

IBM Cluster Systems Management for Linux



Administration 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 139.

Eighth Edition (September 2003)

This edition of the *IBM Cluster Systems Management for Linux Administration Guide* applies to version 1, release 3, modification 2 of IBM Cluster Systems Management (CSM) for Linux licensed program, product number 5765–E88, CSM for Linux on pSeries, product number 5765-G16, and to all subsequent releases and modifications of this product until otherwise indicated in new editions. 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 describes IBM Cluster Systems Management for Linux. It provides information about the tasks required for setting up and maintaining a Linux cluster, including managing nodes, monitoring your systems, and understanding security issues. This book also provides information about understanding messages and resolving problems. CSM for Linux currently supports Linux nodes only; for information on using Linux and AIX 5L nodes in the same cluster, see the CSM for AIX 5L documentation.

Attention!

- Except where noted, the information in this book also applies to Linux on pSeries clusters. Linux on pSeries clusters must be homogeneous – both a management server and Managed nodes running Linux on pSeries servers only.
- Refer to the Statement of Direction in the IBM Cluster Systems Management V1.3.2 Announcement Letter 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 book is intended for system administrators who want to use IBM Cluster Systems Management for Linux. It describes the tools that are provided for managing and monitoring CSM nodes. The system administrator should:

- Be highly skilled in using most Linux commands and utilities.
- Be comfortable with most basic system administration tools and processes.
- Possess a solid understanding of a Linux-based operating system.
- Be familiar with fundamental networking/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 155 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 IBM CSM development, send your comments by e-mail to: cluster@us.ibm.com.

Chapter 1. Cluster Systems Management

IBM Cluster Systems Management (CSM) for Linux provides a distributed system management solution that allows a system administrator to set up and maintain a cluster of nodes running the Linux operating system. See the *IBM CSM for Linux: Planning and Installation Guide* for the specific cluster hardware models and software versions supported with CSM 1.3.2. The following cluster functionality is included in CSM:

- CSM installation for cluster nodes
- Operating system (OS) installation support
- Node and node group management
- Configuration file management (CFM)
- Hardware monitoring and control
- System event monitoring and management
- Remote command capability
- Diagnostic probes (see Chapter 5, “CSM diagnostics,” on page 119)
- Software Maintenance System for Linux nodes
- Linux Cluster Support (LCS) extension for IBM Director.

CSM supports several different Linux distributions, with the following restrictions:

- You can only use one of the four Linux distributions listed below in a CSM cluster. You cannot combine, for example, Red Hat 8.0 and Red Hat AS 2.1 nodes in the same cluster.
- Your CSM management server must be running a Linux version that is equal to or greater than the highest level version running on any node in the cluster. For example, you cannot have a node running Red Hat 8.0 if your management server is running Red Hat 7.3.
- To use the LCS extension, your CSM management server and Managed nodes can be running Red Hat 7.2 or 7.3, Red Hat AS 2.1, SuSE Linux 8.0, or SuSE SLES 8 only. If you plan to install IBM Director Server or Console software on one or more CSM nodes, then only Red Hat Linux 7.3 or SuSE Linux 8.0 can be used.
- xSeries servers and pSeries servers running Linux cannot be mixed in the same cluster.

The supported Linux distributions and versions for CSM for Linux version 1.3.2 are:

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

However, all of these specific Linux distributions and version levels are not necessarily supported on all CSM supported hardware.

The supported Linux distribution and version for CSM for Linux on pSeries is:

- SuSE SLES 8 (8.1)

The IBM servers that can be used in a CSM for Linux 1.3.2 cluster are:

- HMC-attached pSeries (SuSE SLES 8 – management server and Managed nodes exclusively)

- xSeries (Linux – management server and Managed nodes)
- BladeCenter (Linux – Managed nodes only)
- IntelliStation (Linux – Managed nodes only)
- eServer 325 (Linux – Managed nodes 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.)

See the *IBM CSM for Linux: Planning and Installation Guide* for details on which Linux distributions and versions are supported on your specific hardware models.

RSCT and RMC

CSM works in conjunction with Reliable Scalable Cluster Technology (RSCT), which is a set of software components that provide a comprehensive clustering environment for Linux. RSCT is the infrastructure used by a variety of IBM products to provide clusters with improved system availability, scalability, and ease of use.

Included with RSCT is the Resource Monitoring and Control (RMC) subsystem, which provides a common abstraction for the resources of a single node or cluster of nodes. RMC provides global access to resource subsystems throughout the cluster, which produces a single management and monitoring infrastructure. RSCT also provides a set of resource managers for mapping programmatic abstractions in RMC into the actual calls and commands of a resource. For more information about RSCT and RMC, see the *IBM RSCT for Linux: Administration Guide*.

High availability

CSM supports a loose cluster of machines for distributed management; the cluster management server can communicate with all nodes, but all nodes might not be able to communicate with each other. CSM does not provide high availability services, although high-availability clusters can be part of the set of machines that CSM manages.

Installing CSM

Installing CSM requires creating a CSM management server and configuring CSM nodes. Full installations install Linux and CSM. CSM-only installations install CSM code only. The CSM management server must have the Linux operating system and CSM management server software installed.

CSM nodes must also have Linux installed, and they must be added to the cluster and configured as CSM **Managed** nodes.

A CSM for Linux management server installs Linux and CSM on 16 machines at a time by default. Multiple install servers can be defined to increase the number of concurrent installations. See the *IBM CSM for Linux: Planning and Installation Guide* for a complete description of the CSM installation process.

Note: SLES 7 is not supported for full installations because of backwards compatibility issues using AutoYaST between SLES 7 and SLES 8. Likewise, SuSE 8.0 is not supported for full installations because of backwards compatibility issues using AutoYaST between SuSE 8.0 and SuSE 8.1.

You can write user customization scripts to run during CSM installation to handle exceptions to the default process. See “Running customization scripts” on page 23 for details.

To maximize node performance, the CSM minimal installation option installs the Linux operating system on the specified nodes, but no CSM or RSCT code. The *Mode* attribute value for these Minimally-Managed nodes is **MinManaged**. The following CSM functions are **not** available on Minimally-Managed nodes:

- Configuration File Manager (CFM)
- Software Maintenance System (SMS)
- Monitoring conditions and responses
- Installation of CSM and RSCT RPM packages
- Full RMC heartbeating
- Linux Cluster Support (LCS) extension for IBM Director

See the *IBM CSM for Linux: Planning and Installation Guide* for a complete description of CSM Minimally-Managed nodes.

The following commands and files are used during CSM installation. For detailed CSM command usage see the man pages or the *IBM CSM for Linux: Command and Technical Reference*.

addlcsext	Adds Linux Cluster Support (LCS) extension components to CSM and IBM Director systems (not supported on pSeries hardware).
rmlcsext	Removes Linux Cluster Support (LCS) extension components from CSM and IBM Director systems (not supported on pSeries hardware).
csmconfig	Displays or changes certain parameters that affect CSM.
csmsetupks	Sets up Kickstart configuration for the nodes (not supported on pSeries hardware).
csmsetupyast	Configures AutoYaST and defines the SuSE and SuSE SLES nodes to be installed in the CSM database.
definemode	Defines the specified node information in the CSM database.
getadapters	Collects information for LAN adapters installed on a node.
installms	Installs CSM on the management server. On SuSE and SuSE SLES, the command also copies and installs AutoYaST packages, if necessary.
installnode	Installs both the Linux operating system and CSM, and starts the required servers on the nodes.
kscfg.tmpl	Linux operating system configuration file used by Red Hat Kickstart (not supported on pSeries hardware).
monitorinstall	Displays the status of the installation on each of the nodes.
nodedef file	Node definition file for cluster nodes.
systemid	Stores the user ID and password required for internal programs to access remote hardware.
updateisvr	Updates CSM installation files across multiple install servers (not supported on pSeries hardware).

updatenode	Updates or installs CSM packages, Linux RPM packages on Linux nodes, and CFM configuration files across the cluster. The command also runs user customization scripts.
yastcfg file	AutoYaST configuration file.

Managing CSM information

CSM provides a set of commands for managing cluster, node, and node group information, which is stored in the CSM database. This information is then used by CSM components to manage the cluster. See the man pages or the *IBM CSM for Linux: Command and Technical Reference* for detailed command usage information.

Managing cluster information

Cluster-wide CSM parameters such as the remote shell type can be managed using the **csconfig** command. To list all of the parameters that can be affected, run **csconfig** with no options.

The **csmbackup** command provides a method for duplicating critical CSM management server data. In case of a subsequent problem with the management server, any lost data can be restored using the **csrestore** command. IBM suggests using the **csmbackup** command before upgrading your management server.

csmbackup	Extracts and stores vital CSM data (not supported on pSeries hardware).
csconfig	Displays or changes certain parameters that affect CSM, such as accepting the license agreement. For example, to change the default cluster remote shell to OpenSSH, enter: <code>csconfig -r /usr/bin/ssh</code>
csrestore	Restores CSM data backed up by the csmbackup command (not supported on pSeries hardware).

Managing node information

Node information is defined in the CSM database as persistent and dynamic attribute values. Persistent attribute values such as *Hostname* are static and can be changed manually. Dynamic attribute values such as *Status* change dynamically depending on the status of the node attribute and cannot be changed manually. For example, the dynamic attribute *Status* value could be either **0** (unreachable), **1** (alive), or **127** (unknown), depending on the current state of the node. You cannot manually change the *Status* value in the CSM database; the value is only updated dynamically.

The following commands and files are used for managing node information. See the man pages or the *IBM CSM for Linux: Command and Technical Reference* for detailed command usage information.

chnode	Changes node attributes in the CSM database.
csstat	Provides a snapshot of cluster node reachability, power status, and network interface status.
definnode	Defines nodes in the CSM cluster.
lsnode	Displays information about nodes in the CSM cluster such as whether the node is currently reachable.

nodeattributes	A man page listing all available CSM node attributes.
nodedef file	Contains node attributes that can be used to create CSM node definitions.
rmnode	Removes nodes from the CSM cluster database.
updatenode	Updates nodes in the CSM cluster.

Managing node group information

CSM nodes can be logically defined into node groups to facilitate node management. For example, you could specify a single command to run on a node group instead of specifying the command to run on the individual nodes.

Node groups can be either static or dynamic. Static node groups are created by explicitly specifying node names, node group names, or both. Dynamic node groups are created by specifying selection criteria against persistent attributes which are applied to cluster nodes to dynamically define the node group. Whenever a node is added, removed, or changed, dynamic groups are automatically updated to include or exclude the node. This allows you flexible control over node group membership by defining the node attributes which define the group, rather than the specific node names that belong to the groups.

The following commands are used for managing node group information. See the man pages or the *IBM CSM for Linux: Command and Technical Reference* for detailed command usage information.

lsnode	Displays information about nodes in the CSM cluster such as whether the node is currently reachable.
nodegrp	Defines node groups which can be used by other CSM functions such as hardware control and CFM.

Dynamic node group selection criteria are specified by an SQL-like select string that uses persistent node attributes to create dynamic node group select strings. To return the CSM persistent attributes, enter the following command:

```
lsrsrdef -x -t -a p IBM.ManagedNode | awk '{print $1}' | xargs -n3
```

The following examples show valid select strings and node groups created using those select strings. See the *IBM RSCT for Linux: Administration Guide* for detailed information about select string format.

Note: Single and double quotation pairs are interchangeable as long as they are consistently matched.

1. To list all nodes with the *Hostname* attribute beginning with **clsn54**, enter the select string:

```
lsnode -w "Hostname like 'clsn54%'"
```

2. To create a node group using the above select string, enter:

```
nodegrp -w "Hostname like 'clsn54%'" (nodegroup_name)
```

Predefined dynamic node groups

CSM provides the following predefined dynamic node groups. These groups might not have any members (nodes), or might not be defined, depending on your cluster environment. Run the **nodegrp** command to display the list of defined node groups.

Name	Select String
AllNodes	Hostname like '%'
APCNodes	PowerMethod=='apc'
ManagedNodes	Mode=='Managed'
PreManagedNodes	Mode=='PreManaged'
MinManagedNodes	Mode=='MinManaged'
LinuxNodes	InstallOSName=='Linux'
RedHatNodes	InstallDistributionName=='Redhat'
RedHat72Nodes	InstallDistributionName=='RedHat' && InstallDistributionVersion=='7.2'
RedHat73Nodes	InstallDistributionName=='RedHat' && InstallDistributionVersion=='7.3'
RedHat80Nodes	InstallDistributionName=='RedHat' && InstallDistributionVersion=='8.0'
RedHat9Nodes	InstallDistributionName=='RedHat' && InstallDistributionVersion=='9'
RedHatAS21Nodes	InstallDistributionName=='RedHatAS' && InstallDistributionVersion=='2.1'
SLES72Nodes	InstallDistributionName=='SLES' && InstallDistributionVersion=='7.2'
SLES81Nodes	InstallDistributionName=='SLES' && InstallDistributionVersion=='8.1'
SuSE80Nodes	InstallDistributionName=='SuSE' && InstallDistributionVersion=='8.0'
SuSE81Nodes	InstallDistributionName=='SuSE' && InstallDistributionVersion=='8.1'
AutoyastNodes	InstallMethod=='autoyast'
KickstartNodes	InstallMethod=='kickstart'
xSeriesNodes	PowerMethod=='xseries'
pSeriesNodes	InstallPkgArchitecture=='ppc64'
ppcSLES81Nodes	InstallDistributionName=='SLES' && InstallDistributionVersion=='8.1' && InstallPkgArchitecture=='ppc64'
EmptyGroup	Hostname==''
Note: EmptyGroup prevents sample CFM files from being distributed to nodes. Do not change the select string for this node group.	

CSM hardware control

CSM hardware control provides remote control of cluster nodes from the management server. See the *IBM CSM for Linux: Hardware Control Guide* for detailed information on CSM hardware control. The following commands are used for hardware control. See the man pages or the *IBM CSM for Linux: Command and Technical Reference* for detailed command usage information.

chrconsolecfg

Removes, adds, or rewrites console entries in the Conserver configuration file.

chsnmp	Sets the SNMP agent configuration information for xSeries and BladeCenter servers.
getadapters	Collects information for LAN adapters.
lshwinfo	Collects node information from one or more hardware control points.
lshwstat	Collects environmental and Vital Product Data (VPD) information from xSeries and BladeCenter servers.
lssnmp	Collects SNMP agent configuration information from xSeries and BladeCenter servers.
rconsole	Opens a remote console for a node.
rconsolerefresh	refreshes the Conserver daemon.
reventlog	Collects service processor log information for xSeries and BladeCenter servers.
rpower	Boots and resets hardware, powers hardware on and off, and queries node power status.
systemid	Stores the user ID and password required for internal programs to access remote hardware.

Running commands remotely

The distributed shell **dsh** command runs commands remotely across multiple nodes. The **dsh** command uses the remote shell defined by the **csconfig** command.

The following commands are used for running commands remotely – see the man pages or the *IBM CSM for Linux: Command and Technical Reference* for detailed command usage information.

dcem Launches the DCEM (Distributed Command Execution Manager) GUI for running remote commands (not supported on pSeries hardware). See Chapter 3, “Distributed Command Execution Manager,” on page 37 for detailed DCEM information.

dsh Runs remote shell commands and their options on multiple nodes. The command can retrieve a list of all nodes in the CSM cluster or only nodes in a specified node group.

dshbak
Presents formatted output from the **dsh** command.

Managing files with Configuration File Manager

Configuration File Manager (CFM) provides a file repository for configuration files that are common across all nodes in a 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. It is the system administrator’s responsibility to maintain the configuration files stored on the management server.

Note: CFM does not apply to Minimally-Managed – *Mode=MinManaged* – nodes because no CSM files or code reside on these nodes.

CFM provides a certain amount of control over the distribution of your cluster configuration files. Though the files are common, there are mechanisms to allow for variations based on node groups, IP address, and host name. You could create a configuration file for all nodes in a cluster, and specify different versions of that file for specific node groups or host names.

CFM components include the Server File Repository, the **cfmupdatenode** command, the **cfmupdatenode** cron job, ERRM conditions and responses, and CFM log files. These components work together to provide an administrator with control over cluster configuration files.

Server File Repository

The Server File Repository is a directory on the management server called **/cfmroot**, which contains the cluster configuration files. By default, the management server distributes the configuration files to each node every 24 hours using the **cfmupdatenode** cron job. When a configuration file in **/cfmroot** is updated, the changes can also be automatically distributed to the nodes at that time.

The path name to the configuration file on each node is the same as the path to the server file repository, without **/cfmroot**. For example, the final destination of a configuration file on the management server called **/cfmroot/etc/securetty** is **/etc/securetty** on the node. If you specify different versions of files for CSM node groups using a **._nodegrp** extension or host names using a **._hostname** extension, the extension will be stripped off during file distribution. For example, a file named **/cfmroot/etc/passwd._xSeriesNodes** would be distributed to all the nodes in the **xSeriesNodes** node group as **/etc/passwd**. In addition, a file named **/cfmroot/etc/group._node1.clusters.com** would be distributed to **node1.clusters.com**.

If a configuration file is deleted from **/cfmroot**, it will not be deleted from the nodes. To delete configuration files from nodes, you must use the **dsh** command as shown in the following example. The *hostname* attribute values specify the nodes.

```
dsh -n hostname[,hostname...] rm -f /etc/securetty
```

cfmupdatenode command

The **cfmupdatenode** command is used to distribute configuration files throughout the cluster. For example, to distribute files to all of cluster nodes, run **cfmupdatenode -a**.

System administrators can also use the **cfmupdatenode** command to check the status of configuration files in the cluster. The command can output the node names and configuration files that are outdated to indicate which files will be changed the next time the configuration files are distributed. For example, to check the status of configuration files on all nodes in a cluster, enter:

```
cfmupdatenode -qa
```

Using **._hostname** or **._nodegrp** extensions, you can create different versions of a file to be distributed throughout your cluster. CFM has a set of rules that defines how to distribute these files. If only one version of the file exists, these rules will be followed:

- If a file in **/cfmroot** does not have a **._hostname** or **._nodegrp** extension, then it will be distributed to all nodes in the cluster.
- If a file has a **._hostname** (either long or short host name) extension, it will be distributed to the node matching the specified host name.

- If a file has a **._nodegrp** extension, it will be distributed to the nodes in the specified node group. If multiple versions of a file exist with different **._** extensions, then CFM has special handling to ensure only one version of the file is distributed to a node:
 - If a version of the file exists with a **._hostname** extension, it will be distributed to the node with the matching host name.
 - If a version of the file exists with a **._nodegrp** extension, it will be distributed to all nodes in the specified node group, unless another version of the same file has a different **._nodegrp** extension and the two node groups overlap. In the overlapping case, the overlapping nodes will receive the version of the file destined for the smaller node group. If the node groups are both the same size, CFM will arbitrarily select which file goes to the overlapping nodes (a situation you should try to avoid with your file naming schemes), and issue a warning message.
 - If a version of the file exists with no **._** extension, it will be distributed to all remaining nodes (those that are not already receiving a different version of the file).

In addition to **._** extensions, which control file distribution location, you can use **filename.pre** and **filename.post** files which are run on the node before and after the file is copied. These files must match the name of the target file exactly, with **.pre** or **.post**, and any **._** extensions appended after **.pre** or **.post**. For more information on **filename.pre** and **filename.post** files, see the **cfmupdatenode** man page. For example, to distribute **/etc/ypserv.conf** to nodes in the **RedHat80Nodes** group and run **.pre** and **.post** files:

- **/cfmroot/etc/ypserv.conf._RedHat80Nodes**
- **/cfmroot/etc/ypserv.conf.pre._RedHat80Nodes**
- **/cfmroot/etc/ypserv.conf.post._RedHat80Nodes**

The **cfmupdatenode** command is also run automatically after completion of the **updatenode** and **installnode** commands. See the command man pages or the *IBM CSM for Linux: Command and Technical Reference* for detailed command usage information.

Symbolic links

The **cfmupdatenode** command distributes the targets of symbolic links in **/cfmroot**, so you must use scripts to create symbolic links on the nodes in **filename.post** files. These files are scripts that CFM runs after transferring the **filename** file to the node. For example, to distribute **/etc/rc.d/rc** and create the symbolic link **/etc/rc -> /etc/rc.d/rc**:

1. Create the **/cfmroot/etc/rc.d/rc** file.
2. Create the **/cfmroot/etc/rc.d/rc.post** file, which will run every time **/cfmroot/etc/rc.d/rc** is copied to a node. The **rc.post** file should have contents similar to:

```
#!/bin/sh
if [ -e /etc/rc ]
then
/bin/rm -f /etc/rc
fi
ln -s /etc/rc.d/rc /etc/rc
```

The **filename.post** and **filename.pre** files can be written in any scripting language available on the nodes, and will only be run when the **filename** file is updated. For example, the **rc.post** script would only get run on a node if the **/cfmroot/etc/rc.d/rc** file was changed and distributed.

Meta variable substitution

You can customize files on a node by node basis with CFM meta variables. Currently CFM supports two meta variables: **%ip%** and **%hostname%**. These strings are replaced with the node's IP address and host name when the configuration file is distributed to the individual node. The node's IP address and host name are based on the resolved default host name of the machine.

Running filename commands

Commands run by a **filename.pre** or **filename.post** file will usually finish before the **cfmupdatenode** command exits. To start a long-running command with **cfmupdatenode**, use the **at now** command. The following example shows a **filename.post** file that starts a five minute sleep process:

```
#!/usr/bin/perl
system("echo sleep 200 | at now");
exit 0;
```

Sample configuration files

Sample CFM configuration files are included with CSM. These files have **._EmptyGroup** extensions which prevents them from being distributed to nodes. To distribute these files to nodes, rename them to a different extension or to no extension. The current sample configuration files shipped with CSM are mainly user management files.

User management and host name resolution files are provided as links to the files stored on the management server:

```
/cfmroot/etc/hosts._EmptyGroup -> /etc/hosts
/cfmroot/etc/passwd._EmptyGroup -> /etc/passwd
/cfmroot/etc/group._EmptyGroup -> /etc/group
/etc/group /cfmroot/etc/shadow._EmptyGroup -> /etc/shadow
```

Distribution of these files will configure your nodes to have the same user management and host name resolution as the management server. Distributing the user management files will overwrite any password changes that users might initiate on the nodes. If you choose to distribute these files, you must notify users to make any password changes on the management server. You might also choose to change the CFM cron job frequency to distribute these files more often.

cfmupdatenode cron job

The **cfmupdatenode** cron job is created when you install CSM. By default, the cron job runs the **cfmupdatenode** command every night at 12:00 a.m., but you can set it to run at any time interval. To set the time interval, edit the **cfmupdatenode** cron job by using the **crontab -e** command. All errors reported by the cron job are e-mailed to root. See the **crontab** man page for detailed usage information.

CFM log files

CSM system administrators will be concerned with two log files – the error log and the change log. Both of these logs are located on the management server. CFM uses the error log to record errors that are encountered by the **cfmupdatenode** command. The log is located on the management server in **/var/log/csm/cfmerror.log**. Once the size of the error log file (**cfmerror.log**) exceeds 100,000 bytes, it is copied to a backup log named **cfmerror.log1**. When the size of the new **cfmerror.log** exceeds 100,000 bytes, **cfmerror.log1** is renamed to **cfmerror.log2** and the current **cfmerror.log** is renamed to **cfmerror.log1**. CFM retains a maximum of four backup logs, so you could have **cfmerror.log**,

cfmerror.log1, **cfmerror.log2**, **cfmerror.log3**, and **cfmerror.log4** in the **/var/log/csm** directory, with **cfmerror.log** being the most recent.

CFM uses the change log to record configuration file details such as when they are updated in **/cfmroot** on the management server, and when they are distributed to the nodes. The change log is located on the management server in **/var/log/csm/cfmchange.log**. The file uses the following format:

```
File server modification time | updated nodes [date stamp] | non-updated nodes \  
[date stamp — attempted update]
```

Software maintenance

CSM and Linux software maintenance must be performed regularly on a CSM cluster. CSM software maintenance should be performed using the process documented in the *IBM CSM for Linux: Planning and Installation Guide*. The Software Maintenance System (SMS) for Linux should be used to update RPM packages on Linux nodes.

Software Maintenance System (SMS)

CSM Software Maintenance System (SMS) updates, installs, queries, and deletes RPM packages across cluster nodes. RPM packages contain software and updates for the Linux operating system, which are installed on a single system using the **rpm** command. The **smsupdatenode** command is the SMS interface for updating, installing, querying, and deleting RPM packages on cluster nodes. The command has a test mode to return command results without making any node updates. The **smsupdatenode** command can be run manually by a system administrator, or set up to run automatically at defined intervals using a cron job.

Note: SMS does not apply to Minimally-Managed – *Mode=MinManaged* – nodes because no CSM files or code reside on these nodes.

There are two SMS RPM package distribution modes: install mode and update mode. Install mode installs new RPM packages on a node. Update mode only installs an RPM package if an older version of the package is already on the node. The **smsupdatenode** command can also be used to update software on the management server if the machine has the **csm.client** package installed. See the **smsupdatenode** command man page or the *IBM CSM for Linux: Command and Technical Reference* for detailed command usage information.

SMS directory structure

To make RPM packages available to SMS, you must place them on the management server under a directory structure corresponding to the CSM attributes of the target nodes. There are three separate directories corresponding to each type of node: **../RPMS**, **../updates** and **../install**.

These three directories (**../RPMS**, **../updates** and **../install**) are subdirectories of the following directory structure:

```
/csminstall/InstallOSName/InstallDistributionName/InstallDistributionVersion/  
InstallPkgArchitecture. This directory structure allows you to have different sets of RPM packages for each Linux distribution in your cluster.
```

Note: If the *InstallPkgArchitecture* is **i486**, **i586**, or **i686**, then **/i386** will be used for the directory structure.

