mnt/cdrom**:

```
/mnt/cdrom/lcsext/addlcsext -S
```

**If your IBM Director Server system is also your CSM management server:** You might already have the necessary extension components installed depending on the order that you installed IBM Director and ran various CSM commands. To check if the **csm.director.server** RPM is installed, issue the following command:

```
rpm -qa | grep csm
```

If the RPM is not installed, issue the following command:

```
| /opt/csm/bin/addlcsext -S
```

| **If your IBM Director Server system is also a CSM managed node:** If your IBM  
| Director Server system is a CSM managed node, you might already have the  
| necessary extension components installed depending on the order that you installed  
| IBM Director and ran various CSM commands. To check if the **csm.director.server**  
| RPM is installed, issue the following command:

```
| rpm -qa | grep csm
```

| If the RPM is not installed, do one of the following:

- Insert the CSM CD-ROM into the CD-ROM drive on your IBM Director Server system, and run the following install script. In this example, the CD-ROM drive is mounted on the directory **/mnt/cdrom**:

```
| /mnt/cdrom/lcsext/addlcsext -S
```

- From the management server that controls the node, issue the following command, where *<hostname>* is the *hostname* of the system that is both your IBM Director Server and CSM managed node:

```
| /opt/csm/bin/updatenode <hostname>
```

---

## Appendix C. Avoiding problems with hardware and network setup

---

### Avoiding installation errors related to problems with DHCP

There are some DHCP (Dynamic Host Configuration Protocol) problems that can cause the **installnode** command to fail. The **installnode** command is used to install CSM and the operating system on the nodes of your cluster. Depending on your configuration, you may need to take one of the following actions:

- **If you have the 2.4.7–10 kernel and a Gigabit Ethernet switch**, you need to upgrade your kernel. The 3.1.22 version of the Intel<sup>®</sup> Pro/1000 network driver that is included in the 2.4.7–10 kernel has problems, while the 3.1.23 version of the driver does not have problems. The 3.1.23 version of the driver is included with, for example, the 2.4.9–31 kernel.
- **If you have the 2.4.9–31 or above kernel and most Ethernet switches** (for example, the one that is included with the IBM Cluster 1350), there will be DHCP problems that are caused by the Spanning-Tree protocol setting in the Ethernet switch. To work around this problem, you can either turn off Spanning-Tree (which is not recommended) or enable the portFast setting for the ports (which is recommended).

For more information about potential Spanning-tree problems, refer to the CSM FAQ at [http://techsupport.services.ibm.com/server/cluster/tips/csm\\_faq.html](http://techsupport.services.ibm.com/server/cluster/tips/csm_faq.html)

Note also that the CSM management server must be the only DHCP server running on the subnet. If you have another DHCP server running on the same subnet as the CSM management server and the nodes, it can intercept the DHCP broadcasts from the nodes. As a result, the install process will not start.

---

### Configuring your switch for multiple VLANs

Having multiple network interfaces on a management server that are attached to the same VLAN can cause some unexpected side effects due to fact that broadcast traffic on the VLAN is seen on multiple interfaces.

One possible problem is that ARP requests for the IP address that is assigned to one interface may be seen by another interface first. This causes the other interface to send its MAC address back in a form of automatic proxy ARPing. This can cause inbound and outbound traffic for a given network to be split between the interfaces (where inbound traffic comes in on the wrong interface). In addition, protocols like DHCP, that rely on broadcast traffic, can get confused by the multiple queries/responses that are seen on the network.

To avoid these problems, it is recommended that you connect the various cluster networks to separate VLANs.

The following is an example of how to configure a switch for multiple VLANs. It shows making the first 16 ports part of *cluster-VLAN*, the rest of the ports part of the default VLAN1, and the Gbps ports trunk.

```
Connect to the Cisco switch
> telnet cisco
> enable

Create the new VLAN
> vlan database
```

```

> vlan 2 name cluster-VLAN
> exit
Confirm that the VLAN has been created
> show vlan brief

Add ports to the VLAN
Note that we also set each port with "spanning-tree portfast".
Without this option, DHCP may fail because it takes too long
for a port to come online after a node powers up.

> configure terminal

The following needs to be done for each port being added to the VLAN
For example "interface Fa0/3" for port 3.

 > interface Fa0/{port number}
 > switchport mode access
 > switchport access vlan 2
 > spanning-tree portfast
 > exit

When done, exit the configuration mode
> exit

Verify that the ports are now part of the new VLAN
> show vlan brief

Make the Fiber ports trunk all VLANS
> configure terminal
> interface Gi0/1
> switchport mode trunk
> switchport trunk encapsulation isl
> exit
> interface Gi0/2
> switchport mode trunk
> switchport trunk encapsulation isl
> exit
> exit

Save the config
> copy running-config startup-config
> exit

```

---

## Avoiding problems with externally attached SCSI devices

The way that Linux assigns SCSI device names can cause device name issues when the operating system is installed. During the install process, SCSI device names are assigned according to the order in which they are found. This means that, for systems that put their onboard SCSI controllers last in the PCI probe order, any add-on SCSI controllers will be found first, and will have their attached drives mapped first. This is a common problem for systems that have external storage attached to either a secondary SCSI or FiberChannel PCI adapter.

Note the following output from the `/proc/pci` file on an xSeries 345 system with optional QLogic fibre adapters:

```

Bus 6, device 1, function 0:
 Fibre Channel: QLogic Corp. QLA2300 (rev 1).
 IRQ 16.
 Master Capable. Latency=64. Min Gnt=64.
 I/O at 0x2400 [0x24ff].
 Non-prefetchable 64 bit memory at 0xfbf000 [0xfbf000ff].
Bus 8, device 2, function 0:
 Fibre Channel: QLogic Corp. QLA2300 (#2) (rev 1).
 IRQ 18.