The **../RPMS** directory holds the distribution RPM packages that were copied by an operating system installation of the nodes, or by the **smsupdatenode --copy**

command run on the management server. These distribution RPM packages fulfill any dependencies required by the software in the `../updates` and `../install` directories.

RPM packages placed in the `../updates` directory will only be installed on nodes that already have an earlier version of the package installed. This directory is intended to contain all RPM updates for a given Linux distribution. The SMS updates functionality allows you to download large numbers of RPM updates, ensuring that they are only installed on nodes that already have the software installed (useless RPMs are not installed). The `../updates` directory can also contain RPM packages that you want to install on certain nodes using the `smsupdatenode -i` command.

RPM packages that are not installed with the base operating system or with CSM can be placed in the `../install` directory, which automatically installs them on all nodes matching the directory structure. This directory is intended for third party RPM packages that must be installed on all nodes. SMS attempts to install any RPM placed in the `../install` directory; therefore RPM packages that you only want installed on select nodes should be put in the either the `../updates` directory or a node group subdirectory of `../install`.

The `installnode`, `updatenode`, and `smsupdatenode` commands invoke the SMS default behavior – upgrading `../updates` RPMs and installing `../install` RPMs on the target nodes. The `smsupdatenode` command can also perform more complex software maintenance; see the `smsupdatenode` man page for details.

Copying distribution RPM packages

Before performing software maintenance on nodes, copy the RPM packages from the nodes' operating system CDs. These RPM packages supply dependencies for RPM updates – place them into the corresponding `/csminstall/.../RPMS` directory. This work is done automatically by the `csmssetupks` and `csmssetupyast` commands, which are used if you do an OS install on your nodes. However, if you are installing CSM-only nodes, you can use the `smsupdatenode` command to copy these RPM packages using the `smsupdatenode --copy` (and optionally, `--path`) command options.

Updating RPM packages

To update existing RPM software on the nodes, place the updated RPM packages into the `/csminstall/.../updates` directory corresponding to the target nodes' attributes, and run the `smsupdatenode` command with options to specify the nodes. This will update all RPM packages in the `/updates` directory that have earlier versions already installed on the nodes. If these RPM packages have any uninstalled dependencies, `smsupdatenode` will try to satisfy these with distribution RPM packages stored in the corresponding `/RPMS` directory. The following examples show `smsupdatenode` command usage:

- To run the `smsupdatenode` command on all nodes, enter:
`smsupdatenode -a`
- To update RPM packages on all Red Hat 8.0 nodes, enter:
`smsupdatenode -N RedHat80Nodes`
- To update RPM packages on all SuSE 8.1 nodes, enter:
`smsupdatenode -N SuSE81Nodes`

Note: The **smsupdatenode** command is called internally by the **updatenode** command. Therefore, any RPM packages placed in the **/csminstall/.../updates** directory will also be updated by the **updatenode** command.

Node group subdirectories

To install RPM software on certain node groups only, place the designated RPM packages in node group subdirectories under the **/csminstall/.../updates** or **/csminstall/.../install** directories. For example, to install RPM packages on only the nodes in the **RedHat80Nodes** node group, create the directory **/csminstall/.../install/RedHat80Nodes**. Only subdirectories corresponding to defined CSM node groups will be recognized. However, AutoUpdate also looks in subdirectories corresponding to the architecture of the node, so do not make any architecture subdirectories. The next time software maintenance is invoked on the node group corresponding to the subdirectory, the software will be updated.

Updating the kernel

SMS uses the AutoUpdate open source tool to update RPM packages. On Red Hat nodes, AutoUpdate will by default not update the kernel. However on SuSE and SLES nodes, kernel RPM packages are handled as normal RPM packages, so you must use caution when using SMS to update RPM packages starting with **k_** on SuSE and SLES nodes. The default behavior for upgrading RPM packages results in the entire package being replaced. So if you upgrade the kernel on a SuSE or SLES node, it will replace the entire existing kernel, making it impossible to revert to the original one. After upgrading a kernel on a SuSE or SLES node, check the **/etc/lilo.conf** file for accuracy and run **lilo** to refresh the boot record.

On Red Hat nodes, kernel updates are handled in a specific manner by AutoUpdate and you must enable these updates in the configuration file. Kernel updates can be enabled by changing the **autoupdate.conf** file used by SMS. A copy of this file is stored on the management server in **/var/opt/csm/autoupdate.conf**, which is generated the first time **smsupdatenode** is run. To enable kernel updates on Red Hat nodes:

1. Copy the **autoupdate.conf** file to the corresponding location in **/cfmroot**:
/cfmroot/var/opt/csm/autoupdate.conf.
2. Uncomment the following lines in the **/cfmroot/.../autoupdate.conf** file and set to the following values:

```
DoKernel=1
DoBoot=0
DoInitRD=0
```
3. Run the **cfmupdatenode -av** command to distribute the **autoupdate.conf** file to all nodes.
4. Place the updated kernel in the **/csminstall/.../updates** directory.
5. Run the **smsupdatenode -av** command to install the kernel on all nodes.
6. Edit the **grub.conf** or **lilo.conf** file on the nodes to specify the correct kernel to boot. You can use CFM to complete this task if the kernel configuration is the same on all nodes.
7. Run the **rpower** command to reboot the nodes.

You can also use the **smsupdatenode** command to install a custom kernel. The only requirement is that the kernel must be in RPM package format. The following procedure creates a custom kernel RPM package on a Red Hat node. For instructions on how to build a kernel RPM package on other operating systems, see the operating system documentation.

1. Add the following lines to the **/usr/src/linux-kernel_level/scripts/mkspec** file:

```

echo "%post"
echo "cd /boot"
echo "ln -sf vmlinuz-$VERSION.$PATCHLEVEL.$SUBLEVEL$EXTRAVERSION vmlinuz"
echo "ln -sf System.map-$VERSION.$PATCHLEVEL.$SUBLEVEL$EXTRAVERSION System.map"
echo "ln -sf module-info-$VERSION.$PATCHLEVEL.$SUBLEVEL$EXTRAVERSION \
module-info"
echo "[ -x /usr/sbin/module_upgrade ] && /usr/sbin/module_upgrade"
echo "[ -x /sbin/mkkerneldoth ] && /sbin/mkkerneldoth"
echo "if [ -x /sbin/new-kernel-pkg ] ; then"
echo "  /sbin/new-kernel-pkg --mkinitrd --depmod --install \
$VERSION.$PATCHLEVEL.$SUBLEVEL$EXTRAVERSION"
echo "fi"
echo "%postun"
echo "/sbin/modprobe loop 2> /dev/null > /dev/null || :"
echo "if [ -x /sbin/new-kernel-pkg ] ; then"
echo "  /sbin/new-kernel-pkg --rminitrd --rmmoddep --remove \
$VERSION.$PATCHLEVEL.$SUBLEVEL$EXTRAVERSION"
echo "fi"

```

2. Go to the `/usr/src/linux-kernel_level` directory.
3. Build the kernel and kernel modules.
4. Run the **make spec** command.
5. Run the **make rpm** command.
6. When the RPM package has finished building, follow steps 1-7 outlined in the previous procedure for updating the kernel.

Installing new RPM packages

There are two ways to install new RPM packages on cluster nodes. A simple method is to place the desired RPM packages in the `/csminstall/.../install` directory, and then run the **smsupdatenode** command to the desired nodes. This will install the new RPM packages on the nodes regardless of whether an earlier package is installed. Distribution RPM packages from the `/RPMS` directory will be used to satisfy any dependencies not met by other RPM packages in the directory.

An alternative is to place the desired RPM packages in `/csminstall/.../updates` and then use the **smsupdatenode -i** command to manually install the RPM packages on select nodes. Again, distribution RPM packages from the `/RPMS` directory will be used to satisfy any dependencies not met by other RPM packages in the directory. You can leave the RPM packages in `/csminstall/.../updates` since they will never be automatically installed on a node that does not already have an earlier version of the RPM installed.

Deleting RPM packages

You can use **smsupdatenode** to remove RPM packages from nodes in your cluster. Removal of packages is specified using the **-e --deps packagename** or **-e --nodeps packagename** options. The **--deps** option specifies to remove *packagename* and all packages that depend on it. The **--nodeps** option specifies to only remove *packagename*. For example, to remove **gnome-games-1.4.0.1-5** and all packages dependent on it, enter:

```
smsupdatenode -av -e --deps gnome-games-1.4.0.1-5
```

Restoring an earlier RPM package

There is no explicit SMS utility to restore earlier versions of RPM packages. To restore an earlier version of an RPM package, use one of the following two procedures:

1. Remove the existing RPM package on the nodes by entering **smsupdatenode -e --nodeps -p packagename hostname,...**
2. Place the earlier version of the RPM package in the `/csminstall/.../updates` directory structure.

3. Run **smsupdatenode -i packagename hostname,...** to install the RPM package on the specified host names.

Alternatively, you can do the following to restore an earlier version of an RPM package:

1. Copy the earlier version of the RPM package to the nodes using **cfmupdatenode**.
2. Use **dsh** to run **rpm --force packagename** on the nodes to replace the newer version of the RPM package with the earlier version.

Querying installed RPM packages

The **smsupdatenode** command **-q** option can be used to query the RPM packages installed on cluster nodes. Run **smsupdatenode -aq** to return a list of unique RPM packages installed on each node. Run **smsupdatenode -aqc** to also return a list of common RPM packages installed on every node.

Running an SMS cron job

A system administrator can set up a cron job to run the **smsupdatenode** command automatically at defined intervals by completing the following steps:

1. As root user run the **crontab -e** command.
2. Enter the following command on a single line:

```
minute hour day-of-month month day-of-week command
```

For example, to have cron run **smsupdatenode** every day at 1:00 a.m., add the following line:

```
0 1 * * * /opt/csm/bin/smsupdatenode -a
```

Monitoring system events

Resource Monitoring and Control (RMC) is a flexible distributed system monitoring application provided by Reliable Scalable Cluster Technology (RSCT). RMC allows you to define conditions on your system that you want to monitor, and to automatically respond to system events that occur when the defined conditions are met. An event occurs when a monitored condition reaches a threshold that is defined in an event expression. When an event occurs, automated responses to the event are run. Multiple actions can be defined as components of a single response. Actions include running commands or user-defined scripts on the management server or on any node in the cluster, notification actions such as logging, e-mail or paging, and generating SNMP alerts to forward information about events to other management tools.

RMC commands are provided for setting up the monitoring application to meet your requirements. Predefined conditions and responses are also provided to be used as is, or copied and modified to fit your requirements.

System resources that can be monitored include:

- File systems
- Programs
- System resources such as CPU and memory utilization
- Network to node connectivity status
- Additional resources by using sensors.

The monitoring application, its components, and predefined conditions and responses are described at a high level in Chapter 2, “Monitoring your system,” on page 27

page 27. For monitoring application details see the *IBM RSCT for Linux: Administration Guide*. RSCT command syntax, descriptions, and examples are available as man pages and in the *IBM RSCT for Linux: Technical Reference*.

Retrieving node status

The **csmstat** command provides a snapshot of cluster node reachability, power status, and network interface status. The command gathers this information for the specified nodes and displays the output. The default output is displayed by host name. If there are multiple hardware control points for a node, multiple HMCs for example, then the first hardware control point in the list is shown.

Notes:

1. This command is not supported for nodes on IntelliStation workstations.
2. This command is not supported for Linux on pSeries clusters.
3. Displayed LCD values are limited to 16 characters. The **rpower -l** (lowercase L) command displays the complete values.

Backing up and restoring CSM files

The **csmbackup** command backs up vital CSM management server data (not supported on pSeries hardware). IBM suggests running the command before critical cluster reconfiguration tasks such as migrating your cluster to a new version of CSM or redefining the management server definition on a new hardware model. The **csmbackup** command nearly replicates the state of the management server. The command backs up vital information for nodes, node groups, conditions and responses, and condition and response associations. Customization scripts and DCEM scripts are also copied.

The command does not backup all data on the management server because some information should be copied to a backup storage device manually using commands such as **scp**, **rsync**, or **rcp**. However, additional files for the **csmbackup** command to store can be specified using the **-f** option.

The **csmrestore** command restores the files that were copied by the **csmbackup** command into the specified directory. The **csmrestore** command restores nodes, node groups, conditions and responses, and condition and response associations on the management server. Customization scripts and DCEM scripts are also restored. For detailed information on the **csmbackup** and **csmrestore** commands, see the man pages or the *IBM CSM for Linux: Command and Technical Reference*, and the *IBM CSM for Linux: Planning and Installation Guide*.

Using CSM with IBM Director

IBM Director is a separate IBM systems management solution designed for managing a complex environment of Intel-based servers (not supported on pSeries), desktop systems, workstations, mobile computers, and assorted devices running a variety of operating systems. For detailed information go to http://www.ibm.com/servers/eserver/xseries/systems_management/xseries_sm.html. If you want to use both IBM Director and CSM for Linux to manage Linux clusters, consider installing the Linux Cluster Support (LCS) extension for IBM Director that is included with CSM for Linux. The LCS extension provides the following functions and capabilities:

- When a CSM management server is discovered and unlocked, an object is added to the IBM Director Console to represent the entire CSM Linux cluster, and to serve as a target for the IBM Director Console Tasks that are run for all cluster nodes.
- Once the CSM management server has been discovered and unlocked, the discovered CSM Managed nodes are shown grouped together below their Linux Cluster object, assuming the IBM Director Console's **Cluster Membership** association is on.
- CSM node data for discovered CSM Managed nodes is viewable through the IBM Director Console's Inventory Query Browser.
- Dynamic groups can be defined based on standard system inventory data and CSM node data.
- ERRM conditions defined on discovered CSM management servers are published as IBM Director event types and can be used as IBM Director event types when building Event Filters.
- Monitoring of ERRM conditions in CSM clusters can be started by associating Event Action Plans with Linux cluster objects, or with CSM system objects or groups.
- RMC events corresponding to monitored ERRM conditions are forwarded as IBM Director events so that Actions in Event Action Plans occur as expected.
- The IBM Director Console's **Remote Session** Task can be used to run arbitrary CSM, ERRM, RMC, or other Linux commands on discovered CSM management servers and Managed nodes.

For information on the IBM Director versions supported by the LCS extension, see the *IBM CSM for Linux: Planning and Installation Guide*.

Discovering CSM systems

This section assumes the following:

- The LCS extension has been installed on the IBM Director Server.
- The IBM Director Agent and LCS extension have been installed on the CSM management server.
- The IBM Director Agent and LCS extension have been installed on the Managed nodes.

Note: The IBM Director product is shipped separately from CSM for Linux. For information on installing an IBM Director Server, see the IBM Director product documentation. For details on installing CSM and the LCS extension, see the *IBM CSM for Linux: Planning and Installation Guide*.

Launch the IBM Director Console and select **All Systems and Devices** in the **Groups** pane. Then discover your CSM systems using any of IBM Director's system discovery mechanisms.

Discovering CSM management servers

When a CSM management server is discovered, a system object representing the system appears in the IBM Director Console's **Group Contents** pane. If a lock icon appears next to the system object, you must give the IBM Director Server access to the CSM management server by doing the following:

1. Select **Request Access...** from system object's context menu.
2. In the dialog that opens, enter user ID **root** and the CSM management server's root password.

3. Click the **OK** button.

An informational dialog will state that access has been granted. The lock icon will be removed and after a brief interval a second object should appear. This object is labeled with the CSM management server's short host name and represents the entire CSM Linux cluster.

CSM management server objects are members of the **All Systems and Devices** group and the **Systems with Linux** group, among others. CSM Linux cluster objects are members of the **All Systems and Devices** group, the **Clusters** group, the **Linux Clusters** group, and potentially the **Clusters and Cluster Members** group.

Discovering CSM nodes

As CSM Managed nodes are discovered, system objects appear in the IBM Director Console's **Group Contents** pane to represent the nodes. If the Managed node objects appear with lock icons, unlock them by ensuring that their CSM management server is discovered and unlocked. You do not usually need to use the **Request Access...** function on individual nodes, because once a CSM management server has allowed a IBM Director Server to access it, all nodes in the cluster should grant access to the same IBM Director Server automatically.

CSM Managed node objects are members of the **All Systems and Devices** group and the **Systems with Linux** group, among others. If their CSM management server is discovered and unlocked, CSM Managed node objects and their cluster's CSM Linux cluster object are members of the **Cluster and Cluster Members** group.

Note: You must explicitly discover all CSM Managed nodes, either in bulk or individually. Discovery of a CSM management server does not force the discovery of its Managed nodes. IBM Director can discover CSM PreManaged and MinManaged nodes, if they are operational and have a IBM Director Agent installed, but they are not recognized as cluster nodes in the IBM Director Console until they become Managed nodes.

Using Associations

Without any IBM Director Console **Associations** turned on there is no obvious relationship between CSM management server objects, CSM managed node objects, and Linux cluster objects in the IBM Director Console's **Group Contents** pane. To see these relationships select **Cluster Membership** from the IBM Director Console's **Associations** menu. CSM managed node objects will group themselves below their respective Linux Cluster objects. CSM management server objects do not group unless they are also Managed nodes and their CSM management server has been discovered.

Figure 1 on page 19 shows an IBM Director Console with a CSM management server (planets) and several nodes (earth, mars, mercury, venus) that have been discovered, unlocked, and inventoried. Notice that there is a system icon for planets as well as a cluster icon. Also, in this example, planets is not a cluster node itself, so its system object is not grouped below the cluster object named planets.

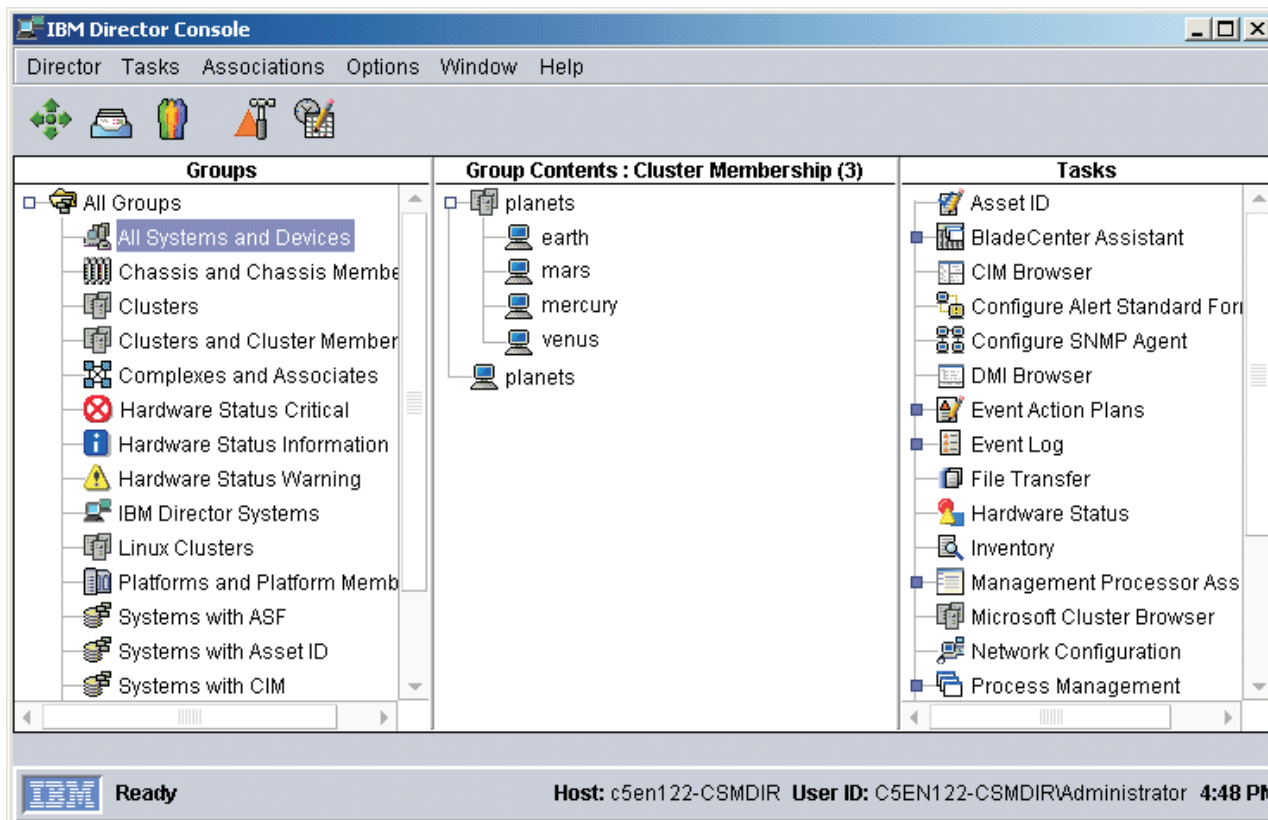


Figure 1. IBM Director Console

Viewing CSM node data

CSM Managed node data (persistent attribute data stored in instances of the **IBM.ManagedNode** resource class) can be viewed through the IBM Director Console's **Inventory Query Browser**. In the **Available Queries** pane, expand the tree under the **Standard** folder and select the **Linux Cluster Node** query. Changes to CSM Managed node data are not dynamically updated in the **Linux Cluster Node** query results. You can refresh the query results by switching to another query and then returning to the **Linux Cluster Node** query.

Figure 2 on page 20 shows an **Inventory Query Browser** window with the **Linux Cluster Node** query selected.

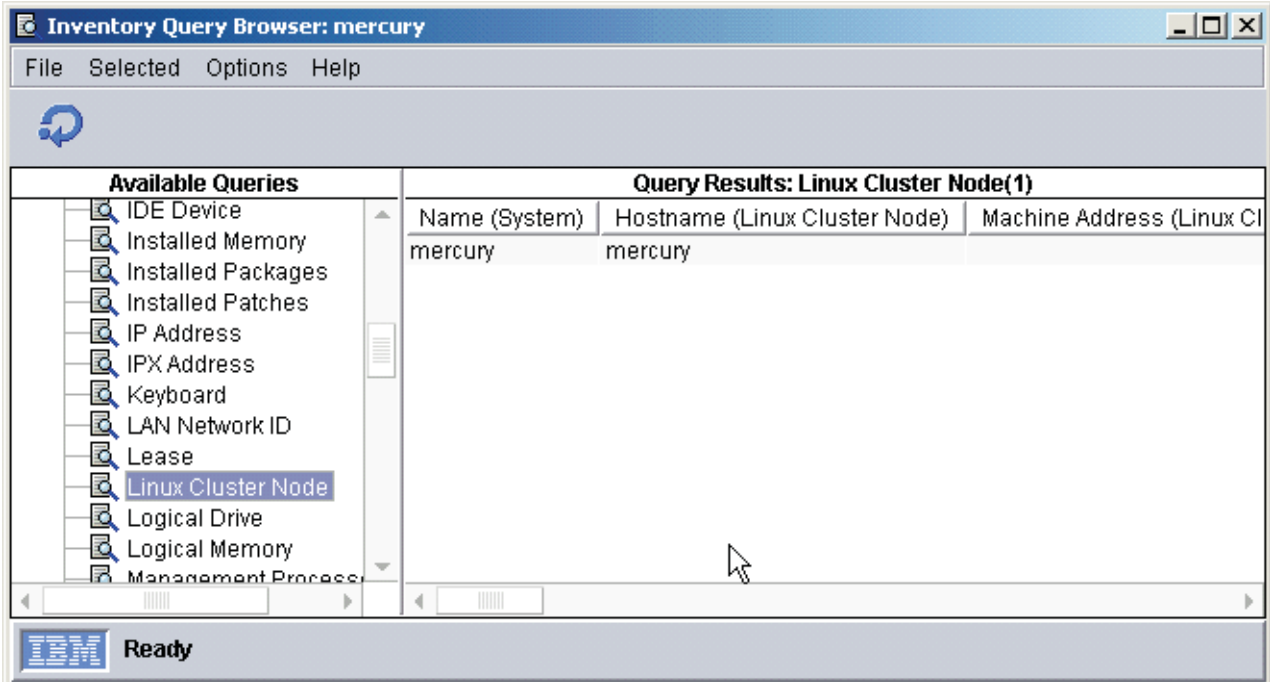


Figure 2. IBM Director Query Browser

Creating dynamic groups based on CSM node data

CSM Managed node data is included in IBM Director inventory data, so dynamic groups based on CSM Managed node data (or other inventory data) can be created in IBM Director. The IBM Director Console's **Dynamic Group Editor** contains an **Inventory (Linux Cluster)** category in the **Available Criteria** pane. Navigate through this category to select CSM Managed node data criteria for the dynamic groups you want to create.

Note: CSM has its own node grouping capabilities, but CSM node groups are NOT exposed to IBM Director by the LCS extension.

Figure 3 on page 21 shows a **Dynamic Group Editor** window with the **Inventory (Linux Cluster)** category expanded.

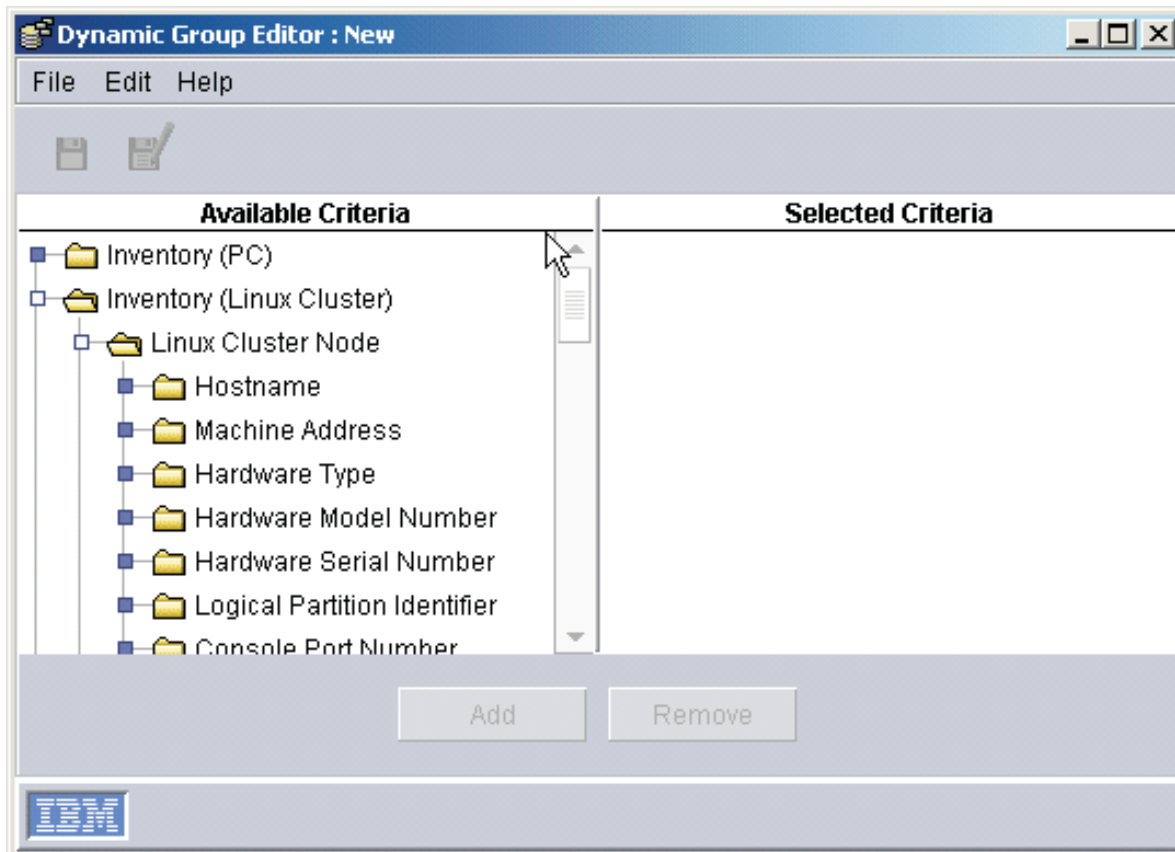


Figure 3. IBM Director Dynamic Group Editor

Building Event Filters to receive RMC events

The ERRM conditions defined on a discovered CSM management server are published as IBM Director event types. In the IBM Director Console's **Event Filter Builder** windows a category of event types named **Linux Cluster** appears whenever one or more CSM management servers have been discovered. The **Linux Cluster** category includes distinct subcategories corresponding to each defined ERRM condition. If ERRM conditions are added, changed, or removed while viewing the **Event Filter Builder** window, the subcategories are not dynamically updated. To see the changes you must close and then reopen the **Event Filter Builder** window. When building Event Filters, use the **Linux Cluster** event types as you would use any other IBM Director event type.

Note: ERRM responses are not exposed in IBM Director by the LCS extension. Instead, use the IBM Director **Actions** in the **Event Action Plan Builder**.

Figure 4 on page 22 shows a **Simple Event Filter Builder** window with **Linux Cluster** event types expanded.

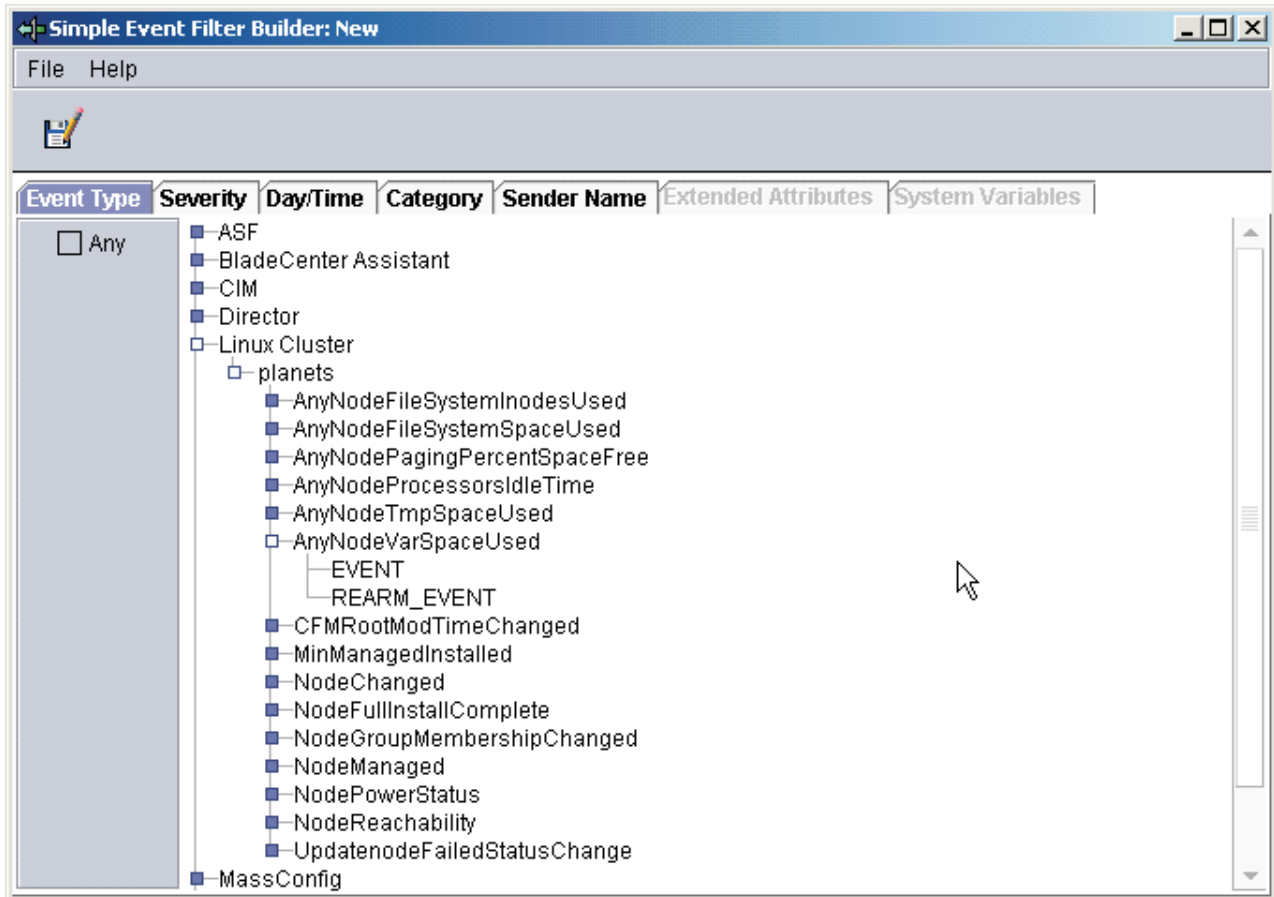


Figure 4. IBM Director Simple Event Filter Builder

Starting ERRM condition monitoring

If you have built an Event Action Plan using an Event Filter based on a **Linux Cluster** event type, monitoring of the corresponding ERRM condition starts when you drag and drop the Event Action Plan onto an appropriate Linux cluster object, CSM management server object, IBM Director group of CSM Managed nodes, or set of CSM Managed node objects. Monitoring of the ERRM condition stops when you delete the Event Action Plan from the group or object.

Notes:

1. The node list defined within an ERRM condition is ignored; monitoring is actually started on a copy of the original ERRM condition. In the copy, the node list is derived from the targets of the Event Action Plan drag and drop operation.
2. To select appropriate objects or groups, you must be familiar with ERRM conditions and their monitoring scope. ERRM conditions that have "management domain" scope (*MgtScope = m*) can be monitored on any CSM node. ERRM conditions that have "local" scope (*MgtScope = l*) can be monitored on a CSM management server only. To check the scope of an ERRM condition, run the **lsccondition condition | grep MgtScope** command on your CSM management server.
3. If you drag and drop an Event Action Plan onto an inappropriate object or group, IBM Director might indicate that the Event Action Plan has been successfully associated with that object or group. However, if the ERRM

condition upon which the Event Action Plan is based cannot be monitored on the target system, monitoring is NOT started, no event will be generated, and the Action in your Event Action Plan will never occur.

Running customization scripts

CSM provides support for automatically running user-provided customization scripts during node installation or updating. To run a script during the operating system installation process, the script must be placed in one of the following two directories:

/csminstall/csm/scripts/installpreboot

Scripts in this directory will run after operating system installation, but prior to the first reboot of the node.

/csminstall/csm/scripts/installpostreboot

Scripts in this directory will run after the first reboot of the node.

To have a script run when a node is being updated by the **updatenode** command, the script must be placed in the following subdirectory:

/csminstall/csm/scripts/update

These scripts will run after any CSM updates have completed.

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

The naming convention for these files is *scriptname[._target]*. The *._* characters following the script name are required if the script is only 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 run on all nodes. If there is a script and additional multiple versions for subsets of nodes, such as **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**.

The **/csminstall/csm/scripts/data** subdirectory contains any additional scripts or data files that are used by the scripts in the directories listed previously. The files in this directory may be referred to by using either a relative path to the file or by using the **SCRIPTDATAPATH** environment variable. Do not use the **/csminstall/csm/scripts/data** directory in your script because this path will not be correct when the script is run on the node.

From your user customization script the relative path to the data file is **.../data/userdatafile**.

The **SCRIPTDATAPATH** environment variable is set by the CSM script that calls the customization script. It contains the actual path of the **.../data** directory. You may use this variable to refer to files in the data directory as follows:
\$ENV{SCRIPTDATAPATH}/userdatafile.

Cluster security

Cluster security is provided by the operating system, so only root users can run commands or modify system data. Flexibility in the degree of security required by a specific environment is provided by remote shells that conform to the IETF secure remote command. Remote shells can be specified using the **dsh** command. See the **dsh** man page for details on how to specify the remote shell of your choice.

dsh security

The **dsh** distributed shell command uses the remote shell defined by the **csconfig** command. It is the system administrator's responsibility to configure and enable remote shell access to other systems, and to fulfill the particular security obligations of a specified environment.

Note: Be aware that the **dsh** command does not provide the set up for a specific security configuration.

Specifying a remote shell

You can also specify the remote shell to use for remote communication using the **csconfig -r** command: either **/usr/bin/rsh** or a secure remote command. You can specify the shell by setting the **DSH_REMOTE_CMD** environment variable to the full path name of your **rsh** or secure remote command (for example, **/usr/bin/secureremote**). You can also use the **-r** option on the **dsh** command. When the **dsh** command is run, it first checks for the value of the **-r** option. If the option has not been set, it checks for the value of the **DSH_REMOTE_CMD** environment variable. If the environment variable has also not been set, the **dsh** command defaults to the value stored by the **csconfig** command. For specific details on remote shells, see "Diagnosing problems with dsh" on page 123. For information on installing a remote shell, see the *IBM CSM for Linux: Planning and Installation Guide*.

RSCT security

CSM uses RSCT security functions to ensure that the cluster software components can properly authenticate the identity of associated peers, clients, and subcomponents. Since it is possible for one of these peers, clients, or subcomponents to imitate another, cluster components must be able to verify their identities. Instead of only requiring each party to verify the identity of the other when a connection is established, RSCT security uses a message authentication process for identification.

RSCT message authentication

The authentication mechanism used by RSCT is host based authentication using private-public key pairs. Each node in the cluster has a unique private-public key pair and the public key should be exchanged between the management server and the nodes for proper authentication of the requests. When configuring a cluster the required key exchanges between cluster nodes is automatically carried out by CSM. The public key is copied from each of the **Managed** nodes to the management server, and the management server's public key is copied to each of the **Managed** nodes. If your system is not secure enough to prevent address and identity spoofing, you must transfer the public keys between the management server and the nodes manually. See the *IBM RSCT for Linux: Administration Guide* for more information.

RSCT authorization

CSM implements authorization using an access control list (ACL) file. You can create a new ACL file to apply access control to resource classes, or you can use the default ACL file which is provided with RSCT. A sample ACL file is provided in **`/usr/sbin/rsct/cfg/ctrmc.acls`**.

The ACL file is in stanza format. Each stanza begins with the stanza name, which is the name of a resource class. Each line of the stanza contains a user identifier, an object type, and an optional set of permissions. A stanza line indicates that the user at the host has permission to access the resource class or resource instances, or both, for the resource class named by the stanza.

For any command issued against a resource class or its instances, the RMC subsystem examines the lines of the stanza matching the specified class in the order specified in the ACL file. The first line that contains an identifier matching the user issuing the command and an object type matching the objects specified by the command is the line used to determine access permissions. See the *IBM RSCT for Linux: Administration Guide* for detailed information about authorization and the ACL file.

Chapter 2. Monitoring your system

This chapter provides an introduction to monitoring concepts. The Monitoring application is provided by Reliable Scalable Cluster Technology (RSCT); detailed information about planning for monitoring your system, tracking system events, and using and modifying predefined scripts, expressions, commands, and responses is provided in the *IBM RSCT for Linux: Administration Guide*.

CSM uses the Resource Monitoring and Control (RMC) application, which is part of RSCT. RMC provides consistent and comprehensive monitoring of system resources. By monitoring conditions of interest and providing automated responses when these conditions occur, RMC helps maintain system availability. RMC is administered from the command line. See the *IBM RSCT for Linux: Technical Reference* for detailed RMC command usage information. If you are using the LCS extension, monitoring can be started through the IBM Director Console – see “Using CSM with IBM Director” on page 16.

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. You can specify an unlimited number of actions to be taken in response to an event.

As system administrator, you have a great deal of flexibility in responding to events. For example, you can respond to an event differently depending on the time or day the event occurs. The following examples show common monitoring uses:

- You can be alerted by e-mail if **/tmp** is unmounted during working hours. During non-working hours, you can have the problem logged instead.
- You can be notified by e-mail when **/var** is 80% full.
- You can configure your paging software to notify you if a critical file system goes offline.
- You can have a user-written script run automatically to delete the outdated files when **/tmp** is 90% full.

CSM uses RMC to monitor the system and to perform many of its operations. For more information about RMC, see the *IBM RSCT for Linux: Administration Guide*. For information about the command line interface to the RMC subsystem, see the *IBM RSCT for Linux: Technical Reference*.

Monitoring concepts

Monitoring allows you to detect conditions of interest associated with cluster nodes and their related resources, and then automatically take action when those conditions are met. The key elements in monitoring are *conditions* and *responses*. A condition identifies one or more resources that you want to monitor (for example, the **/var** file system), and the specific resource state you are interested in (for example, % full). A response specifies one or more actions to be taken when the condition is met, including event notification, running commands, and logging.

Using conditions for monitoring

System resources that you can monitor are organized into general categories called *resource classes*. Examples include the Processor, File System, Physical Volume,

and Ethernet Device resource classes. Each resource class includes individual system resources, and each of these resources also has a set of properties that you can monitor.

For a condition, you specify the monitored attribute of the resource in a logical expression that defines a threshold or state of the monitored resource. For example, `/var > 90% full` states that you are monitoring the file system `/var` using the condition name **FileSystem space used** and the event expression **PercentTotUsed > 90**. When the logical expression is true (the threshold is reached or the state becomes true), an event is generated. The logical expression is the event expression of the condition. Event expressions are typically used to monitor potential problems and significant changes in the system. RSCT provides predefined conditions to use for monitoring.

It can be useful to set up a rearm expression, which typically indicates when the monitored resource has returned to an acceptable state. When the rearm expression is met, monitoring for the condition resumes.

Using responses for monitoring

A response consists of one or more actions to be performed by the system when an event or rearm event occurs for a condition. After monitoring for the condition begins, the system evaluates the event expression to see if it is true. When the event expression becomes true, an event occurs that automatically causes each response to run its defined actions.

The Monitoring application includes predefined responses, but you can also create custom responses and associate them with conditions as needed. You can associate multiple responses with one condition, and you can associate one response with multiple conditions. For detailed information about conditions, responses, and using expressions, see the *IBM RSCT for Linux: Administration Guide*.

Components provided for monitoring

Resources have identifiable attributes that can be expressed so that conditions of interest can be detected and observed. Predefined thresholds can be set for conditions, and responses can be defined and associated with these conditions. When a threshold is met, an event is generated and the actions associated with the condition are run. Predefined conditions and responses can be used as is, or as templates for defining conditions and responses most appropriate for your installation.

The main components of the RSCT monitoring tool are the Resource Monitoring and Control (RMC) subsystem and certain resource managers. Resource managers are briefly described in the following sections; for more detailed information, see the *IBM RSCT for Linux: Administration Guide*.

Resource Monitoring and Control (RMC) subsystem

The RMC subsystem monitors and queries system resources. The RMC daemon manages an RMC session and recovers from communications problems. The RMC subsystem is used by its clients to monitor the state of system resources and to send commands to resource managers. The RMC subsystem acts as a broker between the client processes that use it and the resource manager processes that control resources.

Resource managers

A resource manager is a stand-alone daemon that maps resource and resource class abstractions into calls and commands for one or more specific types of resources. A resource manager contains definitions of all resource classes that the resource manager supports. A resource class definition includes a description of all attributes, actions, and other characteristics of a resource class. These resource classes are accessible and their attributes can be manipulated through the command line. See the man pages or the *IBM RSCT for Linux: Technical Reference* for information on accessing the resource classes and manipulating their attributes through the command line interface.

The following resource managers are provided:

Audit Log resource manager (IBM.AuditRM)

Provides a system-wide facility for recording information about the system's operation, which is particularly useful for tracking subsystems running in the background. See the *IBM RSCT for Linux: Administration Guide* for details.

Domain Management Server resource manager (IBM.DMSRM)

Manages a set of nodes and node groups that are part of a system management cluster. This includes monitoring the status of nodes and adding, removing, and changing node and node group attributes in the cluster. See "Domain Management Server resource manager" on page 30 and "Managing CSM information" on page 4 for details.

Event Response resource manager (IBM.ERRM)

Provides the ability to take actions in response to conditions occurring on a system. See the *IBM RSCT for Linux: Administration Guide* for details.

File System resource manager (IBM.FSRM)

Monitors file systems. See the *IBM RSCT for Linux: Administration Guide* for details.

Hardware Control resource manager (IBM.HWCTRLRM)

Provides hardware control for nodes in the system management cluster.

Host resource manager (IBM.HostRM)

Monitors resources related to an individual machine. The types of values that are provided relate to load (processes, paging space, and memory usage) and status of the operating system. It also monitors program activity from initiation until termination. See the *IBM RSCT for Linux: Administration Guide* for details.

Sensor resource manager (IBM.SensorRM)

Provides a means to extend RMC via scripts. See the *IBM RSCT for Linux: Administration Guide* for details.

Hardware control resource manager

The Hardware Control resource manager (IBM.DMSRM) controls the Node Hardware Control resource class (IBM.NodeHwCtrl) and the Hardware Control Point resource class (IBM.HwCtrlPoint). The Hardware Control resource manager runs on the node designated as the management server and is automatically started by the RMC subsystem. The Hardware Control resource manager is a component of CSM. For information about the resource managers that are available with RSCT, see the *IBM RSCT for Linux: Administration Guide*.

Node Hardware Control resource class (IBM.NodeHwCtrl)

The 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.

Hardware Control Point resource class (IBM.HwCtrlPoint)

The Hardware Control Point resource class (IBM.HwCtrlPoint) represents the physical hardware control point that controls the node. The IBM.HwCtrlPoint resource class, along with the IBM.NodeHwCtrl resource class, provide support for hardware control of the nodes in the cluster.

Domain Management Server resource manager

The Domain Management Server resource manager (IBM.DMSRM) controls the managed node (IBM.ManagedNode) resource class and the node group (IBM.NodeGroup) resource class. The Domain Management Server resource manager runs on the node designated as the management server and is automatically started by the RMC subsystem. The Domain Management Server resource manager is a component of CSM. For information about the resource managers that are available with RSCT, see the *IBM RSCT for Linux: Administration Guide*.

Managed Node resource class (IBM.ManagedNode)

The Managed Node resource class (IBM.ManagedNode) runs on the management server and is started by the RMC subsystem. It is controlled by the Domain Management Server resource manager. For details about Managed Node class attributes, see the **nodeattributes** man page or the *IBM CSM for Linux: Command and Technical Reference*.

Predefined conditions for Managed Node resource class

The following predefined conditions are available for the IBM.ManagedNode resource class.

NodeReachability:

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
Status !=1	An event is generated when a node in the network cannot be reached from the management server.	Status =1	The event is rearmed when the node can be reached again.	None.

NodeChanged:

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
ChangedAttributes not in ""	An event is generated when a node definition in the ManagedNode resource class changes.	None	None	NodeNames = {localnode}

NodePowerStatus:

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
PowerStatus !=1	An event is generated whenever the power state of the node is no longer 1 (on). This typically happens when the node is powered off, or when the power status of the node cannot be determined.	PowerStatus =1	The event is rearmed when the node is powered on again.	NodeNames = {localnode}

Node Group resource class (IBM.NodeGroup)

The Node Group resource class (IBM.NodeGroup) runs on the management server.

Predefined conditions for the Node Group resource class

The following table shows the predefined conditions and example expressions that are available for the IBM.NodeGroup resource class.

NodeGroupMembershipChanged:

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
MembershipChanged.AddCount !=0 MembershipChanged.DelCount !=0	An event is generated when a node is added to or deleted from a previously existing node group.	None	None	NodeNames = {localnode}

CSM conditions and responses

CSM provides predefined conditions and responses that can be used for monitoring your system. First use the RSCT **mkcondresp** command to define an association between a condition and a response. Then use the RSCT **startcondresp** command to start monitoring. For information on using the **mkcondresp** and **startcondresp** commands, see the man pages or *IBM RSCT for Linux: Administration Guide*.

The following predefined conditions are available for monitoring:

Table 1. CSM conditions and responses

Condition Name	Condition Description	Corresponding Response	Response Description
AnyNodeNetworkInterface	Generates an event when the <i>OpState</i> of any network interface on the node is not online.	AnyNodeNetworkResp	Runs ? to ?
AnyNodeSwitchResponds	Generates an event when the <i>OpState</i> of the switch network interface on the node is not online.	AnyNodeSwitchResp	Runs ? to ?

Table 1. CSM conditions and responses (continued)

Condition Name	Condition Description	Corresponding Response	Response Description
NodeGroupMembershipChanged	Change to a node group definition that has corresponding CFM files	CFMNodeGroupResp	Runs cfmupdatenode to update all the nodes in the changed node group.
UpdatenodeFailedStatusChange	Generates an event when a node that previously did not complete updatenode is back online.	UpdatenodeFailedStatusResponse	Re-runs updatenode on the nodes that previously did not complete the command.
NodeChanged	Generates an event when a node definition in the ManagedNode resource class is changed.	rconsoleUpdateResponse	Updates the Conserver configuration whenever a node is added or removed.
NodeFullInstallComplete	Detects when a node has completed a full installation, by noting that its <i>Mode</i> has changed from Installing to Managed .	RunCFMToNode	Distributes CFM files to the appropriate node.
NodeFullInstallComplete	Detects when a node has completed a full installation, by noting that its <i>Mode</i> has changed from Installing to Managed .	removeArpEntries	Linux on pSeries only.
NodeManaged	Detects when a node's <i>Mode</i> changes to Managed .	GatherSSHHostKeys	Gathers the SSH Host keys for the node if the <i>RemoteShell</i> is ssh , otherwise, it does nothing.

The **UpdatenodeFailedStatusChange** and **UpdatenodeFailedStatusResponse** condition and response pair is activated during CSM installation to automate use of the **updatenode** command. Monitoring for the **UpdatenodeFailedStatusChange** condition starts when a node on which the **updatenode** command did not complete successfully comes online. This automatically runs the **UpdatenodeFailedStatusResponse** response which re-runs **updatenode** to the unsuccessful nodes. This condition and response pair allows you to run **updatenode -a** to all nodes, knowing that if any nodes are offline they will be updated when they come back online. For more information on ERRM, see the *IBM RSC T for Linux: Administration Guide*.

The **NodeChanged** and **rconsoleUpdateResponse** condition and response pair is also activated during CSM installation to automatically update the Conserver configuration whenever a node is added to or removed from a CSM cluster. This allows the **rconsole** command to recognize the new configuration with no user intervention. Defining or removing large numbers of nodes simultaneously could degrade system performance. To avoid this consequence you can temporarily disable the **rconsoleUpdateResponse** response by running the following command on the management server:

```
stopcondresp NodeChanged rconsoleUpdateResponse
```

When the node definition or removal is complete, run the following commands on the management server to reactivate the **rconsole** response and update the Conserver configuration:

```
startcondresp NodeChanged rconsoleUpdateResponse
chrconsolecfg -a
rconsolerefresh
```

The **NodeFullInstallComplete** and **RunCFMToNode** condition and response pair are automatically activated during CSM installation. This condition response association allows CFM files to be automatically distributed to nodes after they complete a full installation.

The **NodeManaged** and **GatherSSHHostKeys** condition and response pair are automatically activated during CSM installation. This condition response association gathers SSH host keys from the nodes and places them in **\$HOME/.ssh/known_hosts** on the management server if the *RemoteShell* defined by **csconfig** is **ssh**. This allows **dsh** to run to the nodes without prompting the user to accept the host key.

Other predefined conditions

The tables below list the predefined conditions that are provided to use with RSCT resource managers. For more information about RSCT resource managers and their associated predefined conditions, see the *IBM RSCT for Linux: Administration Guide*.