```



```

 Master Capable. Latency=64. Min Gnt=64.
 I/O at 0x2600 [0x26ff].
 Non-prefetchable 64 bit memory at 0xf9fff000 [0xf9ffffff].
Bus 6, device 8, function 0:
 Ethernet controller: PCI device 8086:1010 (Intel Corp.) (rev 1).
 IRQ 29.
 Master Capable. Latency=64. Min Gnt=255.
 Non-prefetchable 64 bit memory at 0xfbf00000 [0xfbfdffff].
 I/O at 0x2500 [0x253f].
Bus 6, device 8, function 1:
 Ethernet controller: PCI device 8086:1010 (Intel Corp.) (rev 1).
 IRQ 30.
 Master Capable. Latency=64. Min Gnt=255.
 Non-prefetchable 64 bit memory at 0xfbf00000 [0xfbfbdffff].
 I/O at 0x2540 [0x257f].
Bus 8, device 7, function 0:
 SCSI storage controller: LSI Logic / (...) 53c1030 (rev 7).
 IRQ 27.
 Master Capable. Latency=72. Min Gnt=17.Max Lat=18.
 I/O at 0x2700 [0x27ff].
 Non-prefetchable 64 bit memory at 0xf9fe0000 [0xf9feffff].
 Non-prefetchable 64 bit memory at 0xf9fd0000 [0xf9fdffff].
Bus 8, device 7, function 1:
 SCSI storage controller: LSI Logic / (...) 53c1030 (#2) (rev 7).
 IRQ 28.
 Master Capable. Latency=72. Min Gnt=17.Max Lat=18.
 I/O at 0x2800 [0x28ff].
 Non-prefetchable 64 bit memory at 0xf9fc0000 [0xf9fcffff].
 Non-prefetchable 64 bit memory at 0xf9fb0000 [0xf9fbffff].

```

With this PCI bus arrangement, the first drive or LUN in a storage controller attached to one of the QLogic adapters would be mapped by the install kernel as **/dev/sda**. This would cause the installation to overwrite any existing data on that drive/LUN, and would create boot problems because the bootstrap code would be written to a drive that is not bootable via the system BIOS.

To get around this problem, any externally attached SCSI devices or controllers should be powered off or disconnected when you install the operating system. This will force the install to occur on the native system drives. After the operating system has been installed, verify that the **/etc/modules.conf** file lists the modules for add-on controllers with the highest *scsi\_hostadapter* numbers, and that any special SCSI options have been set for those controller types. For example, here is an **/etc/modules.conf** file for an xSeries 345 with a FASTT controller attached via Qlogic adapter cards:

```

alias parport_lowlevel parport_pc
alias eth0 e1000
alias eth1 e1000
alias usb-controller usb-ohci
alias scsi_hostadapter mptbase
alias scsi_hostadapter1 mptscsih
alias scsi_hostadapter2 mptscsih
alias scsi_hostadapter3 mptscsih
alias scsi_hostadapter4 qla2300
options scsi_mod max_scsi_luns=128

```

If you change the **modules.conf** file, the **mkinitrd** utility needs to be run to rebuild the boot **initrd** image.

---

## Avoiding problems with Linux on pSeries and SuSE SLES nodes

### Installing many nodes at the same time

If you are planning to install more than 8 nodes at the same time with **installnode**, you need to do the following:

1. Update the following file

```
:/etc/sysconfig/nfs
```

and set **USE\_KERNEL\_NFSD\_NUMBER** to a higher value than the default of 4. Based on the number of nodes you are installing, consider setting the value to 16 or 32.

2. Restart the **nfs** server to ensure that the values take effect

Also, before you run **installnode**, use the following commands to set the **CSM\_FANOUT** to 4 and **CSMFANOUT\_DELAY** to 2400 to install a large number of nodes simultaneously:

```
export CSM_FANOUT=4
export CSM_FANOUT_DELAY=2400
```

### Installation using AutoYaST

When you use the CD-ROM with AutoYaST to install SuSE SLES 8.1 for Linux on pSeries nodes, the program might hang. To prevent the problem, follow these steps::

- Download the update for the SuSE SLES 8.1 kernel (**kernel-ppc64-2.4.19-228.ppc.rpm** or greater) to a temporary directory. To obtain the kernel, go to the following site:

```
http://support.suse.de/psdb/
```

- Copy the update kernel RPM file to the following directory:

```
/csminstall/Linux/SLES/8.1/ppc64/updates/kernel/directory
```

- Run the following command:

```
csmsetupyast
```

### HMC Power Status errors

The **hmc** driver version must be 3.2.1 or greater. For updates, see the following web site:

```
https://techsupport.services.ibm.com/server/hmc
```

If the **rpower** command does not return a valid power status from the HMC, you might need to restart **IBM.HWCTRLRM**. Follow these steps:

1. Issue the following command:

```
lssrc -a
```

2. If the **IBM.HWCTRLRM** daemon is not active, go to step 5.

3. If the daemon is active, issue the following command:

```
stopsrc -s IBM.HWCTRLRM
```

4. Check to determine that the daemon is stopped:

```
lssrc -a
```

If the daemon is not stopped, repeat step 3.

5. If the daemon is stopped, issue the following command:

```
ps -ef|grep HWCTRL
```

6. To restart the daemon, issue the following command:

```
startsrc -s IBM.HWCTRLRM
```

## **Updating OpenFirmware for pSeries hardware**

To update the OpenFirmware on pSeries hardware, see the following web site

<https://techsupport.services.ibm.com/server/mdownload//download.html>



---

## Appendix D. Understanding error messages from SuSE, SLES, and Red Hat

---

### NFS errors while running `installnode` and `updatenode` commands

|                   When you use the `installnode` and `updatenode` commands, you might see some  
|                   NFS warnings. You also might see NFS *invalid argument* warnings when you run  
|                   the `exportfs` command:

```
| 172.60.3.11:/csminstall/csm: Invalid argument
| 172.60.3.17:/csminstall/csm: Invalid argument
```

|                   You can ignore these warnings. To eliminate the warnings, stop and restart the NFS  
|                   daemon. This action flushes the problems out of the NFS table of the kernel.