File System resource manager predefined conditions

AnyNodeVarSpaceUsed

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
PercentTotUsed>90	An event is generated when more than 90 percent of the total space in the /var file system is in use.	PercentTotUsed<75	The event is rearmed when the amount of space used in the /var file system falls below 75 percent.	None

AnyNodeTmpSpaceUsed

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
PercentTotUsed>90	An event is generated when more than 90 percent of the total space in the /tmp file system is in use.	PercentTotUsed<75	The event is rearmed when the amount of space used in the /tmp file system falls below 75 percent.	None

AnyNodeFileSystemSpaceUsed

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
PercentTotUsed>90	An event is generated when more than 90 percent of the total space in the file system is in use.	PercentTotUsed<75	The event is rearmed when the amount of space used in the file system falls below 75 percent.	None

AnyNodeFileSystemInodesUsed

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
PercentNodeUsed>90	An event is generated when more than 90 percent of the total inodes in the file system is in use.	PercentNodeUsed<75	The event is rearmed when the amount of inodes used in the file system falls below 75 percent.	None

Host resource manager predefined conditions

AnyNodeProcessorsIdleTime

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
PctTotalTimeIdle>70	An event is generated when the average amount of time that all processors are idle is at least 70 percent.	PctTotalTimeIdle<10	The event is rearmed when the amount of idle time falls below 10 percent.	None

AnyNodePagingPercentSpaceFree

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
PctTotalPgSpFree>10	An event is generated when the amount of free paging space falls below 10 percent.	PctTotalPgSpFree<15	The event is rearmed when the amount of free paging space increases to 15 percent.	None

Predefined responses

The following table shows the predefined responses and associated commands that are available for use with the RSCT and CSM resource classes.

Note: The **UpdatenodeFailedStatusChange** and **UpdatenodeFailedStatusResponse** condition-response pair, and the **NodeChanged** and **rconsoleUpdateResponse** condition-response pair are started automatically during **csm.server** installation.

Table 2. Predefined responses

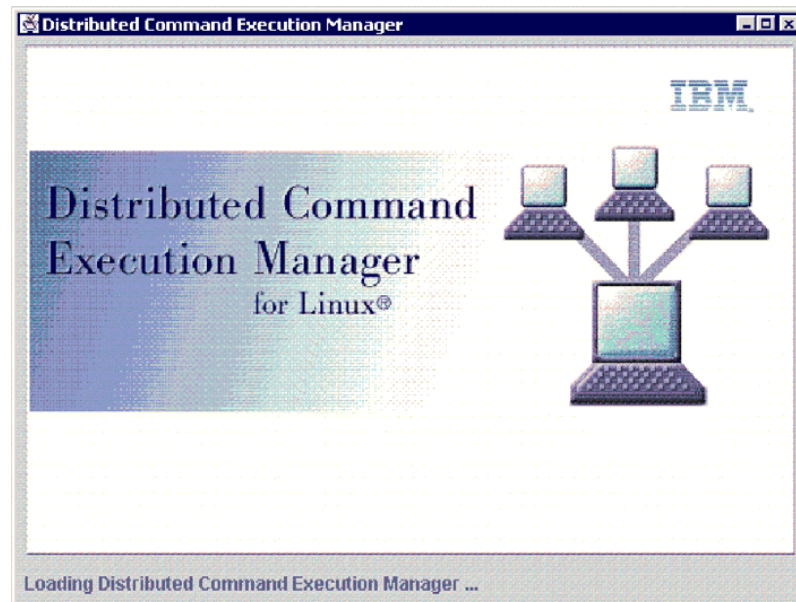
Response Name	Corresponding Command	Notes
removeArpEntries	/opt/csm/csmbin/removeArpEntries	Applies to Linux on pSeries only.
CFMModResp	/opt/csm/bin/CFMmodresp	Applies to CFM only
CFMNodeGroupResp	/opt/csm/csmbin/CFMnodegroupresp	Applies to CFM only
UpdatenodeFailedStatusResponse	/opt/csm/csmbin/updatenodeStatusResponse	Applies to CFM only
MsgEventsToRootAnyTime	/usr/sbin/rsct/bin/msgevent root	Applies to all resource classes
DisplayEventsAnyTime	/usr/sbin/rsct/bin/displayeventdmindesktop:0	Applies to all resource classes
EmailEventsToRootAnyTime	/usr/sbin/rsct/bin/notifyevent root	Applies to all resource classes
LogEventsAnyTime	/usr/sbin/rsct/bin/logevent, /var/log/csm/systemEvents	Applies to all resource classes
BroadcastEventsAnyTime	/usr/sbin/rsct/bin/wallevent	Applies to all resource classes
GenerateSNMPTrap	/usr/sbin/rsct/bin/snmpevent	Applies to all resource classes
LogOnlyToAuditLogAnyTime	Not applicable.	Applies to all resource classes
UpdatenodeFailedStatusResponse	/opt/csm/csmbin/updatenodeStatusResponse	Applies to ManagedNode resource class only
rconsoleUpdateResponse	/opt/csm/csmbin/rconsoleUpdate_response	Applies to ManagedNode resource class only

Chapter 3. Distributed Command Execution Manager

The Distributed Command Execution Manager (DCEM) provides a variety of services for a network of distributed machines (not supported on pSeries hardware). The DCEM graphical user interface allows you to construct command specifications for running on multiple target machines, while providing real-time status as commands are run. You can enter the command definition, run time options, and selected hosts and groups for a command specification, and you have the option of saving command specifications for future use. When you save a command specification, a Perl script is generated that you can run from the command line.

You can also create and modify node groups to use as targets for a command directly from DCEM. You can specify these groups by supplying host names for the group or by using dynamic queries on specific node attributes in a domain. DCEM also creates a log of all distributed command activity.

The DCEM startup window is shown in the following illustration.



You can use DCEM to manage systems running on the following operating systems:

- Red Hat Linux
- Red Hat AS Linux
- SuSE Linux
- SuSE SLES Linux

Installing DCEM

DCEM uses IBM Cluster Systems Management (CSM), which uses the Resource Monitoring and Control (RMC) subsystem. Installing DCEM requires that you install and correctly configure both CSM and RMC. In particular, DCEM uses the CSM **dsh** command to run commands on the nodes. For **dsh** to work, you must set up security on each node.

If you choose the default remote shell **rsh**, you must add the management server host name to the **\$HOME/.rhosts** file on the nodes that will be managed. To make the managed hosts visible to DCEM (through the Browse Hosts dialog), you must create node definitions in the CSM database on the management server for all nodes to be managed. You can create these definitions when you install CSM. However, if these node definitions do not exist, you can create them using the CSM **definenode** command, as follows:

```
/opt/csm/bin/definenode -n linux_hostname InstallOSName=Linux
```

See the man page or the *IBM CSM for Linux: Command and Technical Reference* for detailed information on the **definenode** command.

Starting DCEM

To start DCEM, enter the following command:

```
/opt/csm/dcem/bin/dcem
```

The DCEM command line options are:

```
/opt/csm/dcem/bin/dcem [-h | --help][-V | --version][-v | --verbose][-N |  
--groups [ nodegroups]] [-n | --hosts [node_list]]  
[command_specification_name]
```

Command syntax

Using the **dcem** command without options displays the Distributed Command Execution Manager dialog. From this dialog, you can create a new command specification or select from a list of saved command specifications.

Using the **dcem** command with the *command_specification_name* attribute causes DCEM to initialize the input fields in the main window with specified command data. The *command_specification_name* refers to the name used to save a command specification in the DCEM dialog. To send the command defined in the command specification to the specified hosts or groups, click the **Run** button in the dialog. The Execution Progress dialog shows the progress of the commands. To reset DCEM to the default values, click the **Defaults** button in the dialog.

You can also use the following options:

- **-h | --help** writes the usage message for the **dcem** command to standard output.
- **-N | --groups nodegroups** specifies a node group or a comma-separated list of node groups. Also, overrides the **Groups of hosts** and clears the **Host names** field.
- **-n | --hosts node_list** specifies a host name or a comma-separated list of host names. Also, overrides the **Host names** and clears the **Groups of hosts** field.
- **-V | --version** writes version information to standard output.
- **-v | --verbose** runs the **dcem** command in debug mode and writes the command's verbose messages to standard output.

The following examples specify hosts and groups together with the *command_specification_name* parameter on the command line. Assume the **myCommand** command specification was saved with host names **h1, h2, h3**, and groups of hosts **g1, g2, g3**.

1. To run DCEM, enter:


```
dcm
```

2. To initialize the input fields with specified command specification name and groups, enter:

```
dcm -N g4,g5 myCommand
```

This results in the following output in the GUI:

```
Host names:{empty}  
Groups of hosts: g4,g5
```

3. To initialize the input fields with specified command specification name, groups, and hosts, enter:

```
dcm -N g4,g5 --hosts h4 myCommand
```

This results in the following output in the GUI:

```
Host names: h4  
Groups of hosts: g4,g5
```

4. To display the version of DCEM that is running, enter:

```
dcm -V
```

Note: When you run DCEM from a remote host, run the **xhost +** command on the machine where you expect to display the GUI. On the machine running DCEM, export your display by entering the following command:

```
export DISPLAY=IPaddress:0
```

Command specification samples

DCEM includes command specification samples that you can use in **/opt/csm/dcem/samples**. To install them:

1. If **\$HOME/dcem/cmdspecs/mycmds** does not exist, run **mkdir -p \$HOME/dcem/cmdspecs/mycmds**
2. Enter **cd \$HOME/dcem/cmdspecs/**
3. Enter **cp /opt/csm/dcem/samples/samplecmds.tar .**
4. Enter **tar -xvf samplecmds.tar**
5. Enter **cp samplecmds/* mycmds/**
6. To view command specifications, open the DCEM GUI and select **Browse commands**.

Using DCEM

The following panels help you define command specifications:

- General panel
- Options panel
- Advanced panel
- Groups panel
- Dynamic Groups panel

The General and Options panels provide an interface for creating new command specifications and modifying previously saved command specifications. The Advanced panel allows you to view and change options that are not directly related to running commands, such as specifying the report maximum directories number

and rerunning commands. The Groups and Dynamic Groups panels provide an interface for creating and modifying groups of host machines.

Creating command specifications

DCEM allows you to create, save, and edit command specifications to save time and effort when you repeatedly run the same command. A command specification consists of the following parts:

- The name of the command specification.
- A command definition including the path and command or inline script to run on remote host machines.
- The user name under which the command will run.
- A description of the command.
- A list of nodes or node groups on which the command will run.
- Options for security, output streaming, and number of hosts on which to concurrently run the command.

General panel

Use the following General panel to specify most of the information that is required to run commands on distributed nodes.

The screenshot shows the 'General' panel of the Distributed Command Execution Manager. It includes fields for Name, Path (\$PATH), Command, Run as user (root), Description, Host names, and Groups of hosts. Buttons for Run, Save, Defaults, Close, and Help are at the bottom.

To create a command specification, you must provide, at a minimum, the following information in the text fields on this panel:

- **Name** - The name that identifies a command specification. When you create a new command specification, you must type a name for it in this field. The name field is not required for running a command specification, but is required when saving a specification.
- **Command** - The command or inline script to run, plus one or both of the following:

- **Host Names** - The name of one or more nodes. You can type the name of any fully qualified host name as long as the host has a remote shell available, or type a list of fully qualified host names separated by commas or spaces. You can also select host names known to CSM from the Browse Hosts dialog, which displays when you click the **Browse** button next to the field.
- **Groups of Hosts** - The name of one or more node groups. You can type a list of node groups separated by commas or spaces. You can also select node group names from the Browse Groups dialog, which displays when you click the **Browse** button next to the field. To use this selection dialog, you must first have created the groups. For more information, see “Creating node groups” on page 50.

The following fields, which contain default values, are also required:

- **Run as User** - The user name that the command will run under. The default value is the user name under which DCEM is running. You can edit this field. You must configure target machines to allow the user or machine under which DCEM is running to run as the user specified in this field. This configuration is specific to the remote shell used to run a command.

- **Path** - The path that points to the actual location of the saved commands. The default value for this field is **\$PATH**. You can edit this field.

If you use the default **\$PATH** in this field, the application does not delegate the local **\$PATH** to the target nodes when the command is run. Instead, it prepends `export PATH=$PATH` to the command, where the **\$PATH** variable referred to is the one set on the target machine.

To run commands found only in a specific directory, you can replace **\$PATH** with that directory name. To guarantee that a directory is searched first, you can prepend the directory to **\$PATH**, for example, **/usr/bin:\$PATH**.

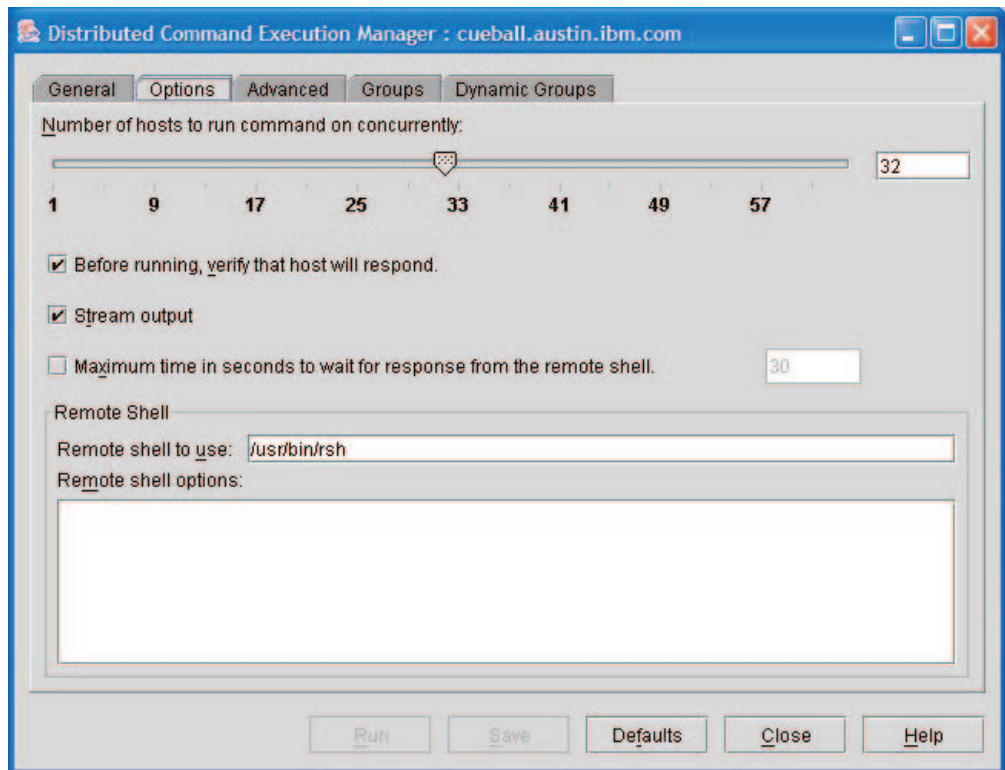
If you leave the **Path** field empty, the default **\$PATH** is used.

The following field is optional and has no default:

- **Description** - An optional text description of the command specification. This description also displays in the Browse Command Specifications dialog to help you locate a particular saved command specification.

Options panel

When you create a command specification, you can also change the options for running the commands on the distributed hosts. Use the following Options panel to view or change options.



The Options panel displays the following options:

- **Number of hosts to run commands on concurrently** - The slider and text box display the number of hosts on which the command will run simultaneously. You can specify between 1 and 64 hosts, with a default value of 32. To change this value, either drag the slider to a new value or specify a value in the text box.
- **Before running, verify that hosts will respond** - Select this check box if you want to determine whether the hosts are online and responding before you run a command specification. By default, this check box is not selected, which allows commands to be sent to all nodes without checking whether they are available.
- **Stream Output** - Select this check box if you want to display output in the Execution Progress dialog as it is received. When this box is not selected, the output is collected and displayed only after the command completes.
- **Maximum time in seconds to wait for response from the remote shell** - Specifies the time, in seconds, to wait for a response from the remote shell. By default this option is not selected; once selected, the default value is 30 seconds, which can be changed.
- **Remote Shell** - Displays the remote shell under which distributed commands will be run. Initially, the default remote shell determined by CSM is displayed in the **Remote shell to use** text field. You can edit this field if you are using a different remote shell. The full path to the remote shell is required. You can also enter options for the remote shell in the text box provided, as you would enter them on the command line. For more information about remote shell considerations, see the *IBM CSM for Linux: Planning and Installation Guide*.

DCEM can be used with a variety of secure remote shells and has been tested using OpenSSH. The DCEM application is not interactive, so you must configure the remote shell to run in batch mode. If you do not, any commands requiring interactive user input will not run correctly, and you will have to click the **Stop** button in the Execution Progress dialog to stop the command. You can enable

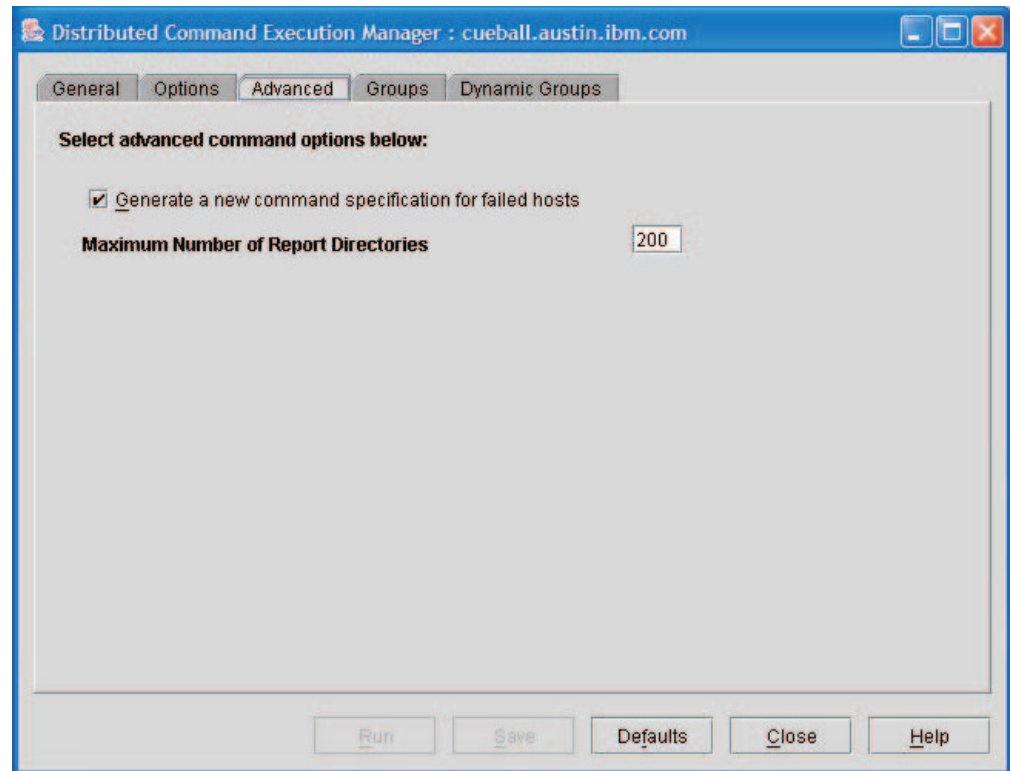
batch mode either in the secure remote shell client configuration file on the CSM server, or in the secure remote shell options in the DCEM Options panel. For detailed information about secure remote shell client configuration, see the specific secure remote shell documentation.

Advanced panel

The Advanced panel lets you view and change the following DCEM options that are not directly related to running commands:

- Set maximum number of report directories.

Use the Advanced panel to change these options:



- **Generate a new command specification for failed hosts** - This option controls whether DCEM creates a command specification to run a command on nodes where the command did not complete successfully. If this option is selected and one or more nodes do not run the command specification successfully, then DCEM will create a new command specification. The command specification contains all the information from the original command specification, except that the list of target hosts includes only those nodes on which the command was initially unsuccessful. The name of the **Failed Command** specification is derived from the name of the original command specification preceded by the prefix **Failed_**. To rerun the command on these specific nodes:
 1. In the **General** tab of the DCEM dialog, click the **Browse** button following the **Name** field.
 2. In the **Browse Command Specifications** dialog, select the **Failed Commands** tab.
 3. Select the command specification to run from the list.
 4. Click the **OK** button to return to the main dialog and run the command specification on the specific nodes where the previous attempt was unsuccessful.

Only one Failed Command specification is created for each user-defined command specification. During a command run, any nodes that complete successfully are removed from the Failed Command specification. If the Failed Command specification is still loaded into the DCEM dialog, then the successful nodes are automatically removed for the **Host names** field of the General panel. The DCEM dialog is then ready to rerun the command on only those hosts that were not successful in the last attempt.

You can modify the Failed Command specification once it has been loaded into the DCEM dialog by adding any corrective actions required for these specific targets to the **Command Definition** field. If these actions are a permanent requirement to run on these targets, you can save the edited command specification. Note that any command specification saved is always saved as an ordinary command specification; the saved command specification will always appear under the **My Commands** tab of the **Browse Command Specifications** dialog. IBM suggests saving the new command specification before running the command, because any successful targets are automatically removed from the DCEM dialog after the completion of a command run, if the **Name** field contains the current name of the **Failed Command**. The **Failed_** prefix used as part of the name of each Failed Command specification should be removed you decide to save the command specification.

This option is saved with each user-defined command specification and updated when a user-defined command specification is loaded. The option is not modified when a Failed Command specification is loaded.

- **Set Maximum Number of Report Directories** - This option specifies the maximum number of directories that can be created on the management server for storing command specification reports. Once this maximum is reached, DCEM stops creating additional reports, and a warning message is displayed when a command is run indicating that a report will not be created. By default the maximum number of directories is set to 150. To resume report creation, delete report directories in **\$HOME/dcem/report/** that are no longer needed or increase the maximum number of directories allowed. This option is not saved with each command specification and does not change when previously saved command specifications are reloaded.

Saving a command specification

When you have completed entering your command specification information, click the **Save** button to save it as a script. Command specifications that you save are stored as Perl scripts (see “DCEM command script,” on page 127). The saved script contains all the information on the DCEM General and Options panels. Saved command specifications are located in

`/user_home_directory/dcem/scripts/myscripts/script_file_name.pl`

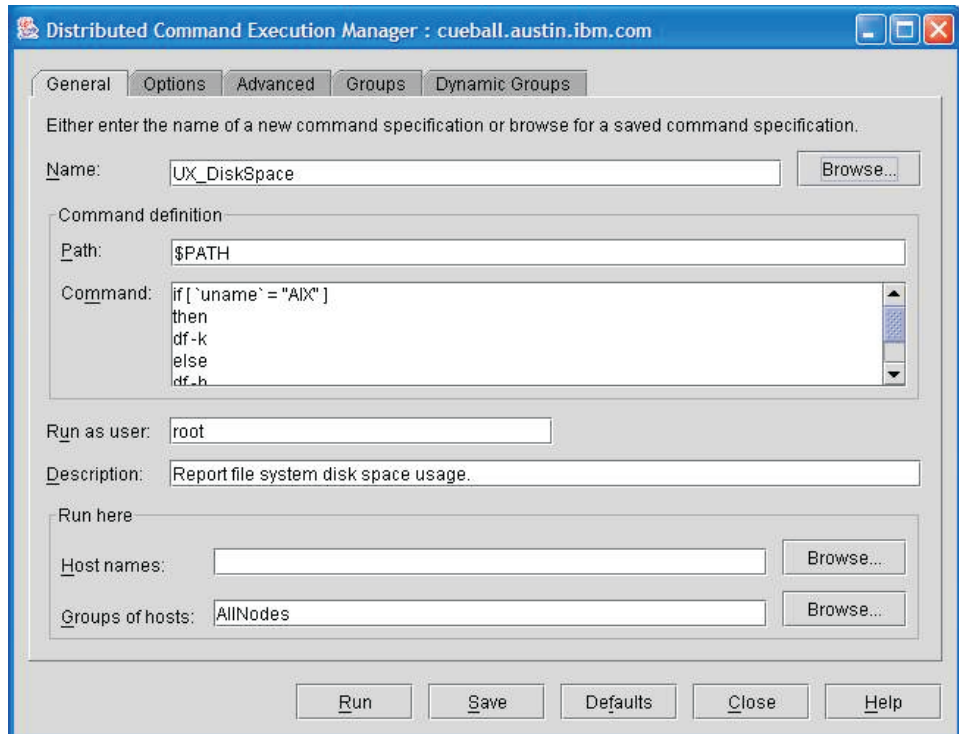
The *script_file_name* value is the name of a Perl script file containing a saved command specification. After you save a command specification, you can run it (see “Running a command on one or more hosts”), view it, and select it from the Browse Command Specifications dialog.

Running a command on one or more hosts

You can run commands on multiple hosts using any of the following methods.

From the DCEM dialog

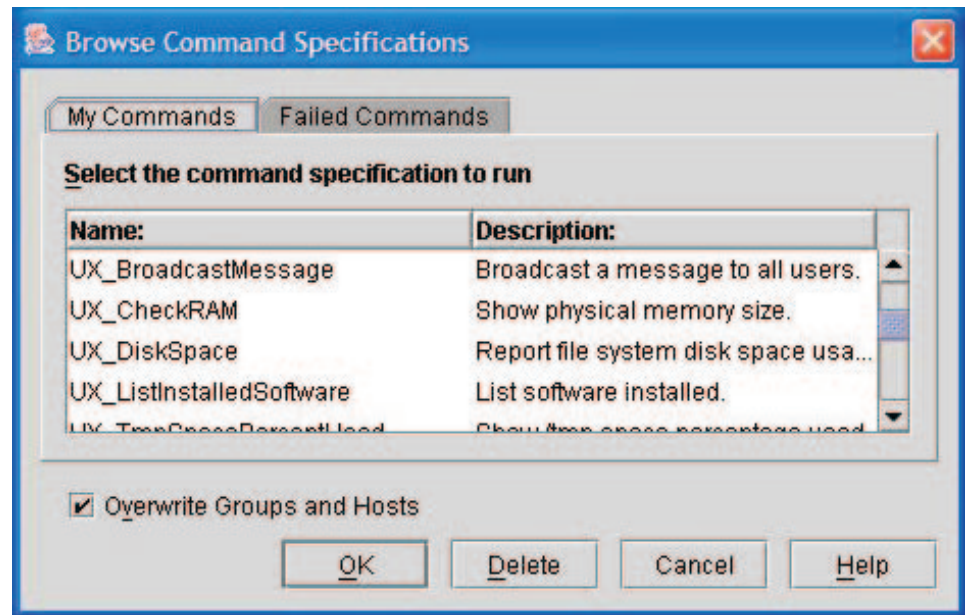
1. In the General panel, shown below, click the **Browse** button beside the **Name** text entry field.