---

### Errors while running `installms` on Red Hat 8.0

The following warnings may appear when running `installms` on a Red Hat 8.0 machine:

```
Installing nfs-utils-1.0.1-2.i386.rpm .
installms: Exit code 1 from command: /bin/rpm -U \
/csminstall/Linux/RedHat/8.0/i386/RedHat/RPMS/nfs-utils-1.0.1-2.i386.rpm \
--force 2>&1
Error message from cmd: warning: /csminstall/Linux/ \
RedHat/8.0/i386/RedHat/RPMS/nfs-utils-1.0.1-2.i386.rpm: \
V3 DSA signature: NOKEY,
key ID db42a60e
```

These warnings can safely be ignored.



---

## Appendix E. Creating multiple install servers for CSM Installs (Linux on xSeries, IntelliStation, and BladeCenter only)

This appendix tells you how to allow multiple machines, called install servers, to supply CSM install files to your cluster. Using multiple install servers allows you to increase the number of concurrent CSM and Linux OS installs.

**Note:** Currently, install servers are not supported for Linux on pSeries clusters.

---

### Before you begin

**Note:** For dhcp purposes, the management server will still need to be connected to all node subnets for Linux full installs. The install server cannot be used as a gateway to the nodes during full installations (although this is allowed for CSM only, updatenode, installs).

Both the install server and the nodes that it serves must be able to do full hostname resolution on each other. This information will be provided to the node during full install, but must be manually added to the install server's `/etc/hosts` file, and added to the nodes' `/etc/hosts` file if you are doing CSM only installs.

---

### Using a CSM node as an install server

The easiest way to configure an install server is to use a CSM node as the server. This allows the CSM tools to recognize the dual functionality of the node and to automatically configure the install server. There are three steps in this process:

#### Step 1. Set the `InstallServer` attribute

To use a CSM node as an install server, you need to set the `InstallServer` attributes of the nodes that you want it to serve. In the `InstallServer` attribute you can specify both the name of the machine and optionally a directory that you want to use to store the install files. (If you don't specify a directory, it defaults to `/csmserver`).

You can use any directory on the install server to store the CSM installation files. The `hostname` of the machine and the directory should be separated by a colon. The `hostname` of the install server should match the `hostname` attribute of the node that you want to use as an install server, and it should be a full `hostname`.

The following example shows how to set `node1` as the install server for all of the nodes in the `RedHat72Nodes` node group. (All commands are shown after the `$` prompt, the other lines are output):

```
$ lsnode -a Hostname node1
node1.clusters.com
$ chnode -N RedHat72Nodes
InstallServer=node1.clusters.com
```

The following example shows how to also specify that the `/csmfiles` directory be used to store the CSM install files:

```
$ lsnode -a Hostname node1
node1.clusters.com
$ chnode -N RedHat72Nodes InstallServer=node1.clusters.com:/csmfiles
```

**Note:** If the `InstallServer` attribute is left blank, the management server will serve files to the node.

## Step 2. Create the directory (optional)

You can create a separate partition for the directory that will be used to store the CSM files on the install server. If you did not specify a directory in the *InstallServer* attribute, then CSM will use the */csmserver* directory. The CSM tools will automatically create the directory on the install servers, but you may wish to make the directory by hand inside a certain partition. See the operating system documentation for instructions on how to create a partition.

## Step 3. Run updatenode

Run **updatenode** to the install server. **Updatenode** will detect that the node is also an install server and automatically run the **updateisvr** command.

**Note:** Run **updatenode** with **-v** so you can observe the data transfers that are taking place. The first sync of the install servers may take a significant amount of time.

---

## Using a non-CSM node as an install server

If it is not possible, or desirable, to have the install server as a node in the cluster, you can manually set up an install server. There are five steps in this process:

### Step 1. Set up remote authentication to the install server

The management server must be able to connect to the install server over the remote shell stored by the *csmconfig* **command**, or the value stored in the *DSH\_REMOTE\_CMD* environment variable. For information on how to manually set up remote shell authentication, see “Setting up remote access manually” on page 75.

### Step 2. Install the required software on the install server

All install servers must have Rdist v 6.1.5 or greater and NFS installed.

### Step 3. Set the *InstallServer* attribute

You need to set the *InstallServer* attributes of the nodes that you want the install server to serve. In the *InstallServer* attribute you can specify both the name of the machine and optionally a directory that you want to use to store the install files. (If you don't specify a directory, it defaults to */csmserver*).

You can use any directory on the install server to store the CSM installation files. The *hostname* of the machine and the directory should be separated by a colon.

The following example shows how to set *server1.cluster.com* as the install server for all of the nodes in the RedHat72Nodes node group:

```
chnode -N RedHat72Nodes InstallServer=server1.cluster.com
```

The following example shows how to also specify that the */csmfiles* directory be used to store the CSM install files:

```
chnode -N RedHat72Nodes InstallServer=server1.cluster.com:/csmfiles
```

**Note:** If the *InstallServer* attribute is left blank, the management server will serve files to the node.



## Step 4. Create the directory (optional)

You can create a separate partition for the directory that will be used to store the CSM files on the install server. If you did not specify a directory in the *InstallServer* attribute, then CSM will use the */csmsvr* directory. The CSM tools will automatically create the directory on the install servers, but you may choose to make the directory by hand inside a certain partition. See the operating system documentation for instructions on how to create a partition.

## Step 5. Run `updateisvr` to transfer files to the install server

Once the remote shell has been configured, run `updateisvr -v` to perform the first sync of the install servers. Later syncs by CSM software will be much quicker, but this first sync will take time. The `updateisvr` command is run on the CSM management server, and takes the install server hostnames as command line arguments. Note that the *InstallServer* attribute must be set to *full hostname*. After running `updateisvr`, you can use the CSM install commands as usual, and you do not need to run `updateisvr` again.

---

## Administration

When deleting files from */csminstall*, please note that CSM will never delete files from the CSM repositories residing on the install servers. Therefore if you remove files from */csminstall* on the CSM management server, you must also manually (or through `dsh`) remove these files from the CSM repositories located on the install servers.