This displays the Browse Command Specifications dialog.

2. In the **Browse Command Specifications** dialog, shown below, select a command specification from the list of existing command specifications in the **My Commands** tab or **Failed Commands** tab, then click the **OK** button to load the selected command specification into the **General**, **Options** and **Advanced** panels. The **Failed Commands** tab displays the command specifications that did not complete successfully on one or more hosts in the previous attempt. To overwrite the groups and hosts in the **General** panel, select the **Overwrite groups and hosts** check box. By default this option is selected, which causes the groups and hosts fields in the **General** panel to be overwritten by the saved values in the command specification. To not load the groups and hosts saved in the command specification, deselect the **Overwrite groups and hosts** check

box.



3. In the DCEM dialog, click the **Run** button to run the selected command specification on the specified hosts or groups of hosts.

From the DCEM dialog, you can also create a new command specification (see Creating Command Specifications “Creating command specifications” on page 40), then click the **Run** button to run the selected command specification on the specified hosts or groups of hosts.

Load the command specification from the command line

To load the command specification into the DCEM dialog directly from the command line, enter:

```
/opt/csm/dcem/bin/dcem command_specification_name
```

Using the **dcem** command with the *command_specification_name* option causes DCEM to initialize the input fields in the General and Options panels of the DCEM dialog with specified command data. You can then click the **Run** button to send the command to the specified hosts.

Run the command specification script on the command line

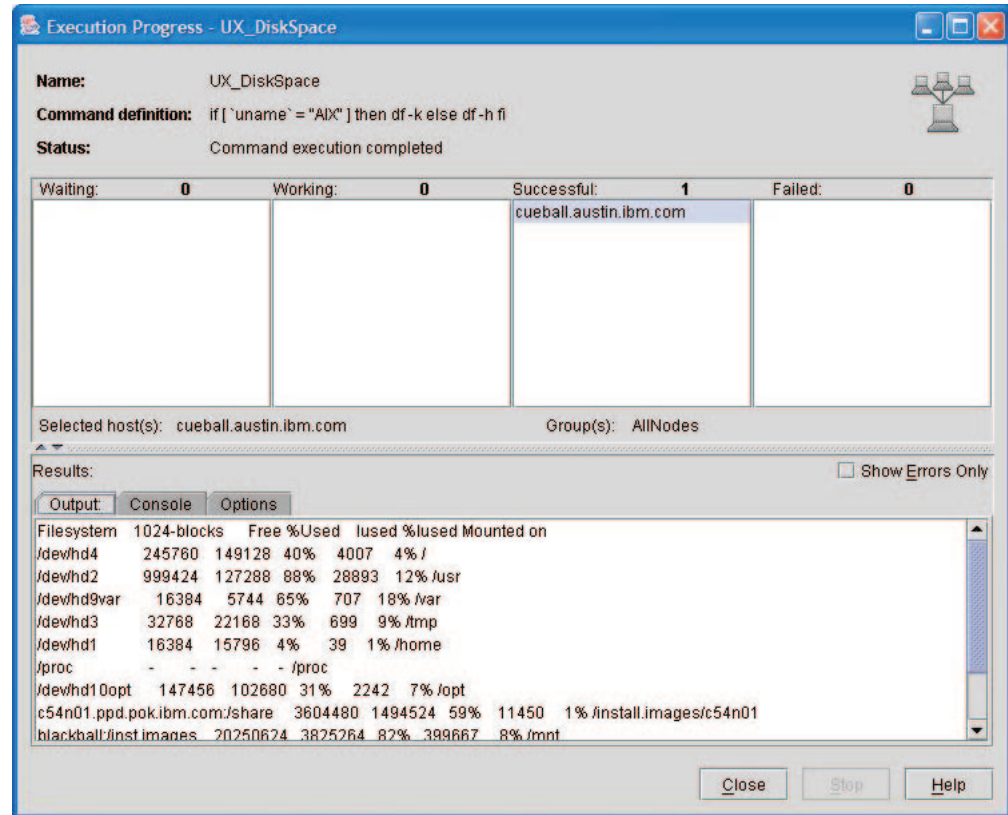
To run the command specification script directly on the command line, enter:

```
user_home_directory/dcem/scripts/myscripts/commandSpecificationName.pl [-debug] \ [-non_interactive] [-format_output]
```

- *commandSpecificationName* - The name used to save a command specification using the DCEM dialog.
- **debug** - Verbose mode. Determines the actual execution string specified.
- **non_interactive** - Does not prompt on the command line to run the command. This option is useful when invoking the command script from another script.
- **format_output** - Formats standard output from all hosts. Output is grouped by host name.

Using the Execution Progress Dialog

After you click the **Run** button to run a valid command specification or command on hosts or groups of hosts, DCEM displays the following Execution Progress Dialog to show the status of the command on all of the hosts.



In this dialog, a series of lists show the hosts with one of the following command states:

- Waiting
- Working
- Successful
- Failed

The bottom of the window displays output from the command on selected hosts in the **Output** tab. To display output from a host, select its name from any of the lists. To view real-time output, select a host that is currently in the working state. The **Console** tab shows console messages on the management server. Command report locations, error messages and other information are displayed. This window is displayed automatically when console messages appear. To return to the command output window, click the **Output** tab. The **Options** tab allows you to specify the maximum number of output lines to display in the **Output** tab. The range must be between **10** and **10000**. The output is displayed from the end results.

To stop the distributed command on all hosts, click the **Stop** button. If a command has not been completed on a host, the command is terminated for that host. Hosts that have been stopped move to the Failed list. Commands that have already completed may appear in either the Successful or Failed lists.

When the **Show Errors Only** check box is selected, the output area displays error messages for the selected hosts. **Stdout** messages are not displayed.

Selecting the **View Report** button displays an HTML report of command status for viewing or printing. This button is not available if DCEM is running remotely. To see where the report was saved on the managing host, click the **Console** tab in the **Results** area. Selecting the **Close** button hides the **Execution Progress** dialog, but does not stop the command on any hosts. If the DCEM dialog is closed before these hosts have completed the command, then these hosts will be stopped. Use the adjustable bar above the **Results** area to change the relative sizes of the **Host List** area and the **Results** area. To hide an area, drag the bar or click the arrows to the left of the bar.

Generate output file and HTML command report

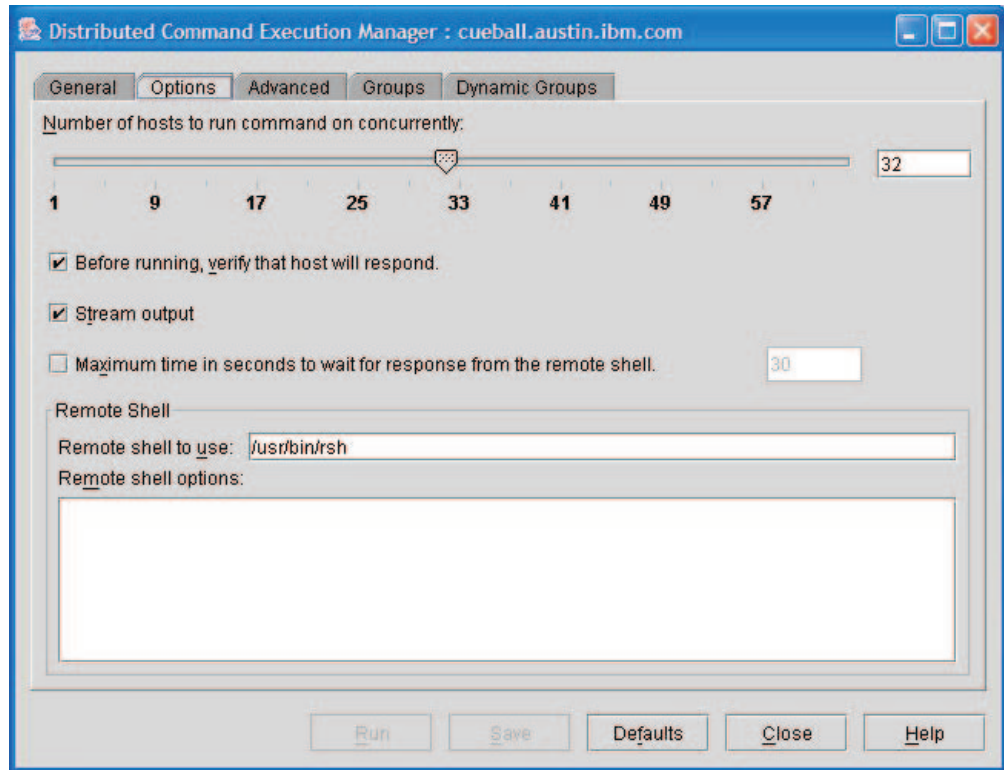
Report and output files for a command specification are generated when a command is run, if the corresponding **Advanced** tab options are selected. The report and output files are created in the same directory, under */home/User/dcem/reports/commandSpecificationName.ReportNumber*. The */home/User/dcem/reports* directory contains the **index.html** file, which references all run commands. For each command specification, a directory is created that contains the standard output and standard error files for each host the command specification was run on. The *ReportNumber* is the current number of reports allowed. The maximum report value is specified in the **Advanced** tab, which is the maximum number of directories that can be created on the management server for storing command specification reports. Once this maximum is reached, DCEM stops creating additional reports, and a message is displayed before a command is run indicating that a command execution cannot be taken. To resume command execution and report creation, either delete report directories that are no longer needed or increase the maximum number of directories allowed. To resume report creation, delete report directories that are no longer needed in */home/User/dcem/reports/* or increase the maximum number of directories allowed.

For example, a command specification named **ls**, run for the first time on node 1 and node 2 would produce the following directory structure:

- A **\$HOME/dcem/reports/ls.0001** directory would be created.
- This directory would contain **node1.out**, **node2.out**, and corresponding **.err** files if any errors were encountered.
- The report **ls.html** file would be located in */home/User/dcem/reports/ls.0001*.

Adjusting run time parameters

You can adjust several run time options for your command using the DCEM **Options** panel, shown in the following illustration. Additional parameters must be set from the command line.



For example, if you are experiencing network problems and you want to improve performance, you can reduce the number of hosts on which the command specification will run simultaneously. On the Options panel, the slider and the text box both display this value. The default is 32. Either of these can be modified with a new value between 1 and 64.

Note: When you change this value using the text field, the slider is only updated when the focus changes or the command is saved or run. It does not change as you type or when you press the **Enter** key.

You can also affect the amount of time it takes for commands to complete by selecting or deselecting the **Before running, verify that host will respond** check box. Selecting this check box allows you to invest the time to immediately check the host response. If there are problems, the wait time should be smaller than the minute typically taken for the remote shell command to time out. You can specify the time, in seconds, to wait for a response from the remote shell by tuning the **Maximum time in seconds to wait for response from the remote shell**.

You can change the default behavior of streaming the output (displaying it in the Execution Progress dialog as it is received) so that the output is collected and displayed for each host only after the command completes on that node and it is either in the successful or failed state.

You can also change the remote shell under which the commands run and specify options for that remote shell. The default remote shell is **rsh**.

You can change heap size for out of memory problems from the command line using the DCEM **HEAP_MAX_SIZE** and **HEAP_MIN_SIZE** environment variables. The default heap size maximum is 1G and minimum is 20MB. For example, to change the heap size, export the following variables at the command line:

```
export HEAP_MAX_SIZE=-Xmx1g
export HEAP_MIN_SIZE=-Xms10m
```

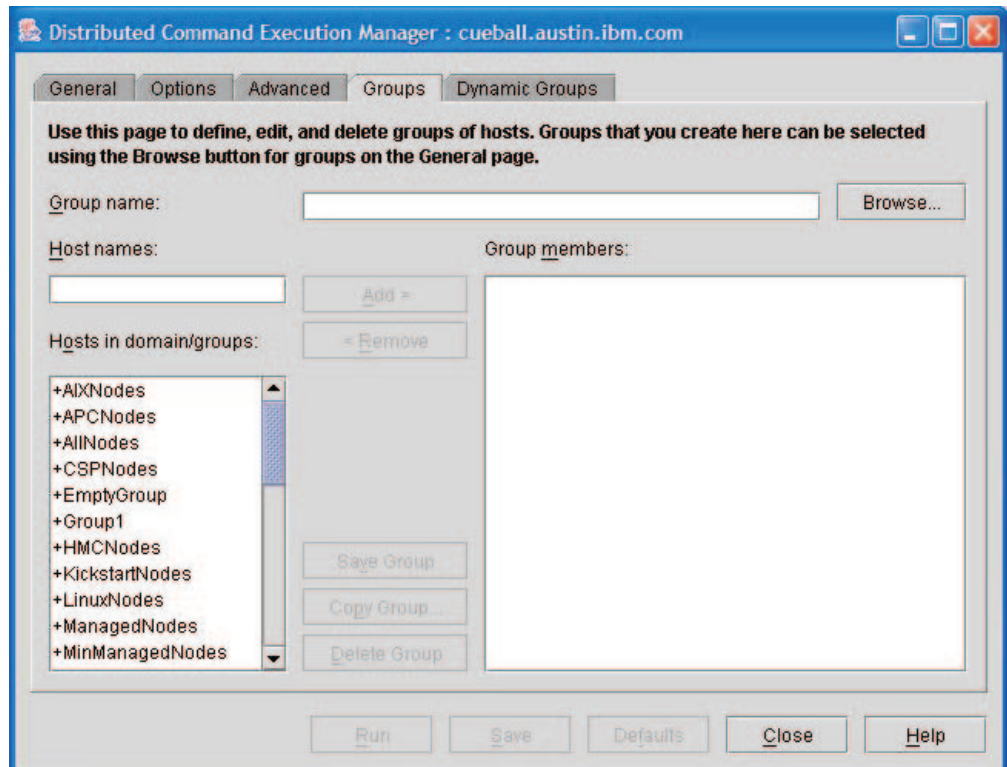
Working with node groups

The ability to organize nodes into groups and to save these groups makes it easier to repeatedly run commands on the same groups of hosts. Node groups can either be explicit lists of node host names, created by explicitly specifying each host, or they can be dynamic groups of hosts, created by specifying the desired selection criteria, such as **Hostname like 'websrvr%'**. To create explicit groups of hosts for use in its command specifications, use the **Groups** panel in the DCEM dialog. To create dynamic host groups to use in its command specifications, use the **Dynamic Groups** panel.

Note: By default the root user has the authority to create groups; a non-root user cannot create groups unless special permission is set for that user. The access authority is defined in the **/var/ct/cfg/ctrmc.acls** file. You can modify this file, then run the **refresh -s ctrmc** command to refresh the systems. For more information, see “Cluster security” on page 24.

Groups panel

Use the Groups panel to create explicit groups of nodes. This panel provides an interface for editing, deleting, and copying the groups that you have created. The **Group members** list box contains a list of nodes that are already in the group.



Creating node groups

Use the Groups panel to create a group of hosts. To create a node group using the DCEM Groups panel, do the following:

1. Type the name of the group you are creating in the **Group name** field.

2. To add a node to the group, either type its name in the **Host names** field or select the host from the **Hosts in domain** list box, then click the **Add >** button. The hosts listed in the **Hosts in domain** list box are nodes defined in CSM that have CSM client code installed.
3. To add nodes to the group that are not defined in CSM, type the host name in the **Host names** field, then click the **Add >** button.
4. To create the node group, click the **Save Group** button.

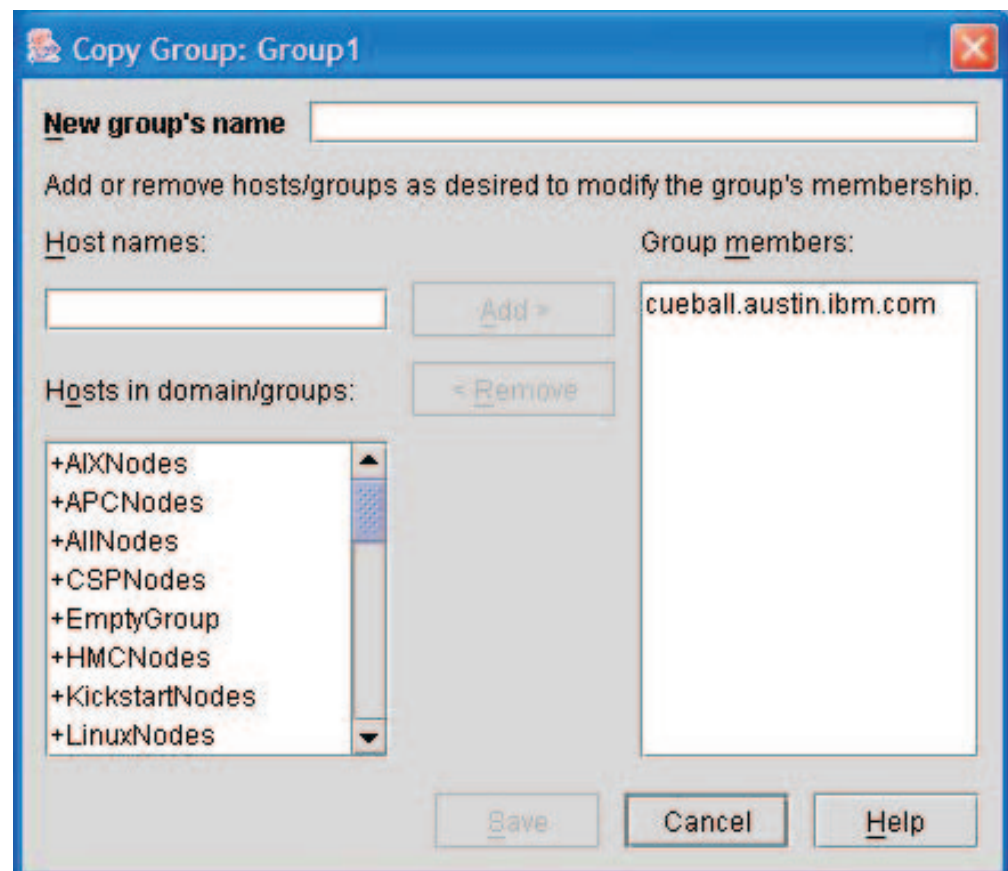
Editing node groups

Use the Groups panel to edit an existing node group. You can select group members to remove host names or add new host names. To edit a node group, do the following:

1. In the **Groups** panel, click the **Browse** button beside the **Group name** box.
2. In the displayed **Browse Groups** dialog, select the group you want to edit.
3. To add a node to the selected group, either type a host name in the **Host names** field, or select a host from the **Hosts in domain** list box, then click the **Add >** button.
4. To delete a node from the selected group, select the hosts from the **Group members** list box, then click the **< Remove** button.
5. To save the changes, click the **Save Group** button.

Copying node groups

Use the **Copy Group** dialog to copy an existing node group. When you copy a group, you can also add and remove nodes before you save the copy.



To copy a node group, do the following:

1. In the **Groups** panel, select the group you want to copy, then click the **Copy Group...** button.
2. In the **Copy Group** dialog, type the name of the new group in the **New group's name** field.
3. To add a node to the new group, either type a host name in the **Host names** field, or select a host from the **Hosts in domain** list box. To delete a node from the new group, select the host from the **Group members** list box, then click the **< Remove** button.
4. To save and copy the group, click the **Save** button.

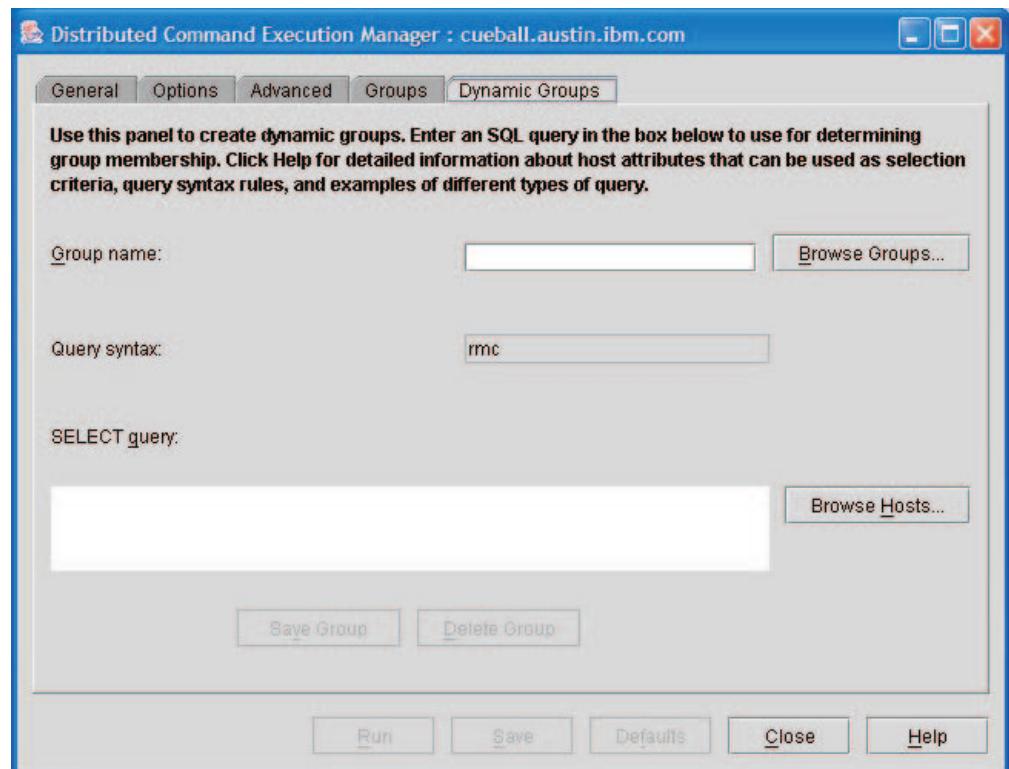
Deleting node groups

Use the Groups panel to delete existing node groups. To delete a node group, do the following:

1. In the **Groups** panel, select the group you want to delete, then click the **Delete Group** button.
2. To confirm, click the **Delete** button in the **Deleting Host Groups** confirmation dialog. To cancel, click the **Cancel** button.

Dynamic Groups panel

The Dynamic Groups panel, shown below, allows you to create dynamic node groups based on a select (SQL-like) string. This select string is used to search the hosts database to dynamically determine the list of nodes in the group.



Creating a dynamic node group

To create a dynamic node group using the DCEM Dynamic Groups panel, do the following:

1. Type the name of the group that you are creating in the **Group Name** field. Alphanumeric characters are allowed.

2. Type the select string in the **SELECT Query** field. This is the select string that is used to dynamically determine which nodes belong to this group. The syntax for this select string is determined by the type of node database you are working with (as indicated in the **Query syntax** box on this panel). If your node database type is **rmc**, use the syntax described in the *IBM RSCT for Linux: Administration Guide*.
3. To show the nodes that match your specified selection criteria after you specify a valid select string, click the **Browse Hosts** button.
4. To create the node group, click the **Save Group** button.

Displaying dynamic node group members

To view the hosts in an existing dynamic node group, do the following:

1. In the Dynamic Groups panel, click the **Browse Groups** button to display the **Browse Groups** dialog.
2. In the Browse Dynamic Groups dialog, select the dynamic group you want to view from the list of dynamic groups in the dialog. After you select the dynamic group, you are returned to the Dynamic Groups panel where the **Group name** field is filled in with the name of the selected group, and the **SELECT Query** field displays the chosen dynamic group's select string.
3. To view the node members of the selected dynamic group, click the **Browse Hosts** button beside the **SELECT Query** text field. The nodes that match the select string and that belong to the dynamic group are displayed.

You can also use this feature to view nodes that satisfy the **SELECT Query** before actually creating a group. To do this, type the select string you want to use, then click on the **Browse Hosts** button. To view nodes matching a select string, you do not need to provide a group name.

Editing a dynamic node group

Just as you cannot create a dynamic group by explicitly adding nodes to the group, you cannot edit a dynamic node group by explicitly adding or removing nodes from the group. The only characteristic you can change about a dynamic group is its select string.

To edit an existing dynamic node group, do the following:

1. In the Dynamic Groups panel, click the **Browse Groups** button to display the **Browse Groups** dialog.
2. In the Browse Groups dialog, select the dynamic group you want to edit.
3. In the **SELECT Query** field modify query. You can check the hosts members that will belong to the group, as defined by your select string, by clicking on the **Browse Hosts** button.
4. To save the selected dynamic group with its edited select string, click on the **Save Group** button.

Copying a dynamic node group

To copy a dynamic node group, do the following:

1. In the Dynamic Groups panel, click the **Browse Groups** button to display the **Browse Groups** dialog.
2. Select the dynamic group you want to copy by selecting a dynamic group from the list in the **Browse Dynamic Groups** dialog.
3. In the Dynamic Groups panel, edit the **Group name** text field with the desired name of the new group.
4. To save the new group click on the **Save Group** button to finish copying the group.

Deleting a dynamic node group

To delete a dynamic node group, do the following:

1. In the Dynamic Groups panel, click the **Browse Groups** button to display the **Browse Groups** dialog.
2. In the Browse Dynamic Groups dialog, select the dynamic group you want to delete.
3. In the Dynamic Groups panel, click on the **Delete Group** button to delete the chosen dynamic group.

Defining a SELECT query string

You can write your own SQL queries to determine specific dynamic grouping criteria. By specifying the resource attribute in the SQL query, you can create a group on which a command can be run. For more information, see “Managing node group information” on page 5.

Command output and activity logs

DCEM command output and activity are saved in log files. Log files are stored in */home/dcem/logs/log_file_name*. The *home* value is the home directory of the user under whose name the distributed command is run. The *log_file_name* value is the name of the log file containing the **dcem** command activity. All DCEM command activity is saved in this log file.

The default log file name is **dcem.log**.

The following is an example of DCEM log file contents:

```
-----  
Command name: UX_DiskSpace  
Run as user:  root  
  
Command definition:  
  if [ `uname` = "AIX" ]  
  then  
  df -k  
  else  
  df -h  
  fi  
  
Started: Tue Jul 29 13:42:16 2003  
Ended:   Tue Jul 29 13:42:17 2003  
  
Successful hosts: none  
  
Failed hosts: none  
  
Hosts not run:  
  cueball.austin.ibm.com  
  
Status:  
  A report for this command has been generated and can be found on the  
  Managing Machine at /dcem/reports/UX_DiskSpace.0001/UX_DiskSpace.html.  
-----  
  
Command name: UX_BroadcastMessage  
Run as user:  root  
  
Command definition:  
  wall 'This is a test.'
```


|
| Started: Mon Jul 28 15:18:35 2003
| Ended: Mon Jul 28 15:18:35 2003

| Successful hosts: none

| Failed hosts: none

| Hosts not run:
| machine1.austin.ibm.com

| Status:
| A report for this command has been generated and can be found on the
| Managing Machine at /dcem/reports/UX_BroadcastMessage.0001/UX_BroadcastMessage.html.

|-----

Chapter 4. CSM messages

The following messages are documented in this chapter:

Message Number	Message Catalog
2617- 028	dsh messages. See “2617 – dsh messages.”
2651- 002 to 2651- 039	Node command messages. See “2651 – Node command messages” on page 59.
2651- 501 to 2651- 521	Software Maintenance System messages issued from the management server. See “2651 – Software Maintenance System (SMS) messages (issued from management server)” on page 62
2651- 526 to 2651- 560	Configuration File Manager messages issued from the management server. See “2651 – Configuration File Manager (CFM) messages” on page 64
2651- 601 to 2651- 995	Hardware control messages. See “2651 – Hardware Control messages” on page 66.
2652- 000 to 2652- 037	CSMAgent Resource Manager messages issued from a node. See “2652 – CSMAgent Resource Manager messages” on page 83.
2652- 500 to 2652- 503	Software Maintenance System (SMS) issued from a node. See “2652 – Software Maintenance System (SMS) messages (issued from node)” on page 87.
2652- 511 to 2652- 517	Configuration File Manager (CFM) messages. See “2652 – Configuration File Manager (CFM) messages” on page 87.
2653- 021 to 2653- 317	Installation messages. See “2653 – Installation messages” on page 87.
2653- 800 to 2653- 978	CLOG messages. See “2653 – CLOG messages” on page 104.
2655- 001 to 2655- 210	Domain Management Server messages. See “2655 – Domain Management Server messages” on page 106.
2655- 400 to 2655- 907	Probe Manager messages. See “2653 – Probe Manager messages” on page 112.

2617 – dsh messages

2617-001 **Remote shell specified was not found -**
the extraneous option.

Explanation: You specified an extraneous option on the program command.

User Response: Enter the command properly.

2617-003 **Incorrect argument** *argument value*
specified on *command flag with bad*
value flag.

Explanation: You specified an incorrect argument to the program command.

User Response: Enter the command properly.

2617-004 **Missing argument on** *command flag*
flag.

Explanation: You specified an option that requires an argument, but you did not supply the argument.

User Response: Enter the command properly.

2617-006 **Missing option.**

Explanation: You omitted an option on the program command.

User Response: Enter the command properly.

2617-007 **DSH list environment variable,**
DSH_LIST or WCOLL, not set.

Explanation: The program command expects the DSH_LIST environment variable to be set because no node list was specified on the command line.

User Response: Set DSH_LIST to the name of a file containing the node list.

2617-008 Cannot open node list file *name of node list file.*

Explanation: The node list file could not be opened.

User Response: Check the system message, fix the problem, and run the command again.

2617-009 *hostname* **remote shell had exit code** *rsh exit code for hostname.*

Explanation: The rsh to the specified host name failed with the specified exit code.

User Response: Determine why the rsh is not working to the host, fix the problem, and retry the program command.

2617-010 Caught SIG *the signal caught - terminating the child processes.*

Explanation: The program has caught the specified signal and will issue SIGTERMs to any outstanding rsh child processes.

User Response: None.

2617-011 No hosts in node list.

Explanation: There are no hosts in the node list. The program may have removed the last host(s) from the node list because the rsh to it has failed.

User Response: Ensure that the hosts in the node list are responding, and then retry the program command.

2617-012 Could not pipe.

Explanation: The program could not issue a pipe system call.

User Response: Contact your system support.

2617-013 Cannot redirect *file output:*

Explanation: The program could not redirect the file output.

User Response: Contact your system support.

2617-014 Cluster Systems Management (csm.core) Isnode command not installed.

Explanation: The system data repository is not working, and the program cannot obtain needed information from it.

User Response: Contact your system support.

2617-015 *hostname* **Could not resolve hostname.**

Explanation: The program command could not find the host name that was specified.

User Response: Check to see if the hostname has been specified correctly. If it has not, correct it and run the program command again. If it has, contact system support.

2617-016 Warning — Specified node not in cluster — *hostname*

Explanation: The program could not find the node that was specified.

User Response: Check to see if the node range has been specified correctly. Nodes must be in the current system partition unless the **-G** option is supplied. If it has not, correct it and run the program command again. If node range has been specified correctly, contact system support.

2617-017 File *filename* **contains POE pools, not supported.**

Explanation: The program could not find the host name that was specified.

User Response: Ensure that the hostname has been specified correctly. If it has not, correct it and run the program command again. If it has, contact system support.

2617-018 Cannot open host file *filename: system error message.*

Explanation: The host file that was specified could not be opened.

User Response: Ensure that the host file name has been specified properly. If it has not, correct it and run the program command again. If it has, contact system support.

2617-019 No node list or POE file found.

Explanation: No node list file or POE file was found.

User Response: Check the WCOLL or MP_HOSTFILE environment variables to see if they specify a valid file of host names.

2617-020 Conflicting options.

Explanation: You entered conflicting options on the program command.

User Response: Enter the command properly.

2617-021 Cluster Systems Management *program name* command could not resolve node group.

Explanation: The first operand was not a number, so the operands are parsed as node groups. The specified node group could not be resolved.

User Response: Use the **nodegrp** command to see if the desired node group exists.

2617-023 Cluster Systems Management *output from Isnode command* command error.

Explanation: The Cluster Systems Management **Isnode** command returned an error.

User Response: Resolve the **Isnode** Cluster Systems Management problem and issue the **dsh** command again.

2617-024 *hostname* The command was not issued for this host because its hostname resolved to the same hostname as another host specified.

Explanation: **dsh** uses *gethostbyname* to resolve each host that is specified, and compares each resolved host name to remove duplicates.

User Response: **dsh** only sends one command to each host. Do not specify more than one host that resolves to the same host name.

2617-025 *hostname* Host is not responding. No command will be issued to this host.

Explanation: The host was not listed as active in the database, and did not respond to a ping command.

2651 – Node command messages

2651-002 Could not find *node name* in the node database. Run **Isnode** without any arguments to see the list of valid node names.

Explanation: None.

User Response: None.

2651-003 Could not find one or more of the following nodes in the database: *node names*. Run **Isnode** without any arguments to see the list of valid node names.

Explanation: None.

User Response: None.

User Response: Resolve the problem with the host and run the command again.

2617-026 Timed out waiting for response from child processes for the following nodes: *the list of child processes*. Terminating child processes.

Explanation: The program timed out while it was waiting for a response from the child processes for the given nodes. The program will send SIGINTs to the child processes.

User Response: None.

2617-027 Invalid value for environment variable: *environment variable name = environment variable value*.

Explanation: Non-numeric or otherwise invalid value for environment variable.

User Response: Change environment variable value to one that is valid.

2617-028 Argument *argument* is invalid.

Explanation: You specified an argument that is not valid in the current system setup. Usually a result of specifying an argument that requires CSM to be installed (**-a** or **-N**).

User Response: Remove the non-valid argument and issue the command again.

2651-004 Could not find one or more of the specified nodes in the database. Run **Isnode** without any arguments to see the list of valid node names.

Explanation: None.

User Response: None.

2651-005 Node group *node group name* is empty (does not have any nodes in it). Run **nodegrp** or **nodegrp -W** to see the definition of the node group.

Explanation: None.

User Response: None.

2651-007 Node group *node group name* not found. Run `nodegrp` to see a list of valid node groups.

Explanation: None.

User Response: None.

2651-008 Cannot add nodes to a group that has the where clause of the select string set. Use `nodegrp -w` to change the definition of the dynamic node group.

Explanation: None.

User Response: A node group cannot be changed from a dynamic to a static node group unless you delete it and recreate it.

2651-009 Cannot remove nodes from a group that has the where clause of the select string set. Use `nodegrp -w` to change the definition of the dynamic node group.

Explanation: A node group cannot be changed from a dynamic to a static node group unless you delete it and recreate it.

User Response: None.

2651-010 Cannot set the where clause of a group that has a node list defined. Use `nodegrp -a` or `nodegrp -x` to change the definition of the static node group.

Explanation: A node group cannot be changed from a static to a dynamic node group unless you delete it and recreate it.

User Response: None.

2651-011 Cannot display the where clause of the select string because it is not set for *node group name*. It is most likely a static node group. Try omitting the `-W` option.

Explanation: None.

User Response: None.

2651-012 *integer (number of node groups not found)* specified node group(s) not found. Run `nodegrp` to see a list of valid node groups.

Explanation: None.

User Response: None.

2651-013 Ignoring the `-g` option because it cannot be specified on a group that already exists. (If you need to change the group from validate to non-validate, delete the group and recreate it with the `-g` option.)

Explanation: None.

User Response: None.

2651-014 With this option you must specify exactly two groups separated by a space.

Explanation: None.

User Response: None.

2651-015 Error opening file *file name* to read group definitions. Message from system: *string error message from the system*.

Explanation: None.

User Response: None.

2651-016 Improper format in group file *file name* in the following line: *Run nodegrp -L to see the expected format*.

Explanation: None.

User Response: None.

2651-017 Node group *node group name* already exists – not overwriting it.

Explanation: None.

User Response: None.

2651-018 The following node(s) already exists in the ManagedNode table: *node name*. Specify node names that do not already exist. Run `lsnode` to see a list of existing nodes.

Explanation: None.

User Response: None.

2651-019 At least one node name must be specified.

Explanation: None.

User Response: None.

2651-020 Improper form specified for an attribute=value argument.

Explanation: None.

User Response: None.

2651-021 No nodes matched the specified select string. Run `lsnode` to see a list of hostnames, or `lsnode -l` to see the attribute values.

Explanation: None.

User Response: None.

2651-023 This machine is neither a CSM management server or node. To make this machine a CSM management server, install `csm.server`. To make this machine a node, install `csm.client`.

Explanation: None.

User Response: None.

2651-024 The management server value cannot be set or removed. This machine is not a CSM node. A hostname or `-d` can only be specified on a machine that has `csm.client` installed.

Explanation: None.

User Response: None.

2651-027 Cannot resolve *node name* to a host name.

Explanation: None.

User Response: None.

2651-028 Cannot resolve *node name* to an IP address.

Explanation: None.

User Response: None.

2651-029 Exit code *number* from command: *command string* Error message from *cmd*: *message from command*.

Explanation: This command, that CSM runs internally, failed.

User Response: Examine the error message from the internal command. If the error is something you can correct, for example, permission denied, fix the problem and run the CSM command again. Otherwise, contact the IBM Support Center.

2651-030 Error opening file *file name* to read node list. Message from system: *error message*.

Explanation: None.

User Response: None.

2651-031 Could not find node group *node group name* in the database. Run `nodegrp -l` to see a list of valid node groups.

Explanation: None.

User Response: None.

2651-032 Could not find one or more of the following node groups in the database: *node group name*. Run `nodegrp -l` to see a list of valid node groups.

Explanation: None.

User Response: None.

2651-033 Internal error in `NodeUtils.listNodeAttrs()` - `SkipResolve` set, but `Res2Unres` not set.

Explanation: None.

User Response: None.

2651-035 Bad value given for the *name of an attribute* option. The value must be one of the following: yes, no, 1, 0.

Explanation: None.

User Response: None.

2651-036 The specified remote shell (*file name*) does not exist or is not executable.

Explanation: None.

User Response: None.

2651-037 Invalid cluster type and model specified: *string user specified*. It must be specified in the format `####-###`.

Explanation: None.

User Response: None.

2651-038 Cannot access key file *file name*. Check that it exists and is readable by this user.

Explanation: None.

User Response: None.

2651-039 Currently, you cannot add both sub-groups and exclusions to a node group. (One or the other is valid.) This is a limitation that will be relaxed in a future release.

Explanation: None.

User Response: None.

2651 – Software Maintenance System (SMS) messages (issued from management server)

2651-501 **Invalid package:** *invalid package*. The package name should not contain a path.

Explanation: Usage error. Only the file names of packages should be given; not their paths.

User Response: None.

2651-502 **Invalid directory:** *invalid directory under directory structure (parent directory)*. The only subdirectories should be "RPMs" and "updates".

Explanation: None.

User Response: None.

2651-503 **You must specify a target for this command. See usage information.**

Explanation: You did not specify a valid node on which to run the **smsupdatenode** command.

User Response: Run the **updatenode** command with valid nodes.

2651-505 **Node *node name* is offline (Status = node's status), Software Maintenance will not be performed on it.**

Explanation: The ManagedNode status for this node is not equal to one.

User Response: Try running the **updatenode** command to resolve problems with the CSM code. If this fails to bring the Status up to one, check for problems with the network connection.

2651-506 **Software Maintenance cannot resolve hostname *unknown node hostname*. No maintenance will be performed on this machine!**

Explanation: There may have been a problem with the **lsnode** command, or the Domain Management Server resource manager (DMSRM). You could also have specified an invalid node name on the command line.

User Response: Have the administrator ensure they are giving valid host names to the **smsupdatenode** command. Then ensure the Domain Management Server resource manager (DMSRM) is up and running with the **lssrc -a** command.

2651-507 **Cannot open file *file name* for read.**

Explanation: None.

User Response: Ensure that the file exists and that you have read access to it.

2651-508 **Error running command *child command name*. It reported *child command return code/errors*.**

Explanation: There was an error running the given command.

User Response: Check to make sure that the command is present and working on this node.

2651-509 **Cannot open file *file name*: *return code*.**

Explanation: None.

User Response: Ensure that the file either does not exist (and the user has permission to create files in that directory), or that it exists and you have read and write access to it.

2651-510 **Cannot open file *file name* to lock.**

Explanation: None.

User Response: Ensure that the file either does not exist (and the user has permission to create files in that directory), or that it exists and you have read and write access to it.

2651-511 **Cannot lock file *file name*. Another version of **smsupdatenode** must be running.**

Explanation: None.

User Response: Wait until all **smsupdatenode** processes have completed. If the lock is still not

released, delete this file and run `smsupdatenode` again.

2651-512 **Error: There is no *non-existent* directory. This is where Linux RPMs should be stored!**

Explanation: None.

User Response: Create the directory.

2651-513 **Cannot perform Software Maintenance: no *non-existent* distributions name distributions.**

Explanation: None.

User Response: If you (administrator) wish to perform software maintenance on a node with that Linux distribution, you must create that directory.

2651-514 **Cannot perform Software Maintenance on the following non-Linux nodes: *node hostnames*.**

Explanation: None.

User Response: None.

2651-515 **Cannot find package *rpm package*.**

Explanation: Usage error. An invalid package name was given on the command line.

User Response: None.

265-516 **Invalid command line arguments: You must specify either *—deps* or *—nodeps*.**

Explanation: Usage error.

User Response: None.

2651-517 **There was an error using the CLOG Logging system: *CLOG subroutine*. Error = *CLOG error*.**

Explanation: This error is for debugging purposes only, since the CLOG system is not exposed to users.

User Response: None.

2651-518 **Software Maintenance System (SMS) failed with exit code: *exit code*.**

Explanation: This message is logged through the CLOG system to alert the administrator to software maintenance errors.

User Response: Consult the SMS error log to determine which errors caused the SMS failure.

2651-519 **These packages *packages with no corresponding nodes* have no corresponding nodes. They will not be installed or updated.**

Explanation: None.

User Response: None.

2651-520 **One of the following directories does not exist: *directory* or *directory*.**

Explanation: None.

User Response: None.

2651-521 **Could not remove the following RPMs from node *hostname: rpm list*.**

Explanation: None.

User Response: None.

2651-522 **Please specify a node with an *InstallIOSName* attribute equal to "Linux".**

Explanation: None.

User Response: None.

2651 – Configuration File Manager (CFM) messages

2651-526 There is a version of file *file* for a group as large as the entire cluster as well as a version of it for all nodes. CFM will disregard the all node version and only transfer the group version.

Explanation: If there is a group as large as the cluster, it contains all the nodes in the cluster. Therefore you should not need to have `filename_group` since this has the same destination as `filename`.

User Response: Ensure that you do not have two files with the same CFM destination. Make sure that if there are multiple versions of a single file, that each of their destinations is unique.

2651-527 There are 2 groups of the same size, *node group* and *node group*, that both receive different versions of the file *file*. Any nodes common to both groups will receive the *node group* version.

Explanation: Since both groups are the same size, CFM does not know which to consider more specific and, therefore, it arbitrarily chooses a group in which to include the common nodes.

User Response: None.

2651-528 File *file* does not have a Group Name extension.

Explanation: The filename includes a `._` but the text following it does not match a defined group name. This file will be sent to all nodes, and no extension will be removed.

User Response: To stop this error from occurring, rename the file so that it does not include a `._`

2651-529 Warning: *file* is wrong type. It will not be distributed.

Explanation: The target is not a file or directory.

User Response: Check the format of the file and remove it from the `/cfmroot` directory if it is not a valid type (directory, file, or symbolic link).

2651-530 Rdist: *rdist* error.

Explanation: Displays error reported by `rdist`.

User Response: None.

2651-531 Error: Cannot open *file*. *error* *error*. Please ensure you have permission to read and write to this file (if you do not, contact the system administrator).

Explanation: None.

User Response: None.

2651-533 Node *hostname* is offline (Status = *Status*). CFM files will not be distributed to it.

Explanation: The `ManagedNodeStatus` attribute of the node is not 1. This indicates that something is wrong with the node.

User Response: Try running the `updatenode` command to the node. If this does not fix the problem, ensure the node is reachable on the network.

2651-534 Error: Cannot open *file*: *error* *error*.

Explanation: None.

User Response: None.

2651-535 Error: Cannot close *file*: *error* *error*.

Explanation: None.

User Response: None.

2651-538 Cluster Systems Management `nodegrp` command could not resolve node group *node group*.

Explanation: Either an underlying resource manager is down, or you specified an invalid node group.

User Response: Ensure that the specified node group exists. Check to make sure that the relevant resource managers are running with `Issrc -a`.

2651-539 CFM cannot resolve hostname *hostname*. No files will be sent to this machine!

Explanation: Either the Domain Management resource manager is down, or you specified an invalid node name.

User Response: Ensure that the specified node is a CSM ManagedNode. Then, check to make sure that the Domain Management resource manager is running with `Issrc -a`.

2651-540 No valid destinations. CFM will not run!

Explanation: None.

User Response: None.

2651-541 The file or directory *file* has more than one `._groupname` extension. CFM does not know where to send it. *file* will not be distributed!

Explanation: None.

User Response: Make sure that no file names or paths contain multiple `._groupname` extensions.

2651-542 Both *file* and *file* have the same destination! In order to keep the wrong files from going to this destination, CFM will not send either version. Please fix your `/cfmroot` directory to ensure each destination file has a unique CFM file.

Explanation: None.

User Response: None.

2651-543 Host *hostname* is probably out of file system space. CFM received this error: *error error*. CFM will not be able to distribute files to *hostname* at this time.

Explanation: A file system on the node is full.

User Response: Ensure that there is room on the file system to which CFM is copying and `/var/opt/csm` (where the temporary files are stored).

2651-544 No space left on host *hostname*. All files were not successfully distributed.

Explanation: A file system on the node is full.

User Response: Ensure that there is room on the file system to which CFM is copying and `/var/opt/csm` (where the temporary files are stored).

2651-545 File *file name* failed to transfer to *hostname*. *command name* will retry distribution of this file one time.

Explanation: None.

User Response: None.

2651-546 There is a current execution of *command name*. Please wait until this existing process exits before trying to run *command name*. Otherwise remove the file *file name*.

Explanation: The `/tmp` file that corresponds to the command is locked.

User Response: Remove the file, if no other execution of the `cfmupdatenode` command is running.

2651-547 Cannot run `/usr/bin/rdist`: *error code*exit *code*.

Explanation: An error occurred while running `/usr/bin/rdist`.

User Response: None.

2651-548 The `dsh` command returned this exit code: *exit code*. It probably failed to reach some nodes.

Explanation: None.

User Response: Ensure that you can run the `dsh` command to all nodes. Run a command similar to `/opt/csm/bin/dsh -a hostname`.

2651-549 Rdist returned this exit code: *rdist exit code*. Some files may not have been distributed to all nodes!

Explanation: There was a problem distributing the files.

User Response: Run the `cfmupdatenode` command again to ensure that all files transfer.

2651-550 There is no target for the `cfmupdatenode` command. Please specify a target with the `-a`, `-N` or host positional arguments.

Explanation: None.

User Response: None.

2651-551 Deletion of temporary CFM files failed on node *hostname*. No file transfer to this node will take place.

Explanation: CFM distributes temporary files to the `/var/opt/csm/cfmlocal` directory on each destination machine. When the corresponding files are removed from `/cfmroot` on the management server, CFM tries to delete them from the `/var/opt/csm/cfmlocal` directory.

User Response: Manually delete all files from the `/var/opt/csm/cfmlocal` directory on the specified node.

2651-552 The file *file* is either not a file or it does not reside in the */cfmroot* directory. It will not be distributed.

Explanation: You ran the `cfmupdatenode -f filename` command with an invalid file.

User Response: Ensure that the file exists in the */cfmroot* directory, and is a valid file type (directory, file, or symbolic link).

2651-553 CSM: :CLOG call *subroutine name* failed with return code *return code*.

Explanation: Problem with the CSM CLOG component. It is possible that logging the *sys/audit* logs was unsuccessful.

User Response: None.

2651-554 Command *child command* failed with error *error message*.

Explanation: None.

User Response: None.

2651-555 Configuration File Manager (CFM) failed with exit code: *exit code*.

Explanation: This message is logged through the CLOG system to alert the administrator to software maintenance errors.

User Response: Consult the CFM error log to determine which errors caused the SMS error.

2651-556 The user group *numeric user of or group id* does not exist on some target nodes. Files owned by this user or group will not be distributed.

Explanation: Users and groups of files in */cfmroot* must exist on all machine in the cluster (with the same user and group identifier).

2651 – Hardware Control messages

2651-601 No command-line flags specified.

Explanation: No command-line options were specified. At least one option is required.

User Response: Specify a option.

2651-602 The *command-line flag* requires an argument.

Explanation: An argument for the specified option was not supplied to the command.

User Response: Either specify a valid option argument, or remove the option. See the man page for

User Response: Ensure that the user or group exists on all target nodes with the same numeric identifier.

2651-557 clocal reported exit code *exit code* on node *hostname*. File transfer may have failed on that node.

Explanation: None.

User Response: None.

2651-558 The following two groups, *node group* and *node group*, contain common nodes, but have different versions of the same file defined for them. Since group *node group* is smaller and more specific, all common nodes will receive its files.

Explanation: None.

User Response: None.

2651-559 Files with the destination name *file* have different owners or groups. They will not be distributed.

Explanation: None.

User Response: None.

2651-560 This file *file* is not owned by the executing user. It will not be distributed.

Explanation: None.

User Response: None.

the command or *IBM CSM for Linux: Command and Technical Reference* for the valid option arguments.

2651-603 Unrecognized flag: *unrecognized flag*.

Explanation: The option was not recognized by the `rpower` command.

User Response: Specify a valid option.

2651-604 Node group not found.

Explanation: The node group specified is not recognized as a valid node group.

User Response: Specify a valid node group.

2651-605 Multiple *flag* flags found.

Explanation: The option was specified multiple times.

User Response: Specify the option only once.

2651-606 No node hostnames found.

Explanation: No node host names found.

User Response: Specify a host name.

**2651-607 Multiple commands specified:
command.**

Explanation: Multiple actions commands were specified.

User Response: Specify only one command.

2651-608 You must specify a command.

Explanation: No action command was entered.

User Response: Enter an action command.

**2651-609 Internal error. Could not allocate
memory.**

Explanation: This message indicates an internal program problem.

User Response: Reboot the computer and try the operation again. If the problem persists, save the error message and contact the IBM Support Center.

2651-610 rpower node list file not specified.

Explanation: This message indicates that the RPOWER_LIST environment variable was defined, but no node list file name was assigned to it.

User Response: Assign a node list file name to the RPOWER_LIST environment variable.

**2651-611 Cannot open node list file *file name*:
system error message (error number).**

Explanation: Could not open the node list file specified in the RPOWER_LIST environment variable due to the reason supplied by the system error message. The error number number returned by **fopen()** is also provided.

User Response: Correct the problem indicated by the system error message. If the problem cannot be corrected, contact the IBM Support Center.