**Note:** You can run out of disk space on the install server. If this occurs, fall back to using the management server instead of the install server. Do this by running:

```
chnode -a InstallServer=
```



---

## Bibliography

This Bibliography helps you find documentation related to Cluster Systems Management (CSM).

---

### Related information

The following references contain information about IBM Cluster Systems Management for Linux:

- *IBM CSM for Linux: Software Planning and Installation Guide*, SA22–7853
- *IBM CSM for Linux: Administration Guide*, SA22–7873
- *IBM CSM for Linux: Hardware Control Guide*, SA22–7856
- *IBM CSM for Linux: Command and Technical Reference*, SA22–7933

The following references contain information about Reliable Scalable Computing Technology (RSCT) for Linux:

- *IBM RSCT for Linux: Administration Guide*, SA22–7892
- *IBM RSCT for Linux: Technical Reference*, SA22–7893
- *IBM RSCT for Linux: Messages*, GA22–7894
- *IBM RSCT for Linux: Group Services Programming Guide and Reference*, SA22–7888

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### Obtaining publications

The CSM and RSCT for Linux publications are available at either of the following Web sites:

- <http://www.ibm.com/servers/eserver/clusters/library>
- <http://www.ibm.com/shop/publications/order>

The @server Cluster 1350 InfoCenter is available at:  
<http://publib.boulder.ibm.com/cluster/>.

### Redbooks

The IBM International Technical Support Organization (ITSO) publishes Redbooks related to CSM.

- Linux Clustering with CSM and GPFS

For a current list, see the IBM Redbooks Web site at: <http://www.ibm.com/redbooks>.

### Other CSM information

See the following references for information related to CSM:

| Information about CSM                   | Location                                                                                                                                                                        |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service information (fixes and updates) | <a href="http://techsupport.services.ibm.com/server/cluster">http://techsupport.services.ibm.com/server/cluster</a>                                                             |
| CSM driver downloads                    | <a href="http://techsupport.services.ibm.com/server/cluster2/fixes/csmdriverdownload.html">http://techsupport.services.ibm.com/server/cluster2/fixes/csmdriverdownload.html</a> |
| README file                             | <b>/opt/csm/README/csm.README</b>                                                                                                                                               |
| Documentation Errata                    | <a href="http://publib.boulder.ibm.com/clresctr/docs/csm/docerrata.html">http://publib.boulder.ibm.com/clresctr/docs/csm/docerrata.html</a>                                     |

| Information about CSM            | Location                                                                                                                                                |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequently Asked Questions (FAQ) | <a href="http://techsupport.services.ibm.com/server/cluster/tips/csm_faq.html">http://techsupport.services.ibm.com/server/cluster/tips/csm_faq.html</a> |
| Read This First document         | <a href="http://www.ibm.com/servers/eserver/clusters/library">http://www.ibm.com/servers/eserver/clusters/library</a>                                   |

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## Getting XCAT tools

If you are an XCAT user, you may find the IBM alphaWorks® *Enhanced Cluster Tools (ECT) for Linux* Web site useful. It is a repository of tools that complement CSM and enhance the management of Linux clusters. The ECT for Linux site provides tools that supplement CSM features such as remote access to hardware inventory and vitals, remote access to server processor logs, and support for the ELS console server. The ECT site includes early versions of tools that will eventually be merged into the CSM product, prototypes of new technology that is being investigated for CSM, and tools for specific vertical market segments. The ECT for Linux site is located at <http://www.alphaworks.ibm.com/tech/ect4linux>.

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## Getting help from IBM

CSM mailing list information is available at <http://www.ibm.com/developerworks/oss/mailman/listinfo/csm>. E-mail sent to this mailing list at [csm@www-124.ibm.com](mailto:csm@www-124.ibm.com) is monitored by the CSM development team, providing a mechanism for users to ask questions and resolve problems. If the mailing list does not solve your problem, then you can send a note directly to the CSM development team at [cluster@us.ibm.com](mailto:cluster@us.ibm.com), or call IBM Support at 1-800-IBM-SERV.

Before you call for help, check to see if all the latest service has been applied to your system. Then, see the diagnosis section in the *IBM CSM for Linux: Administration Guide* to help you diagnose problems before placing a call. If you still need help resolving the problem, call IBM. You might be asked to send relevant data, and to open a problem management record (PMR) for tracking purposes.

## Finding service information

The following Web sites contains all the service bulletins and flashes, as well as PTF and APAR reports for all current releases of CSM:

- Cluster software: <http://techsupport.services.ibm.com/server/support>
- CSM software: <https://techsupport.services.ibm.com/server/cluster/fixes/csmfixhome.html>
- CSM for Linux on pSeries: [https://techsupport.services.ibm.com/server/cluster/csmplinux\\_1.3.2.0down.html](https://techsupport.services.ibm.com/server/cluster/csmplinux_1.3.2.0down.html)
- CSM for Linux: [https://techsupport.services.ibm.com/server/cluster/csmlinux\\_1.3.2.0down.html](https://techsupport.services.ibm.com/server/cluster/csmlinux_1.3.2.0down.html)

## Calling IBM for help

You can get assistance by calling IBM Support. Before you call, be sure you have the following information:

1. Your access code (customer number).
2. The IBM product number. The product number for CSM is 5765-E88.
3. The name and version of the operating system you are using.
4. Any relevant machine type and serial numbers.

5. A telephone number where you can be reached.

The person with whom you speak will ask for the above information and give you a time period during which an IBM representative will call you back.

In the United States:

- The telephone number for IBM software support and IBM hardware support is **1-800-IBM-SERV**.
- The telephone number for IBM Linux support is **1-800-237-5511**.

Outside the United States, contact your local IBM Service Center.

## **Contacting CSM development**

To contact CSM development by e-mail, send your comments to [cluster@us.ibm.com](mailto:cluster@us.ibm.com).