**2651-626 Internal error, could not allocate Java
object.**

Explanation: This message indicates an internal memory allocation problem.

User Response: Reboot the computer and try the operation again. If the problem persists, save the error message and contact the IBM Support Center.

**2651-627 Cannot get pointer to Java object *Java
object*.**

Explanation: This message indicates an internal program problem.

User Response: Reboot the computer and try the operation again. If the problem persists, save error message and contact the IBM Support Center.

**2651-628 Internal error, could not allocate
memory.**

Explanation: The message indicates an internal program problem.

User Response: Reboot the computer and try the operation again. If the problem persists, save error message and contact the IBM Support Center.

**2651-629 Cannot access Java method for *method
name*.**

Explanation: This message indicates that the version of this library might be incompatible with the version of the Java class it is invoking.

User Response: Reinstall this software package.

**2651-630 Unable to get pointer to function in
decryption library *decryption library
name*.**

Explanation: This message indicates that the version of this library might be incompatible with version of the decryption library it is invoking.

User Response: Reinstall the software package.

**2651-631 Could not load Java class *class name*
or one of its components.**

Explanation: This message indicates that the class specified, or one of the dependent classes or libraries required for the class to load, is not present.

User Response: Verify that the class specified, dependent classes, and libraries are present.

2651-632 **Exception occurred while attempting to access Java method** *method name*.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-633 **No hardware control point specified.**

Explanation: No hardware control point was specified.

User Response: Make sure the hardware control point is provided and try again.

2651-634 **Unknown return code from Java interface for method** *method name*.

Explanation: This message indicates that the version of this library might be incompatible with the version of the Java class it is invoking.

User Response: Reinstall this software package.

2651-635 **Cannot find** *file name*.

Explanation: Could not locate the file specified.

User Response: Make sure the file is in the correct location.

2651-636 **Invalid hardware control point address specified** *hardware control point address*.

Explanation: Invalid hardware control point address specified.

User Response: Make sure the address (or addresses) provided is correct and try again.

2651-637 **No partition name was specified.**

Explanation: No partition name was specified.

User Response: Make sure this field is provided and try again.

2651-638 **Unable to attach thread to Java Virtual Machine.**

Explanation: This message indicates an internal program problem.

User Response: Try the operation again. If the problem persists, save the error message and contact the IBM Support Center.

2651-639 **Unable to load decryption library** *decryption library name*.

Explanation: This message indicates that the decryption library specified, or one of the dependent libraries required for the library to load, is not present.

User Response: Verify that the library and dependent libraries are present.

2651-640 **Partition** *partition name* **is not currently active.**

Explanation: The partition specified is not active.

User Response: Specify an active partition in query.

2651-641 **Java interface error for method** *method name*: **Exception.**

Explanation: This message indicates a generic exception in the associated Java class.

User Response: Save the error message and contact the IBM Support Center.

2651-642 **Java interface error for method** *method name*: **IOException.**

Explanation: This message signals that an error has occurred due to a failed or interrupted I/O operation.

User Response: Try the operation again. If the error persists, save the error message and contact the IBM Support Center.

2651-643 **Java interface error for method** *method name*: **unable to create a CIMNameSpace object.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-644 **Java interface error for method** *method name*: **unable to create a CIMClient object.**

Explanation: This message indicates an internal program problem

User Response: Save the error message and contact the IBM Support Center.

2651-645 **Java interface error for method** *method name*: **userid/password or encryption key not found.**

Explanation: The password file, which specifies the user name and password with which to login to the HMC, is missing.

User Response: Create the password file with the **systemid** command.

2651-646 **Java interface error for method** *method name: java.net.ConnectException.*

Explanation: This message indicates that an error occurred while attempting to connect to the HMC.

User Response: Verify that the HMC IP address and username/password are correct.

2651-647 **Java interface error for method** *method name: java.net.NoRouteToHostException.*

Explanation: This message indicates an internal program problem.

User Response: Verify that the HMC IP address and username/password are correct.

2651-648 **Java interface error for method** *method name: java.net.TimeoutException.*

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-649 **Java interface error for method** *method name: internal error: CECtable mismatch.*

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-650 **Java interface error for method** *method name: java.net.ProtocolException: authorization failure.*

Explanation: This message indicates that an error occurred while attempting to connect to the HMC.

User Response: Verify that the HMC username and password are correct.

2651-651 **Java interface error for method** *method name: the CEC is not configured.*

Explanation: This message indicates that the CEC on which the action is being performed is not configured.

User Response: Configure the CEC before issuing action commands.

2651-652 **Java interface error for method** *method name: the CEC is initializing.*

Explanation: This message indicates that the CEC is initializing, and that the specified action cannot be performed.

User Response: Wait until the CEC has completed initialization and perform the action again.

2651-653 **Java interface error for method** *method name: the partition is not configured.*

Explanation: This message indicates that the partition on which the action is being performed is not configured.

User Response: Configure the partition before issuing its action commands.

2651-654 **Java interface error for method** *method name: the partition should not be booted or reset.*

Explanation: This message indicates that the partition is in a state that does not allow the specified actions.

User Response: Do not attempt to perform this action while the partition is in this state.

2651-655 **Java interface error for method** *method name: the partition has received an activate and is booting.*

Explanation: This message indicates that a command has been received to activate a partition, and that partition is already in the process of activating.

User Response: Allow the partition to complete its activating processing before issuing further commands.

2651-656 **Java interface error for method** *method name: the partition has no profile to activate.*

Explanation: This message indicates the partition on which the action is being performed has no profile.

User Response: Create a partition profile prior to activating it.

2651-657 **Java interface error for method** *method name: the partition is not in the running or booting state.*

Explanation: This message indicates that the partition is in a state that does not allow the specified actions.

User Response: Do not attempt to perform this action while the partition is in this state.

2651-658 **Java virtual machine not initialized.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-659 **Invalid virtual console open string** *open string.*

Explanation: This message indicates that the HMC is returning a connect string in a format that this library does not understand.

User Response: Save the error message and contact the IBM Support Center.

2651-660 **Cannot create virtual console socket:** *system error message.*

Explanation: The named system error message describes the reason for the system call failure. This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-661 **Unable to establish virtual console connection:** *system error message.*

Explanation:

The named system error message describes the reason for the system call failure. This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-662 **Error in write to virtual console socket:** *system error message.*

Explanation: An error occurred writing data to the virtual console socket connection, due to the reason supplied by the system error message.

User Response: Correct the problem indicated by the system error message. If the problem cannot be corrected, save the error message and contact the IBM Support Center.

2651-663 **Java interface error for method** *method name: HSCCIMExceptionID=0FA2: all available Virtual Terminal Sessions have been opened and are in use.*

Explanation: This message indicates that another program, perhaps the HMC GUI, currently has the virtual terminal open. Only one connection is allowed to the virtual terminal at a time.

User Response: Do not attempt to perform this operation when the virtual terminal is already open.

2651-664 **Java interface error for method** *method name: CIMException.*

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-665 **Java interface error for method** *method name: command not supported.*

Explanation: This message indicates that the action command specified is not supported. The target hardware is not able to perform this operation.

User Response: Do not issue this command.

2651-666 **Java interface error for method** *method name: userid/password not found.*

Explanation:

The password file, which specifies the user name and password with which to login to the hardware control point, as well as the node, is invalid.

User Response: Recreate the password file with the **systemid** command.

2651-667 **Invalid event type specified:** *event type.*

Explanation: This message indicates that the event type specified is not supported.

User Response: Reissue the command with a valid event type.

2651-668 *partition hostname* **Cannot determine hardware control daemon port number.**

Explanation: The command argument specified is not valid.

User Response: Ensure that a port number is defined in **/etc/services** and try again.

2651-669 *partition hostname* **Error starting thread** *name thread.*

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-670 *partition hostname* **Error connecting to hardware control daemon.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-671 *partition hostname* **Hardware control daemon socket error.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-672 *partition hostname* **Invalid communication protocol data.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-673 *partition hostname* **Invalid communication protocol data.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-674 *partition hostname* **HMC Event Subscription Exception.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-676 [*partition hostname*] **No node name specified.**

Explanation: The target node name was not supplied.

User Response: Make sure the node name is provided and try again.

2651-677 [*partition hostname*] **Cannot get pointer to Java object *Java object*.**

Explanation: This message indicates an internal program problem.

User Response: Reboot the computer and try the operation again. If the problem persists, save the error message and contact the the IBM Support Center Center.

2651-678 [*partition hostname*] **Internal error. Could not allocate memory.**

Explanation: This message indicates an internal program problem.

User Response: Reboot the computer and try the operation again. If the problem persists, save the error message and contact the IBM Support Center.

2651-679 [*partition hostname*] **Cannot access Java method for *method name*.**

Explanation: This message indicates that the version of this library is probably incompatible with the version of the Java class it is invoking.

User Response: Reinstall this software package.

2651-680 [*partition hostname*] **Unable to get pointer to function in decryption library *decryption library name*.**

Explanation: This message indicates that the version of this library is probably incompatible with the version of the decryption library it is invoking.

User Response: Reinstall the software package.

2651-681 [*partition hostname*] **Could not load Java class *class name*, or one of its components.**

Explanation: This message indicates that the class specified, or one of the dependent classes or libraries required for the class to load, is not persistent.

User Response: Verify that the class and the dependent classes and libraries are present.

2651-682 [*partition hostname*] **Exception occurred while attempting to access Java method *method name*.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-683 [*partition hostname*] **Invalid hardware control point address specified *hostname*.**

Explanation: The hardware control point supplied is invalid.

User Response: Make sure a valid hardware control point address is provided and try again.

2651-684 [*partition hostname*] **Unknown return code from Java interface for method *method name*.**

Explanation: This method indicates that the version of this library is probably incompatible with the version of the Java class it is invoking.

User Response: Reinstall the software package.

2651-685 [partition hostname] **Cannot find file name.**

Explanation: Could not locate the file specified.

User Response: Make sure the file is in the correct location.

2651-686 [partition hostname] **No hardware control point specified.**

Explanation: The hardware control point host name/IP address was not supplied.

User Response: Make sure the hardware control point is provided and try again.

2651-687 [partition hostname] **Java interface error for method method name: UninitializedLogException.**

Explanation: This message indicates that an attempt has been made to read the next entries from a log when the first entry has not been read.

User Response: Save the error message and contact the IBM Support Center.

2651-688 [partition hostname] **Unable to attach thread to Java Virtual Machine.**

Explanation: This message indicates an internal program problem.

User Response: Try the operation again. If the problem persists, save the error message and contact the IBM Support Center.

2651-689 [partition hostname] **Java interface error for method method name: SPEXception.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-690 [partition hostname] **Java interface error for method method name: userid/password file not found.**

Explanation: The password file, which specifies the user name and password to login to the hardware control point, as well as the node, is missing.

User Response: Create the password file with the **systemid** command.

2651-691 [partition hostname] **Java interface error for method method name: java.net.UnknownHostException.**

Explanation: This message indicates that an error occurred while attempting to connect to the hardware control point.

User Response: Verify that the host name and user name/password are correct.

2651-692 [partition hostname] **Java interface error for method method name: userid/password not found.**

Explanation: The password file, which specifies the user name and password to login to the hardware control point, as well as the node, is invalid.

User Response: Recreate the password file with the **systemid** command.

2651-693 [partition hostname] **Java interface error for method method name: IOException.**

Explanation: This message signals that an error has occurred due to a failed or interrupted I/O operation.

User Response: Try the operation again. If the error persists, save the error message and contact the IBM Support Center.

2651-694 [partition hostname] **Java interface error for method method name: Exception.**

Explanation: This message indicates a generic exception in the associated Java class.

User Response: Save the error message and contact the IBM Support Center.

2651-695 [partition hostname] **Java interface error for method method name: driver startup failure.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-696 [partition hostname] **Internal error. Could not allocate Java object.**

Explanation: This message indicates an internal memory allocation problem.

User Response: Reboot the computer and try the operation again. If the problem persists, save the error message and contact the IBM Support Center.

2651-697 [partition hostname] **Java virtual machine not initialized.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-698 [partition hostname] **Java interface error for method method name: node not found.**

Explanation: This message indicates that the node specified was not found to be controlled by the hardware control point specified.

User Response: Try the operation on another node.

2651-699 [partition hostname] **Java interface error for method method name: unknown power state.**

Explanation: This message indicates that the node was queried for its power state, and an undefined value was returned.

User Response: Save the error message and contact the IBM Support Center.

2651-700 [partition hostname] **Java interface error for method method name: operation failed.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-701 [partition hostname] **Java interface error for method method name: component not installed.**

Explanation: This message indicates that the query for the information about a particular system component failed because the component is not installed.

User Response: Save the error message and contact the IBM Support Center.

2651-702 [partition hostname] **Java interface error for method method name: LightPathException.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-703 [partition hostname] **Java interface error for method method name: device not available.**

Explanation: This message indicates that a device is not available.

User Response: Save the error message and contact the IBM Support Center.

2651-704 [partition hostname] **Java interface error for method method name: command failed.**

Explanation: This message indicates that a command issued to the service processor failed.

User Response: Save the error message and contact the IBM Support Center.

2651-705 [partition hostname] **Java interface error for method method name: invalid command data.**

Explanation: This message indicates that a CommandFormatter was asked to parse data from a dot-command that is not the correct type for the data requested.

User Response: Save the error message and contact the IBM Support Center.

2651-706 [partition hostname] **Java interface error for method method name: command mismatch.**

Explanation: This message indicates that a CommandFormatter was asked to parse data from a dot-command that is not the correct type for the data requested.

User Response: Save the error message and contact the IBM Support Center.

2651-707 [partition hostname] **Java interface error for method method name: unsupported command.**

Explanation: This message indicates that the action command specified is not supported. The target hardware is not able to perform this operation.

User Response: Do not issue this command.

2651-708 [partition hostname] **Java interface error for method method name: connection already established.**

Explanation: This message indicates that an attempt was made to open a connection that has already been established.

User Response: The connection is available.

2651-709 [partition hostname] **Java interface error for method *method name*: communication buffer invalid.**

Explanation: This message indicates that the send or receive communication buffer is invalid.

User Response: Save the error message and contact the IBM Support Center.

2651-710 [partition hostname] **Java interface error for method *method name*: communication buffer overflow.**

Explanation: This message indicates that the command buffer sent to the service processor is too large.

User Response: Save the error and contact the IBM Support Center.

2651-711 [partition hostname] **Java interface error for method *method name*: no connection to service processor.**

Explanation: This message indicates that a connection to the service processor does not exist. This might be the result of another program having a connection open to the service processor. Only one connection to a service processor is allowed at a time.

User Response: Make sure no other programs have a connection open to this service processor.

2651-712 [partition hostname] **Java interface error for method *method name*: OS resource missing.**

Explanation: This message indicates that some required OS resource is missing.

User Response: Save the error message and contact the IBM Support Center.

2651-713 [partition hostname] **Java interface error for method *method name*: login retry attempts exceeded.**

Explanation: This message indicates that the threshold for login attempts has been exceeded.

User Response: Save the error message and contact the IBM Support Center.

2651-714 [partition hostname] **Java interface error for method *method name*: communication session invalid.**

Explanation: This message indicates that an attempt was made to perform an operation on a communication session that is not valid for its current state.

User Response: Save the error message and contact the IBM Support Center.

2651-715 [partition hostname] **Java interface error for method *method name*: communication timeout.**

Explanation: This message indicates that a communication timeout has occurred.

User Response: Save the error message and contact the IBM Support Center.

2651-716 [partition hostname] **Java interface error for method *method name*: invalid service processor hostname**

Explanation: This message indicates that the parameter(s) for establishing a connection to a service processor does not specify a valid destination.

User Response: Save the error message and contact the IBM Support Center.

2651-717 [partition hostname] **Java interface error for method *method name*: data invalid.**

Explanation: This message indicates an internal program problem.

User Response: Save the error and contact the IBM Support Center.

2651-718 [partition hostname] **Java interface error for method *method name*: command buffer length error.**

Explanation: This message indicates that the data length of the command buffer does not match the actual length of the valid data.

User Response: Save the error message and contact the IBM Support Center.

2651-719 [partition hostname] **Java interface error for method *method name*: ResultFormatException.**

Explanation: This message indicates that an attempt to convert an input or output parameter from a byte[] to another object or value failed.

User Response: Save the error message and contact the IBM Support Center.

2651-720 [partition hostname] **Buffer length exceeded for reply to method *method name*.**

Explanation: This message indicates that an attempt to convert an input or output parameter from a byte[] to another object or value failed.

User Response: Save the error message and contact the IBM Support Center.

2651-721 [partition hostname] **No node hostname/IP address specified.**

Explanation: The target node host name/IP address was not supplied.

User Response: Make sure the node host name/IP address is provided and try again.

2651-722 [partition hostname] **Unable to load decryption library** *decryption library name.*

Explanation: This message indicates that the decryption library specified, or one of the dependent libraries required for the library to load, is not present.

User Response: Verify that the library and dependent libraries are present.

2651-723 [partition hostname] **No connection to hardware control point.**

Explanation: This message indicates that a connection to the hardware control point does not exist.

User Response: Save the error message and contact the IBM Support Center.

2651-724 [partition hostname] **Java interface error for method** *method name: invalid userid/password file.*

Explanation: The password file, which specifies the user name and password to use for logging to the hardware control point as well as the node, is invalid.

User Response: Recreate the password file with the **systemid** command.

2651-725 **Invalid command argument specified:** *command argument.*

Explanation: The command argument that was specified is invalid.

User Response: Ensure a valid command argument is provided and try again.

2651-726 *partition hostname* **Cannot determine hardware control daemon port number.**

Explanation: The command argument that was specified is not valid.

User Response: Make sure a port number is defined in **/etc/services** and try again.

2651-727 *partition hostname* **Error starting thread** *name thread.*

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-728 *partition hostname* **Error connecting to hardware control daemon.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-729 *partition hostname* **Hardware control daemon socket error.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-730 *partition hostname* **Timeout waiting for access to RSA.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-731 **Command not supported on a node of this hardware type.**

Explanation: The node does not support the command.

User Response: Issue the command only to nodes that support the command.

2651-736 **Entry not found.**

Explanation: The entry that was specified does not exist.

User Response: Issue the command again with the correct host name or IP address.

2651-737 **Host name/IP address** *host name* **cannot be resolved.**

Explanation: The input host name or IP address cannot be resolved by the name services used by the system.

User Response: Make sure the host name/IP address is valid and the name services are running, and try again.

2651-738 Incorrect number of arguments entered.

Explanation: There was a syntax error.

User Response: Refer to the man page for the command and try again.

2651-739 Unrecognized flag *unrecognized flag*.

Explanation: The option was not recognized by `systemid`.

User Response: Specify a valid option.

2651-740 Unable to store entry.

Explanation: There is a system problem which prevents a file from being saved.

User Response: Resolve the system problem and try again.

2651-741 File access permissions for file name violated.

Explanation: The permission bits of the specified file have been altered from the original settings.

User Response: Check to see if data is compromised and change the permission bits back to the original settings.

2651-742 Unable to set terminal echo state.

Explanation: Unable to set the terminal echo state to off while a password is being entered.

User Response: Resolve the system problem and try again.

2651-743 Error generating encryption key.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-744 Error encrypting password.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-761 Internal error. Error message *message* index not valid.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-762 Incorrect number of arguments remaining.

Explanation: This is a syntax error.

User Response: Refer to the man page for the command and try again.

2651-763 The environment variable `S1ESC` is not properly defined.

Explanation: The `S1ESC` environment variable can be used to specify the termination character for the named command. It must be set to an octal, decimal, or hexadecimal value, from 0 through 255 (the value of the terminal character). For example, if the termination character is Control-X, set `S1ESC` to 0030, 24, or 0x18.

User Response: Either remove the variable `S1ESC` from your environment, or set it to a correct value.

2651-764 Unable to load *library path* : `dlopen()` error.

Explanation: The named command was unable to load the library indicated by the *library path*. The reason for the error is indicated by the `dlopen()` error.

User Response: Correct the error indicated by the `dlopen()` error and retry the command. If the problem persists, contact the IBM Support Center.

2651-765 Unable to get pointer to function *library function name* : `dlsym()` error.

Explanation: The named command was unable to get a handle to the function named by the *library function name*. This means that although the library loaded successfully, the library function name cannot be invoked. The reason for the error is indicated by the `dlsym()` error.

User Response: Correct the error indicated by the `dlopen()` error and retry the command. If the problem persists, contact the IBM Support Center.

2651-766 `tcgetattr()` was unsuccessful: *system error message (error number)*.

Explanation: This message indicates a system program problem.

User Response: Save the error message and error number, and contact the IBM Support Center.

2651-767 **tcsetattr() was unsuccessful:** *system error message (error number).*

Explanation: This message indicates a system program problem.

User Response: Save the error message and error number, and contact the IBM Support Center.

2651-768 **Internal program error. Select mask too small.**

Explanation: This message indicates an internal program problem. A *core* file should be generated in */var/log/csm/core*.

User Response: Save the core file and contact the IBM Support Center.

2651-769 **select() was unsuccessful:** *system error message (error number).*

Explanation: The named command could not determine whether any of its open file descriptors held data due to the reason supplied by the system error message and error number.

User Response: Correct the error indicated by the system error message and restart the command. If the problem persists, contact the IBM Support Center.

2651-770 **Library function error** *library function name : cu_error.*

Explanation: The named command received an error as a result of a call to the named library function. The error returned by the library is in *cu_error*.

User Response: Correct the error indicated by *cu_error* and retry the command. If the problem persists, contact the IBM Support Center.

2651-771 **write() to serial port was unsuccessful:** *system error message (error number).*

Explanation: The message indicates a system program problem.

User Response: Save the error message and error number, and contact the IBM Support Center.

2651-772 **read() from serial port was unsuccessful:** *system error message (error number).*

Explanation: The message indicates a system program problem.

User Response: Save the error message and error number, and contact the IBM Support Center.

2651-773 **write() to stdout was unsuccessful:** *system error message (error number).*

Explanation: The message indicates a system program problem.

User Response: Save the error message and error number, and contact the IBM Support Center.

2651-774 **read() from stdin was unsuccessful:** *system error message (error number).*

Explanation: The message indicates a system program problem.

User Response: Save the error message and error number, and contact the IBM Support Center.

2651-775 **Could not create Java Virtual Machine instance.**

Explanation: The message indicates a system program problem.

User Response: Save the error message and error number, and contact the IBM Support Center.

2651-777 **Incorrect PowerMethod specified.**

Explanation: You specified an incorrect power method.

User Response: Save the error message and error number, and contact the IBM Support Center.

2651-778 **Given power method does not require a password entry.**

Explanation: Given power method does not require a password entry. No entry will be created.

User Response: None.

2651-791 **The adapter speed specified with the -s flag must be one of "auto", "10", "100" or "1000".**

Explanation: You specified a value other than **auto**, **10**, **100**, or **1000** as the adapter speed.

User Response: Run the command again with the correct arguments.

2651-792 **The adapter type specified with the -t flag must be one of ent, tok or fddi.**

Explanation: The user has specified a value other than **ent**, **tok** or **fddi** as the adapter type.

User Response: Run the command again with the correct arguments.

2651-793 **The adapter duplex specified with the -d flag must be one of "auto", "half", or "full".**

Explanation: You specified a value other than **auto**, **half**, or **full** as the adapter duplex.

User Response: Run the command again with the correct arguments.

2651-794 **The -D flag is only valid with then -t flag is given.**

Explanation: The **-D** option (for discovery) is only valid when an adapter type is specified with the **-t** option.

User Response: Run the command again with the correct arguments.

2651-795 **The -s, -d, -A, -S, and -G flags are only valid when the -D flag is given.**

Explanation: The **-s**, **-d**, **-A**, **-S**, and **-G** options are only valid when discovery is requested with the **-D** option.

User Response: Run the command again with the correct arguments.

2651-796 **Unable to acquire adapter information for node *node name*. The command will continue.**

Explanation: The command could not obtain the adapter information for the indicated node.

User Response: Check the **getadapters** log and the **errpt** for errors if the **-f** option is not specified. If the **-f** option is specified, check the input file for errors. If the problem cannot be resolved, record the above information and contact the IBM Support Center.

2651-797 **Both the -s and -d flags are required for adapter discovery.**

Explanation: When specifying speed and duplex for discovery, both **-s** and **-d** options must be specified.

User Response: Run the command again with the correct arguments.

2651-798 **The -D flag cannot be used with the -f flag.**

Explanation: The **-D** and **-f** options are cannot be used together.

User Response: Run the command with the correct arguments.

2651-799 **Was not successful network booting node *hostname*. Refer to the log file for error information.**

Explanation: The network boot of the specified node failed.

User Response: Check the netboot log and and **errpt** for errors. If the problem cannot be resolved, record the above information and contact the IBM Support Center.

2651-800 **The server location *hostname* for node *node name* could not be resolved.**

Explanation: The server IP address or hostname for this node cannot be resolved.

User Response: Check to see if the hostname has been specified correctly. If it has, consult system support. If it has not, specify the hostname correctly and run the program command again.

2651-801 **None of the options -t, -D, -A, -s, -d, -S, or -G are valid when run on a Linux Management Server.**

Explanation: None of the options for network discovery or adapter type are valid on Linux.

User Response: Do not use the network discovery or adapter type options on a Linux management server.

2651-802 **The network adapter information for Linux Node *node name* cannot be obtained from an AIX Management Server.**

Explanation: The commands required to obtain network adapter information for a Linux node are only available on a Linux management server.

User Response: Obtain the network adapter information a different way.

2651-821 **[*target hostname*] Internal error. Could not allocate memory.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-822 **[*target hostname*] No hardware control point specified.**

Explanation: No hardware control point address or host name was specified.

User Response: Make sure the address or host name is provided and try again.

2651-823 [target hostname] **Invalid hardware control point hostname specified** hardware control point address.