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## Publicly Available Software

IBM Cluster Systems Management includes software that is publicly available:

### **Conserver 7.2 (CSM for Linux on xSeries and pSeries)**

An application that adds logging and multi-user access for remote administration of serial ports, using locally installed multi-port serial interfaces or "reverse-telnet" to console servers, or both.

### **Expect 5.3 (CSM for Linux on xSeries only)**

Tool for automating interactive applications, such as telnet, ftp, passwd, fsck, rlogin, tip.

### **Perl libnet 1.0703 (CSM for Linux on xSeries only)**

Provides a perl client API to FTP, SMTP, NNTP, POP3.

### **SYSLinux 1.64 (CSM for Linux on xSeries only)**

SYSLinux includes PXELINUX, which CSM uses to control the behavior of network boots. SYSLinux is licensed under the GNU GPL.

### **Tftp-HPA 0.34 (CSM for Linux on xSeries and pSeries)**

An implementation of Trivial FTP. Allows download of files from a server when net booting a machine.

### **Rdist 6.15 (CSM for Linux on xSeries only)**

Distributes files to multiple machines, enabling administrators to maintain identical copies of files across multiple machines.

### **Fping 2.42b (CSM for Linux on xSeries Only)**

An implementation of PING for multiple hosts. Quickly ping multiple hosts to determine their reachability.

This book discusses the use of these products only as they apply specifically to the IBM Cluster Systems Management product.

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| perl-XML-Parser (CSM for Linux on xSeries)                                                                                                                    | SuSE SLES 7: <a href="ftp://ftp.rpmfind.net/linux/SuSE-Linux/i386/7.2/full-names/i386/perl-XML-Parser-2.27-63.i386.rpm">ftp://ftp.rpmfind.net/linux/SuSE-Linux/i386/7.2/full-names/i386/perl-XML-Parser-2.27-63.i386.rpm</a>                                                                                                                                                                                                                                                                                         |
| perl-XML-Simple (CSM for Linux on xSeries)                                                                                                                    | <ul style="list-style-type: none"> <li>• SuSE SLES 7: <a href="ftp://speakeasy.rpmfind.net/linux/Mandrake-devel/cookfire/i586/Mandrake/RPMS/perl-XML-Simple-1.05-1mdk.i586.rpm">ftp://speakeasy.rpmfind.net/linux/Mandrake-devel/cookfire/i586/Mandrake/RPMS/perl-XML-Simple-1.05-1mdk.i586.rpm</a></li> <li>• SuSE SLES 8: <a href="ftp://ftp.suse.com/pub/suse/i386/8.1/suse/i586/perl-XML-Simple-1.08-43.i586.rpm">ftp://ftp.suse.com/pub/suse/i386/8.1/suse/i586/perl-XML-Simple-1.08-43.i586.rpm</a></li> </ul> |

The following non-IBM software is required if you want to perform remote hardware control operations for IBM pSeries servers attached with a Hardware Management Console (HMC):

- openCIMOM Version 0.7

You can download the software from:

- <https://techsupport.services.ibm.com/server/cluster>.

The following non-IBM software is required for CSM for Linux on pSeries is required if you want to perform the software maintenance installation and upgrade of non-CSM RPMs on Linux Managed nodes from the management server:

- Autoupdate V4.8, or later levels which maintain full backward compatibility.

You can download the software from:

- <http://freshmeat.net/projects/autoupdate>.

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# Glossary

**action.** The part of the event response resource that contains a command and other information about the command.

**APAR.** Authorized Program Analysis Report. A report of a problem caused by a suspected defect in a current unaltered release of a program.

**ASM.** See ISMP.

**attribute.** Attributes are either persistent or dynamic. A resource class is defined by a set of persistent and dynamic attributes. A resource is also defined by a set of persistent and dynamic attributes. Persistent attributes define the configuration of the resource class and resource. Dynamic attributes define a state or a performance-related aspect of the resource class and resource. In the same resource class or resource, a given attribute name can be specified as either persistent or dynamic, but not both.

**Audit Log.** A log file containing a record of system events and responses.

**authentication.** The process of validating the identity of an entity, generally based on user name and password. However, it does not address the access rights of that entity. Thus, it simply makes sure that a user is who he or she claims to be.

**authorization.** The process of granting or denying access to an entity to system objects or resources, based on the entity's identity.

**AutoYaST.** The part of the SuSE and SuSE SLES operating systems related to Linux OS installation. See also the `csmssetupyast` command.

**BIOS.** Basic Input/Output System. Microcode that controls basic hardware operations such as interactions with diskette drives, fixed-disk drives, and the keyboard.

**BladeCenter.** IBM consolidated high performance eServer hardware racks, which can be used in a CSM cluster.

**BladeCenter chassis.** A chassis that can hold up to 14 hot-swappable blade servers.

**Blade server.** An independent server containing one or more processors and associated memory, disk storage and network controllers, and running its own operating system and software.

**BMC.** The baseboard management controller (**bmc**) is firmware on the eServer 325 NIC card that handles all network traffic. If it detects a hardware control command, the **bmc** accepts and processes the command; otherwise, it ignores it and forwards it to the node.

**bmc.** **bmc** is the *PowerMethod* attribute value for nodes on eServer 325 servers.

**CFM.** The Configuration File Manager maintains files that are common across all nodes in a cluster.

**client.** Client applications are the ordinary user interface programs that are invoked by users or routines provided by trusted services for other components to use. The client has no network identity of its own: it assumes the identity of the invoking user or of the process where it is called, who must have previously obtained network credentials.

**client node.** In CSM, all nodes except the management server are considered client nodes. In a client/server model, the client system sends requests to a server system, who fulfills the request and returns status.

**cluster.** A group of servers and other resources that act like a single system and enable high availability and, in some cases, load balancing and parallel processing.

**cluster hardware control point.** See hardware control point.

**clustering.** The use of multiple computers (such as UNIX workstations), multiple storage devices, and redundant interconnections to form what appears to users as a single highly-available system. Clustering can be used for load balancing, for high availability, and as a relatively low-cost form of parallel processing for scientific and other applications that lend themselves to parallel operations.

**Cluster Systems Management.** IBM Cluster Systems Management software for AIX and Linux is designed for simple, low-cost management of distributed and clustered IBM eServers in technical and commercial computing environments. CSM, included with the Cluster 1350 (Linux) and optional with the IBM Cluster 1600 (AIX), simplifies cluster administration by providing management from a single point-of-control.

**cluster VLAN.** The cluster Virtual LAN (VLAN) connects nodes to each other and to the management server through an Ethernet connection. Installation and CSM administration tasks such as running **dsh** are done on the cluster VLAN.

**coexistence.** The ability of two different pieces of software, running either on the same machine or on machines that are interconnected, to function together. For example, an AIX node and a Linux node coexist in a mixed cluster having an AIX management server.

**condition.** A certain state of a node resource that can be monitored.

**console.** The main operating system display station. Synonym for system console.

**console server.** The hardware device through which the management server opens a remote console session for a node.

**consumability.** Uses the **snmptrap** command to generate traps containing ERRM event information that can be sent to an SNMP manager.

**CSM.** See Cluster Systems Management.

**CSM database.** A repository of cluster, node, and node group information that is created and used by CSM.

**CSM GUIs.** Graphical User Interfaces (GUIs) available for running CSM functions: IBM Web-based System Manager, SMIT, and DCEM GUIs.

**CSM-only installation.** The process of installing only CSM on the nodes, as opposed to a full installation, which involves installing both CSM and the operating system on the nodes.

**CSM plug-ins.** IBM Web-based System Manager GUI plug-ins, which provide an interface for monitoring and managing one or more CSM clusters.

**DCEM.** Distributed Command Execution Manager is a GUI that can run commands on multiple cluster nodes simultaneously.

**distribution.** One of the Linux operating systems used with CSM. For example, Red Hat, SuSE, or SuSE SLES.

**domain.** (1) A set of network resources (such as applications and printers, for example) for a group of users. A user logs in to the domain to gain access to the resources, which could be located on a number of different servers in the network. (2) A group of server and client machines that exist in the same security structure. (3) A group of computers and devices on a network that are administered as a unit with common rules and procedures. Within the Internet, a domain is defined by its Internet Protocol (IP) address. All devices that share a common part of the IP address are in the same domain.

**Domain Management Server resource manager (IBM.DMSRM).** Controls the Managed node (IBM.ManagedNode) resource class and the node group (IBM.NodeGroup) resource class.

**device driver.** (also, **driver**, **kernel module**.) A software program that interacts with a particular hardware device or with other software. Downloading or building kernel modules may be required to install an operating system on certain hardware. A different kernel module is required for each version of the Linux kernel.

**dsh.** A distributed shell program - a mechanism to issue commands to all systems in a network, in parallel.

**dynamic attribute.** A node attribute with a value that can change over time, such as node power status.

**dynamic node group.** A variable node group consisting of nodes with specific attribute values.

**ERRM.** RSCT Event Response Resource Manager controls events and responses on cluster nodes.

**ESP.** The Equinox Ethernet Serial Provider allows you to place COM serial ports anywhere on a local or remote LAN segment. The ESP units communicate with an Equinox SuperSerial NT driver located on Windows NT Server and Workstation systems. Ports on the ESP appear to the servers as standard COM ports as if they were right on the servers' system bus. All the facilities and functions of Windows NT and of application programs are fully available to these LAN-resident COM ports. The ESP units and the LAN are "transparent".

**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. The Ethernet 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.

**event.** Occurs when the event expression of a condition evaluates to True. An evaluation occurs each time an instance of a dynamic attribute is observed.

**event expression.** A definition of the specific state when an event is true.

**event response.** One or more actions as defined by the event response resource manager (ERRM), that take place in response to an event or a rearm event.

**fanout.** The number of systems or processors that are to receive software updates or communications simultaneously. For CSM, this is controlled by the environment variable **CSM\_FANOUT**. The **DSH\_FANOUT** environment variable is used by the **dsh** command to control the number of nodes on which to simultaneously run a remote command.

**filesset.** For AIX, a collection of files, usually used to install a piece of software. The equivalent Linux term is package.

**fix.** A correction or enhancement to software.

**full installation.** The process of installing both the CSM software and the operating system on the nodes

of the cluster, as opposed to installing only CSM on the nodes, or installing only the operating system on the nodes.

**GPFS.** The IBM General Parallel File System (GPFS) for AIX and Linux allows users shared access to files that may span multiple disk drives on multiple nodes. It offers many of the standard AIX file system interfaces, allowing most applications to run without modification or recompiling. AIX file system utilities are also supported by GPFS.

**hardware control point.** The hardware device through which the management server controls node hardware.

**Hardware Control resource manager.** The IBM Hardware Control resource manager manages the IBM.NodeHwCtrl and IBM.HwCtrlPoint resource classes.

**Hardware Management Console.** The IBM Hardware Management Console for pSeries is an installation and service support processor that runs only the HMC software.

**HMC.** See Hardware Management Console.

**hmc.** **hmc** is the *PowerMethod* and *ConsoleMethod* attribute value for nodes on HMC-attached pSeries servers

**hostmap file.** See hostname mapping file.

**host name.** (1) A name assigned to a computer connected to a network. The use of this term can be ambiguous as it can refer to either the short form name of the computer (see short host name), or the fully qualified name of the computer (see long host name). (2) The Internet address of a machine in the network. Also known as host ID.

**hostname mapping file.** A file containing a list of host names and associated hardware control information. This file can be created by the **lshwinfo** command and used as input to the **definnode** command.

**IBM.DMSRM.** See Domain Management Server resource manager.

**IBM.HWCTRLRM.** See Hardware Control resource manager.

**IBM.NodeHwCtrl.** See Node Hardware Control Resource Class.

**ISMP.** Integrated System Management Processor - a computer within a computer, the ISMP performs systems management tasks that help manage and maintain the health of your server. Integrated into select xSeries servers, the ISMP continuously monitors your system and notifies you of potential failures.

Through IBM Director, the ISMP alerts you to changes in system temperature, voltage, fan redundancy, memory and hard-drive performance. It also provides

configuration management benefits with features like remote firmware updates, remote power control, and Automatic Server Restart (ASR).

On Linux, the IBM Integrated System Management Processor (ISMP) device monitors and provides remote power control for xSeries servers. ISMPs are also referred to as ASMs.

**kernel.** The essential component of the Linux and AIX operating system. The kernel is responsible for critical OS functions such as resource allocation, low-level hardware interfaces, and security. Installation on certain hardware, certain Linux distributions, or certain device drivers might require a minimum kernel version.

**Kickstart.** On Linux, part of the Red Hat operating system used to help install Red Hat. Using Kickstart, a system administrator can create a single file containing the answers to all the questions that would normally be asked during a typical Red Hat Linux installation.

Kickstart files can be kept on single server system, and read by individual computers during the installation. This installation method can support the use of a single Kickstart file to install Red Hat Linux on multiple machines, making it ideal for network and system administrators. For CSM, see the **csmssetupks** command.

**kscfg.tmpl.** This file is the template used by the **csmssetupks** command to create a Kickstart configuration file for each Linux node. The template is located in **/opt/csm/install/kscfg.tmpl**.  
*InstallDistributionNameInstallDistributionVersion.*

The Kickstart configuration file generated by **csmssetupks** from the template contains configuration information gathered by Kickstart during installation of the Linux operating system. The **kscfg.tmpl** file can be used as is, or modified. See the sample template in the Appendix of *IBM CSM for Linux: Software Planning and Installation Guide* for instructions on how to properly modify the template.

**ksh.** Korn shell

**license key file.** A file containing keys (passwords) necessary to run CSM.

**license use key.** A key (password) that is required to run CSM. A license key file, containing license use keys, is included with the CSM package.

**Linux node.** One instance of a Linux operating system running on IBM xSeries hardware.

**long host name.** A fully-qualified host name (for example, node15.pok.ibm.com).

**LPAR.** Logical partition. The partitioning of an operating system and its associated resources, such as memory, to give the appearance and functionality of more than one operating system.

**MAC address.** The Media Access Control address is a hardware address that uniquely identifies each node of a network. On a local area network (LAN) or other network, the MAC address is the computer's unique hardware number. On an Ethernet LAN, it is the same as the computer's Ethernet address. CSM only uses the MAC address of the network adapter used to do network boot and installation – the network adapter on the cluster VLAN.

**machine architecture.** The type of hardware for a specific Linux node on xSeries hardware. For CSM, the machine architecture is specified by the *InstallPkgArchitecture* node attribute, and must be provided for hardware control. Currently, CSM supports i386 machine architecture only. However, i486, i586, and i686 processors can be used provided they are defined with an *InstallPkgArchitecture* of i386.

**Managed node.** A node in a CSM cluster under the control of the management server. This node has a Mode attribute of "Managed". The **updatenode** command converts PreManaged nodes to Managed nodes.

**management control point.** See management server.

**management domain.** A set of nodes that are configured for management by the Clusters Systems Management (CSM) licensed program. Such a domain has a management server that is used to administer a number of Managed nodes. Only management servers have knowledge of the whole domain. Managed nodes only know about the servers managing them; they know nothing of each other.

**management server.** A node with CSM cluster management server software installed.

**management VLAN.** The management Virtual LAN (VLAN) connects the management server to the cluster hardware through an Ethernet connection. For optimal security, the management VLAN must be restricted to hardware control points, remote console servers, the management server, and root users. Routing between the management VLAN and cluster or public VLANs could compromise security on the management VLAN.

**migration.** The process of moving to a later software version.

**mixed cluster.** A CSM cluster with an AIX 5L management server and both AIX and Linux nodes.

**NFS.** A distributed file system that allows users to access files and directories located on remote computers and treat those files and directories as if they were local. 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.

**node.** One operating system image. See **Managed node**.

**node attribute.** Pieces of information that make up a node definition. For a CSM node, these attributes must be defined in the CSM database. See the **nodeattributes** man page for more details.

**node attribute template.** A worksheet used by the system administrator to record the attributes assigned to the nodes.

**node configuration template.** A worksheet used by the system administrator to record details of the node configuration.

**nodedef file.** See node definition file.

**node definition file.** A file containing a stanza of information for defining each node in a cluster. The information about each node is of the form *Attr=value*, such as *InstallOSName=AIX*. This file can be used by the **definnode** command. See the man page for **nodedef** for more details.

**node group.** Nodes having similar attribute values and defined as a group to facilitate node management.

**Node Hardware Control Resource Class (IBM.NodeHwCtrl).** Provides support for powering a node on and off, resetting a node, querying the power status of a node, resetting the node's service processor, and resetting the node's hardware control point.

**null value.** Empty, having no value, containing nothing.

**Open source software.** Any program whose source code is made available for use or modification as users or other developers see fit. Open source software is usually developed as a public collaboration and made freely available.

**OpenSSH.** For Linux, OpenSSH is a free version of the SSH protocol suite of network connectivity tools. For AIX, OpenSSH encrypts all traffic (including passwords) to effectively eliminate eavesdropping, connection hijacking, and other network-level attacks. Additionally, OpenSSH provides a myriad of secure tunneling capabilities, as well as a variety of authentication methods. See the OpenSSH Web site at <http://www.openssh.com>.

**package.** For Linux, a collection of files, usually used to install a piece of software. The equivalent AIX term is **fileset**. For Linux, a package is also referred to as an RPM (Red Hat Program Manager) package.

**partition.** (1) A logical division of storage on a fixed disk. (2) A fixed-size division of storage. (3) a group of non-overlapping nodes that act as a logical system.

**persistent attribute.** A node attribute with a value that does not change without manual user input, such as node name.

**port number.** A port number is a way to identify a specific process to which an Internet or other network message is to be forwarded when it arrives at a server. For the TCP/IP and UDP protocols, a port number is a 16-bit integer that is put in the header appended to a message unit. This port number is passed logically between client and server transport layers, and physically between the transport layer and the Internet Protocol layer.

**predefined condition.** A condition whose definition is supplied by the RMC portion of RSCT. Predefined conditions are used to monitor certain system events, and may be customized for a particular installation.

**predefined dynamic node group.** A node group whose members all have a certain attribute set to a certain value. The definitions of these groups are shipped with CSM. For example, the **LinuxNodes** group consists of those nodes whose *InstallOSName=Linux*.

**predefined response.** A response whose definition is supplied by the RMC component of RSCT. Predefined responses are defined to take action when a certain condition becomes true. They may be customized for a particular installation.

**PreManaged node.** A node that is part of a CSM cluster, but has not yet been put under the control of the management server. Such a node has a Mode attribute of "Premanaged". The **updatenode** command converts PreManaged nodes to Managed nodes.

**probe.** Diagnostic software that assesses the functionality of a single machine at a time.

**pSeries.** IBM eServer hardware that runs the AIX 5L and Linux operating systems.

**public VLAN.** The public Virtual LAN (VLAN) connects the cluster nodes and management server to the site network. Applications are accessed and run on cluster nodes over the public VLAN. The public VLAN can be connected to nodes through a second Ethernet adapter in each node, or by routing to each node through the Ethernet switch.

**rconsole.** The remote console command. See remote console.

**rearm event.** An event that occurs when the rearm expression for a condition evaluates to True.

**rearm expression.** An expression that generates an event which alternates with an original event in the following way: the event expression is used until it is true; then, the rearm expression is used until it is true; then, the event expression is used. The rearm expression is commonly defined as the inverse of the

event expression. It can also be used with the event expression to define an upper and lower boundary for a condition of interest.

**Red Hat.** Red Hat is a software company in the business of assembling open source components for the Linux operating system and related programs into a distribution package.

**Red Hat Linux.** A version of Linux produced by Red Hat Inc.

**remote command.** A command issued on the management server that is intended to run on one of the cluster nodes.

**remote console.** From the management server, access to the operator console of one or more CSM nodes. See the **rconsole** command.

**remote hardware control.** Management server control of cluster node hardware.

**remote power.** Management server control of the following CSM node hardware characteristics: power on or off, query power status, reboot, and reset of the service processor. See the **rpower** command.

**remote shell.** When using the **dsh** command, the shell where the remote command will run. Also, the shell set up on each node during installation. In CSM, the *RemoteShell* attribute value specifies which remote shell is used. The default value on AIX is **/usr/bin/rsh**. The default value on Linux is **/usr/bin/ssh**.

**resource.** An entity in the system that provides a set of services. Examples of hardware entities are processors, disk drives, memory, and adapters. Examples of software entities are database applications, processes, and file systems. Each resource in the system has one or more attributes that define the state of the resource.

**resource class.** A group of resources that have attributes, actions, and other characteristics of the resource class in common.

**resource manager.** A standalone daemon that maps resource and resource class abstractions into calls and commands for one or more specific types of resources.

**response.** An automated response to a node resource condition.

**RMC.** The IBM Resource Monitoring and Control component of RSCT, which monitors and controls cluster nodes.

**RPM packages.** Software and updates for Linux nodes.

**rpower.** The remote power command. See remote power.

**RSA.** The IBM Remote Supervisor Adapter (RSA) is the hardware control point for xSeries servers.

**RSCT.** IBM Reliable Scalable Cluster Technology is a set of software components that together provide a comprehensive clustering environment for AIX and Linux. RSCT is the infrastructure used by a variety of IBM products, including CSM, to provide clusters with improved system availability, scalability, and ease of use.

**rsh.** A variant of the **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.

**Server File Repository.** A directory on the management server named **/cfmroot**, which contains the cluster configuration files

**servers.** Hardware that has server programs running in the background on the OS without a user's inherited credentials. A server must acquire its own network identity to get to access other trusted services.

**service processor.** A computer attached to a processor, whose sole function is to control the hardware and provide diagnostic support.

**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. Implementations of the shell concept include Bourne, C, and Korn.

**short host name.** A host name that contains only the local identifier.

**SIS.** System Installation Suite - On Linux, an open source product that helps you install and configure SuSE and SuSE SLES. For use with CSM, see the **csmssetupsis** command.

**SMS.** Software Maintenance System maintains RPM packages on Linux nodes from an AIX or Linux management server.

**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.

**ssh.** Secure Shell, sometimes known as Secure Socket Shell, is a Unix-based command interface and protocol for securely getting access to a remote computer.

**static node group.** A node group consisting of nodes specified by the user.

**SuSE.** SuSE is a privately owned German company whose mission is to promote open source development and General Public License distribution and to be a Linux distribution provider. SuSE assembles open source components for the Linux operating system and related programs into a selection of distribution packages.

**SuSE Linux.** A version of Linux produced by SuSE, Inc.

**SuSE SLES.** SuSE Linux Enterprise Server is a server operating system for professional deployment in heterogeneous IT environment of all sizes and sectors.

**update.** Software fixes periodically installed on a system.

**visual monitoring.** An icon-based method for monitoring a CSM cluster.

**VLAN.** Virtual LAN - Virtual Local Area Network. A division of a local area network by software rather than by physical arrangement of cables. Division of the LAN into subgroups can simplify and speed up communications within a workgroup. Switching a user from one virtual LAN to another via software is also easier than rewiring the hardware.

**xCAT.** xCAT (Extreme Cluster Administration Toolkit) is a tool kit that can be used for the deployment and administration of Linux clusters. Its features are based on user requirements, and many of its features take advantage of IBM xSeries hardware.

**xSeries.** IBM eServer hardware based on the Intel architecture.

**yastcfg XML file.** Template used by the **csmssetupyast** command to create an AutoYaST configuration file for each Linux node. The template is located in **opt/csm/install/yastcfg.InstallDistributionName InstallDistributionVersion-Arch.xml**.

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