Explanation: The hardware control point host name specified could not be resolved.

User Response: Make sure the host name provided is correct and try again.

2651-824 [target hostname] **Hardware control ID is out of range for hardware control point** hardware control point.

Explanation: The given hardware control point ID is not valid for the specified hardware control point.

User Response: Verify the hardware control ID and try the command again.

2651-825 [target hostname] **Internal error. Could not open trace file** log name.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-826 [target hostname] **Could not access trace directory** log directory name.

Explanation: The given trace directory could not be accessed.

User Response: Verify that the directory exists and try the command again.

2651-827 [target hostname] **Could not write log messages.**

Explanation: The program could not write messages to its log file.

User Response: Be sure there is space available in /var, or check the error log for disk errors.

2651-828 [target hostname] **Internal error. Unable to spawn connection process to hardware control point** hardware control point address.

Explanation: This message indicates an internal program problem.

User Response: Verify that the telnet executable exists. Otherwise, save the error message and contact the IBM Support Center.

2651-829 [target hostname] **Timed out waiting for a response from hardware control point** hardware control point address.

Explanation: Did not receive the expected response within the allowed time.

User Response: Check the network connection to the hardware control point and try again.

2651-830 [target hostname] **Incorrect login for hardware control point** hardware control point address.

Explanation: The supplied user ID and password are not correct for the hardware control point.

User Response: Correct the user ID and password for the hardware control point and try again.

2651-831 [target hostname] **The connection to the hardware control point** hardware control point address **terminated unexpectedly.**

Explanation: The network connection to the hardware control point terminated unexpectedly.

User Response: Check the network connection to the hardware control point and try again.

2651-832 [target hostname] **Internal error. Incorrect number of arguments passed to hardware control point** hardware control point address.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-833 [target hostname] **Control action** action **is not supported by hardware control point** hardware control point address.

Explanation: The specified hardware control point does not support the given control action.

User Response: Run the command with a supported control action.

2651-834 [target hostname] **Internal error. Unknown control action** action **received by hardware control point** hardware control point address.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-835 [target hostname] **Internal error. Cannot load library symbol** *library function name* **due to error** *system error number*.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-836 [target hostname] **Unable to open the password file for hardware control point** *hardware control point address*.

Explanation: The password file for this hardware control point cannot be opened.

User Response: Run the **systemid** command to generate a key file and password file for this hardware control point.

2651-837 [target hostname] **Internal error. File I/O error system error number, during i/o operation, accessing file** *filename*.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-838 [target hostname] **Cannot load shared library** *shared library name diagnostic message*.

Explanation: The shared library that was specified cannot be loaded.

User Response: Verify that the library is available and try the command again.

2651-839 [target hostname] **Internal error. Unknown return code** *return code from control script from hardware control point hardware control point address*.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-840 [target hostname] **Internal error. Cannot decrypt password for hardware control point** *hardware control point address*.

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-841 [target hostname] **Internal error, file I/O error system error number, during I/O operation** **operation, accessing temporary password file.**

Explanation: This message indicates an internal program problem.

User Response: Save the error message and contact the IBM Support Center.

2651-842 [target hostname] **Could not access temporary password directory.**

Explanation: The temporary password directory could not be accessed.

User Response: Save the error message and contact the IBM Support Center.

2651-843 [target hostname] **Internal error, control script for hardware control point** *hardware control point could not open temporary password file.*

Explanation: The temporary password directory could not be accessed.

User Response: Save the error message and contact the IBM Support Center.

2651-844 **Command not supported on node of this hardware type.**

Explanation: The node does not support the command.

User Response: Issue the command only to nodes that support the command.

2651-851 **Incorrect argument on flag name flag:** *flag argument.*

Explanation: You specified an invalid argument for the specified option.

User Response: Run the command again using the syntax specified.

2651-852 **Conflicting arguments.**

Explanation: You specified arguments that conflict.

User Response: Run the command again using the syntax specified.

2651-853 **Conflicting options.**

Explanation: You specified an option that requires an argument without the argument.

User Response: Run the command again with the syntax specified.

2651-854 **Missing option.**

Explanation: You omitted an option on the program command.

User Response: Run the command again with the syntax specified.

2651-855 **Cluster Systems Management**
command name **command could not**
resolve node group *node group.*

Explanation: Specified CSM node group could not be resolved.

User Response: Use the CSM **nodegrp** command to see if the desired node group exists.

2651-856 **Too many arguments specified.**

Explanation: You specified too many arguments.

User Response: Run the command again using the syntax specified.

2651-857 **Cannot open node list file** *node list*
filename: error message.

Explanation: The host file specified could not be opened.

User Response: Check to see if the host file name has been specified properly and that it has read permission. If it has read permission, contact system support. If it does not have read permission, correct it and run the command again.

2651-858 **Cluster Systems Management**
(csm.core) Isnode command not
installed.

Explanation: The **Isnode** command, used to acquire node attribute information, is not installed.

User Response: **Isnode** is a program in the **csm.core** package. Contact your system administrator to resolve this problem.

2651-859 **Cluster Systems Management**
command name **command error.**

Explanation: The Cluster Systems Management **Isnode** command returned an error.

User Response: Resolve the **Isnode** Cluster Systems Management problem and issue the **rconsole** command again.

2651-860 **rconsole node list environment**
variable, RCONSOLE_LIST not set.

Explanation: There were no nodes specified and the **rconsole** node list environment variable, **RCONSOLE_LIST**, was not set.

User Response: Either specify an **RCONSOLE_LIST** environment with a file containing the list of hosts, or specify an argument that contains the hosts.

2651-861 **Could not resolve hostname** *host name.*

Explanation: The host name specified could not be found by the program command.

User Response: Check to see if the host name has been specified correctly. If it has been specified correctly, contact system support. If it has not been specified correctly, correct it and run the program command again.

2651-862 **node** *node name* **ConsoleMethod**
attribute is missing in the CSM
database.

Explanation: The *ConsoleMethod* attribute for the node specified could not be found by the program command.

User Response: Check to see if the *ConsoleMethod* attribute for the node has been specified correctly. You can list the node attributes with the **Isnode** command and the **-I** option.

2651-863 *console command does not exist. Verify*
that the CSM attribute ConsoleMethod
for node *node name* **matches the**
intended console method *console*
method **and that there is a console**
method in the *csm bin directory name*
directory.

Explanation: The *ConsoleMethod* attribute for the host name specified did not resolve to a command that was installed on the system.

User Response: Either verify that the *ConsoleMethod* attribute for this host is valid, or move the program used to define this console to the CSM bin directory.

2651-864 **Remote console xinit command**
command name **failed for node** *node*
name.

Explanation: The **xinit** command failed to open the console for this host.

User Response: Attempt to resolve the problems with **xinit**, based on any additional error messages that were provided by this failure.

2651-865 **A previous execution of the *command name* command has not yet finished.**

Explanation: Only one copy of the given program may be run at a time. A previous execution of this program did not complete before the current attempt timed out.

User Response: Make sure all previous executions of this command have completed before running the command again

2651-866 **The *rconsole daemon daemon name* is not running.**

Explanation: A request was made to refresh the daemon, but it was not running.

User Response: Start the daemon manually, then verify that the entry for loading the daemon at bootup and respawning it if it terminates is present in the */etc/inittab* file.

2651-867 **The console entry *config file entry (console name)* is not present in the configuration file.**

Explanation: A request was made to remove an entry from the *rconsole* configuration file that did not exist.

User Response: Verify the name of the nodes given to the *chrconsolecfg* command.

2651-871 **Incorrect number of arguments.**

Explanation: You specified an invalid number of arguments.

User Response: Run the command again with the specified number of arguments.

2651-872 **The *attribute name attribute* is not defined in the CSM database for node *node name*.**

Explanation: A required attribute has not been defined in the CSM database for the specified node.

User Response: Use the *chnode* command to define the missing attribute.

2651-873 **The Cluster Systems Management command *command name* failed with error *error code*.**

Explanation: The specified command failed with the given return code.

User Response: Determine the cause of the failure and run the command again.

2651-980 **Missing option.**

Explanation: You omitted an option on the program command.

User Response: Run the command again using the syntax specified.

2651-981 **Incorrect number of arguments.**

Explanation: You specified an invalid number of arguments.

User Response: Run the command again with a valid number of arguments.

2651-982 **Too many arguments specified.**

Explanation: You specified too many arguments.

User Response: Run the command again using the syntax specified.

2651-983 **Cluster Systems Management (*csm.core*) *command name* command not installed.**

Explanation: The command specified, used to acquire node attribute information, is not installed.

User Response: The command is a program in the *csm.core* package. Contact your system administrator to resolve this problem.

2651-984 **Cluster Systems Management *command name* command error.**

Explanation: The Cluster Systems Management command that you specified returned an error.

User Response: Resolve the Cluster Systems Management command problem and issue the command again.

2651-985 **Cluster Systems Management *command name* command could not resolve node group *node group*.**

Explanation: The specified CSM node group could not be resolved.

User Response: Use the CSM *nodegrp* command to see if the desired node group exists.

2651-986 **Invalid argument specified *argument name*.**

Explanation: You specified an invalid argument.

User Response: Run the command again with a valid argument.

2651-987 **No nodes found.**

Explanation: No nodes exist on which to perform the command.

User Response: Run the command again with a valid node name.

2651-988 **You must specify exactly one of the `-a` flag, the `-f` flag, and the `-n` or `-N` flag.**

Explanation: You must specify at least one, and no more than one of the following options: `-a`, `-f` and `-n` or `-N`.

User Response: Run the command again with the correct arguments.

2651-989 **The nodegroup(s) specified with the `-N` flag is in an incorrect format.**

Explanation: The command has detected an error in the way node groups are specified with the `-N` option.

User Response: Run the command again with the correct arguments.

2651-990 **The hostname(s) specified with the `-n` flag is in an incorrect format.**

Explanation: The command has detected an error in the way host names are specified with the `-n` option.

User Response: Run the command again with the correct arguments.

2651-991 **An error was encountered while opening this file: *file name*.**

Explanation: Failed to open the specified file.

User Response: Verify that the file exists and is readable before running the command again.

2652 – CSMAgent Resource Manager messages

2652-000 **Attribute identifier is invalid.**

Explanation: When enumerating the resource attributes, an unexpected error occurred.

User Response: Record the above information and contact your software service organization

2652-001 **Attribute *resource attribute name* cannot be specified when defining a new resource.**

Explanation: You specified an attribute that is not valid when a resource is defined.

User Response: Remove this attribute from the define resource call.

2651-992 **An error was encountered while opening the log file: *file name*. Will skip processing node *hostname*.**

Explanation: Failed to open the specified log file.

User Response: Verify that there is sufficient disk space for opening the log file before running the command again.

2651-993 **Issuing the command *command* gave a return code of *return code*. The routine will continue.**

Explanation: The program issued the specified command which returned a nonzero code.

User Response: Refer to the error messages produced by the command to determine the cause of problem before running the command again.

2651-994 **Could not resolve hostname *hostname*.**

Explanation: The hostname that was specified could not be found by the program command.

User Response: Check to see if the hostname was specified correctly. If it was, consult system support. If it was not, specify the hostname correctly and run the program command again.

2651-995 **This Linux Management Server does not support AIX node *node name*.**

Explanation: The program detected an AIX node in a cluster managed that is by a Linux management server. This configuration is not supported.

User Response: Remove the AIX node from the configuration.

2652-002 **Attribute *resource attribute name* appears in request more than once.**

Explanation: The attribute name was specified more than once in the request.

User Response: Make sure that the attribute is specified only once in the request.

2652-003 **Class name *resource class name* is not recognized by this resource manager.**

Explanation: The CSMAgent Resource Manager does not recognize the named resource class as belonging to it. This is an internal error or indicates a corrupted RMC configuration.

User Response: Record the information above and

contact your software service organization.

2652-004 **Could not initialize control point for class** *resource class name*.

Explanation: The Distributed Management Server Resource Manager was unable to initialize the named resource class.

User Response: Record the information above, save IBM.CSMAgentRM trace file, and contact your software service organization.

2652-005 **Attribute** *resource attribute name* **must be specified when defining a new resource.**

Explanation: You did not specify a required attribute when you attempted to define a new resource.

User Response: Add the missing attribute and try the define operation again.

2652-006 *resource attribute value is not a valid value for attribute* *resource attribute name*.

Explanation: You gave an invalid value for the resource attribute.

User Response: Pass a valid value for the resource attribute.

2652-007 **Pre-existing ManagementServer resource found.**

Explanation: An IBM.ManagementServer resource already exists with the same Hostname and ManagerType.

User Response: Do not define duplicate resources. If needed, remove or modify existing resource and try again.

2652-008 **Unable to establish session with RMC system at host** *hostname of machine to which an RMC connection was attempted*.

Explanation: Creation of an RMC session failed.

User Response: Verify that RMC is running on the target machine and that sessions can be established.

2652-009 **Unable to determine number of pre-existing IBM.ManagementServer resources.**

Explanation: An error occurred when trying to determine the number of IBM.ManagementServer resources.

User Response: Verify that the RMC registry is not corrupted.

2652-010 **Error in invoking action on management server** *management server hostname*.

Explanation: An error occurred when invoking an action on the management server machine.

User Response: Verify RMC connectivity between management server and this node. Further error messages may be appended to this message. See the documentation for those messages if they are present.

2652-011 **Node setup already in progress - cannot perform action at this time. Try again later .**

Explanation: Only one node setup operation at a time is allowed, and one is already in progress.

User Response: Try again later.

2652-012 **Unable to determine code level of management server** *management server hostname (specific error information – optionally present)*.

Explanation: None.

User Response: Verify RMC connectivity between the management server and this node. Optional specific error message may provide more details and additional actions.

2652-013 **Error retrieving public key of local host.**

Explanation: None.

User Response: Verify that public key file exists, and is set up properly.

2652-014 **Invalid or missing parameters for action** *name of action*.

Explanation: None.

User Response: Pass the correct parameters.

2652-015 **Unable to convert ManagementServerRCP handle to pointer.**

Explanation: Failed to locate a C++ pointer from an RMC handle.

User Response: Save IBM.CSMAgentRM trace file and contact your software service organization.

2652-016 Error reading registry.

Explanation: Unable to fetch value for a resource attribute from the RMC registry.

User Response: Verify that the RMC registry is not corrupted. Save IBM.CSMAgentRM trace file and contact your software service organization.

2652-017 Error exchanging public keys with *name of management server with which the public key exchange was attempted (specific error information - optionally present).*

Explanation: An error occurred in public key exchange. Specific error information may have more details.

User Response: The optional specific error message may provide more details and additional actions. If not, save IBM.CSMAgentRM trace file and contact your software service organization.

2652-018 Error refreshing node information with *name of management server with which the refresh of information was attempted (specific error information - optionally present).*

Explanation: An error occurred in call to RequestNodeManagement in resource class IBM.NodeAuthenticate. The specific error information may have more details.

User Response: The optional specific error message may provide more details and additional actions. If not, save IBM.CSMAgentRM trace file and contact your software service organization.

2652-019 Error updating RMC acl file.

Explanation: Error in updating `ctrmc.acls` file.

User Response: Verify that the `ctrmc.acls` file is writable by root and that `/var` is not full.

2652-020 Unable to verify message from management server *name of management server that sent message.*

Explanation: When the node and management server exchange information, it may optionally be signed. This error indicates that the signature was not valid.

User Response: Restart IBM.DMSRM on the management server and wait a few minutes. If this does not resolve the problem, save IBM.DMSRM (on management server) and IBM.CSMAgentRM (on node) trace files and contact your software service organization.

2652-021 Unable to remove corresponding ManagedNode resource on *name of management server.*

Explanation: Failed to remove IBM.ManagedNode resource on the management server.

User Response: Verify that RMC on the management server machine allows queries of the IBM.ManagedNode class from this node.

2652-022 Attribute *resource attribute name* cannot be changed.

Explanation: You specified a new value for an attribute that is not editable.

User Response: None.

2652-023 Unable to determine local hostname of machine.

Explanation: None.

User Response: Verify that the local machine's host name is configured properly.

2652-024 Invalid or missing RTAS data.

Explanation: RTAS data was missing or malformed.

User Response: Verify that correct RTAS information was sent from HMC.

2652-025 Error during define of IBM.ManagementServer resource for management server at *name of management server.* See trace file for details.

Explanation: An error occurred during define of IBM.ManagementServer resource.

User Response: See IBM.CSMAgentRM trace file (`/var/ct/IW/log/mc/IBM.CSMAgentRM/trace`) for more details.

2652-026 Code level of CSM management server at *name of management server* not supported.

Explanation: Installed code level on the management server is not supported.

User Response: Upgrade CSM management server to newer level of CSM.

2652-027 Unable to determine CSM code level of management server at *name of management server.*

Explanation: None.

User Response: Verify RMC connectivity between

management server and this node, and that the code level of CSM on the management server is supported.

2652-028 **Setting of attribute *attribute name* not supported with management server at *name of management server*. Check code level of management server.**

Explanation: None.

User Response: Verify that the code levels of CSM on the management server and node are supported. Upgrade if needed.

2652-029 **Internal error in resource manager.**

Explanation: An internal error occurred in the resource manager.

User Response: Save IBM.CSMAgentRM trace file and contact your software service organization.

2652-030 **Duplicate hostname value *duplicated value in RTAS string* in RTAS information.**

Explanation: Different RTAS slots have a duplicate hostname (or IP) for an HMC.

User Response: Verify that the RTAS information is set properly, with no improper duplicated data.

2652-031 **IBM.ManagementServer resources with ManagerType of HMC can only be created internally.**

Explanation: IBM.ManagementServer resources are auto-created internally and not from external direction.

User Response: None.

2652-032 **Bad data passed at index *index of bad data* to action *name of action*.**

Explanation: Bad data was passed to action.

User Response: Verify that correct data is passed to action.

2652-033 **Action *action name* is only supported with a ManagerType of *management server type*.**

Explanation: The invoked action is not supported for the given ManagerType.

User Response: Do not invoke this action for those resources with the unsupported ManagerType.

2652-034 **Unable to determine local hostname of machine to use for management server *name of management server*. Please be sure that the management server machine is reachable from this machine.**

Explanation: Could not determine what IP address would be used to reach the management server. This would normally occur if the hostname was invalid or unreachable from the node.

User Response: Verify that the management server machine name given is correct and reachable from the node.

2652-035 **LocalHostname value of *LocalHostname value provided by define operation* cannot be reached from management server at *name of management server*.**

Explanation: The LocalHostname you provided does not appear in the list of host names by which the management server could connect to the node.

User Response: Verify that the management server machine name that was given is correct and reachable from the node.

2652-036 **Short and long hostname mismatch with management server at *name of management server*.**

Explanation: The node and the management server have different host names for each other.

User Response: Verify that the management server and the node both resolve names to the same result.

2652-037 **Some other error occurred — see trace file for results.**

Explanation: Some other error occurred.

User Response: Save IBM.CSMAgentRM trace file and contact your software service organization.

2652 – Software Maintenance System (SMS) messages (issued from node)

2652–500 **Error: Cannot unmount** *NFS mounted directory*. **Exit code:** *exit code*.

Explanation: The `/bin/umount /cmsinstall` command failed on this node.

User Response: Check to see if the NFS mount still exists. If it does, try to unmount it manually.

2652–501 **Error: Cannot resolve management server hostname.**

Explanation: The `/opt/bin/mgmtsvr` command failed.

User Response: Ensure that the command is present and working on this node.

2652–502 **Error: Command** *child command* **failed with return code** *child command return code*.

Explanation: There was an error while running the given child command.

User Response: Ensure that the command is present and working on this node.

2652–503 **Autoupdate is not installed. Please install (or reinstall) the Autoupdate RPMs.**

Explanation: None.

User Response: None.

2652 – Configuration File Manager (CFM) messages

2652-511 **Error: file** *file* **type does not match type of CFM file.** *file* **will not be updated.**

Explanation: The file types are different: perhaps one is a directory and the other is a file.

User Response: Ensure that both files are of the same type (both directories or both files).

2652-515 **This command** *command name* **reported this exit status:** *exit code*, **and this error:** *error message*.

Explanation: Command failed.

User Response: None.

2652-512 **Error: Unable to make destination directory** *directory*.

Explanation: None.

User Response: Check the permissions on the parent directory.

2652-516 **Error: cannot transfer file:** *file*. **It does not have the same owner or group as the version on the management server.**

Explanation: The user and group are not consistent with the version of the file on the management server.

User Response: None.

2652-513 **Error: Cannot close directory** *directory*.

Explanation: None.

User Response: None.

2652-517 **Error: Cannot open directory:** *directory*.

Explanation: None.

User Response: None.

2652-514 **Copy** *copy command* **reported exit code** *exit code* **and gave this error:** *error message*.

Explanation: Command failed.

User Response: None.

2653 – Installation messages

2653-021 **Could not execute the *command* that could not be executed command.**

Explanation: An error occurred when attempting to run this command.

User Response: Try running the command directly from the command line to diagnose the problem.

2653-022 **Could not find *file name* in path in which file name searched.**

Explanation: None.

User Response: Check for the specified file in the path given.

2653-023 ***file name* does not exist.**

Explanation: The file or command does not exist.

User Response: Ensure that the file can be located. Otherwise, the file may need to be installed.

2653-024 **The directory *directory name* that needs to be exported to be exported does not exist. Please check for the directory existence.**

Explanation: None.

User Response: Ensure that the directory exists.

2653-025 **An error occurred while installing CSM packages.**

Explanation: The install command failed.

User Response: Check previous error messages. Try installing packages manually.

2653-026 **An error occurred while attempting to execute the *mgmtsvr* command.**

Explanation: Could not run the *mgmtsvr* command.

User Response: Use error messages and CSM documentation to solve the problem.

2653-027 **Management server must be provided.**

Explanation: The name of the management server was not provided when the command was called.

User Response: None.

2653-028 ***directory name* that needs to be created directory needs to be created but a file exists with the same name. Move the file to another name and rerun the command.**

Explanation: None.

User Response: Rename the file name and rerun the command again.

2653-029 **The node hostname must be provided.**

Explanation: The node host name was not provided when the command was called.

User Response: None.

2653-030 **The *command* that failed command failed with a return code of *return code* (integer) of failed program or command.**

Explanation: None.

User Response: Use the return code to diagnose the error, and then issue the command again.

2653-031 **An error occurred while querying *package name*.**

Explanation: Could not check if package is installed.

User Response: If CSM failed to install properly during a full install, try issuing the **updatenode** command to install CSM.

2653-032 **Could not mount *file system* that could not be mounted.**

Explanation: Either the **mkdir** command or the **mount** command failed.

User Response: Check the previous error message to see which command failed, and perform diagnostics for that command.

2653-033 **Could not unmount *file system* that could not be mounted.**

Explanation: The **umount** command failed.

User Response: Try to unmount **/csminstall** on the remote node using **dsh**.

2653-034 **Could not remove *command* to remove from *place* to remove if from.**

Explanation: Could not remove **csmfirstboot** from **/etc/inittab**.

User Response: Try editing **/etc/inittab** directly.

2653-035 Could not find *file*.

Explanation: The specified object does not exist.

User Response: Determine why the object does not exist, create it, and then try the command again.

2653-036 Could not update *object not updated*.

Explanation: Could not update `/etc/inittab`.

User Response: Check `/etc/inittab` on the remote node.

2653-037 The internal call to *command that was called was not successful*.

Explanation: Internal called `umount` was not successful.

User Response: Try running `umount` directly on the remote node using `dsf`.

2653-038 Cannot setup remote authentication on the following unreachable nodes because they are no longer in PreManaged mode (run `updatenode -k` to setup remote authentication these nodes): *list of nodes*.

Explanation: None.

User Response: None.

2653-039 Could not create NIM script resource.

Explanation: The NIM script resource could not be created.

User Response: Check the previous error messages to determine where it failed.

2653-040 Node *hostname* has a unsupported value for InstallOSName attribute: *attribute value*.

Explanation: The `InstallOSName` is not AIX or Linux.

User Response: Run the `chnode` command to set this value to either AIX or Linux.

2653-041 The `hostname` command returns *hostname* on the following nodes: *list of nodes*. Operations will not be completed on these nodes. Please make sure each node has a unique `hostname`.

Explanation: None.

User Response: Make sure that each node reports a unique name when the `hostname` command is run.

2653-042 Linux nodes are not valid when using this command. Skipping *node name*.

Explanation: This command is only valid when using AIX nodes.

User Response: Check command usage information.

2653-043 *file that does not exist does not exist*.

Explanation: None.

User Response: None.

2653-044 Could not remove *file or directory name*.

Explanation: The `rm` command failed.

User Response: Check for the existence of the specified file, and try to remove it manually.

2653-045 Could not write to file *file name*.

Explanation: Could not open `/etc/inittab.tmp` for writing.

User Response: If CSM failed to install properly during a full install, try issuing the `updatenode` command to install CSM.

2653-046 `csm.core` package is not installed. Please install `csm.core` package first.

Explanation: In order to install the management server using the `installms` command, the `csm.core` package needs to be installed first.

User Response: Install the `csm.core` package.

2653-047 Invalid Operating System Type. Valid values are Linux or AIX.

Explanation: CSM is being run on an invalid operating system.

User Response: CSM must only be run on Linux or AIX systems.

2653-048 Command failed: *command that failed*. Error message: *error message*.

Explanation: A command that was called by *program name* had a failure while it was running.

User Response: None.

2653-049 Invalid argument to `run_cmd` subroutine: *runtype (like show_errors, ignore error)*.

Explanation: The `run_cmd` subroutine was called with invalid arguments.

User Response: Call the `run_cmd` subroutine with the necessary arguments.

2653-050 **Linux distribution, *distribution name*, is not currently supported by CSM. Supported distributions are: *list of supported Linux distribution names*.**

Explanation: The system on which you are installing CSM does not have a supported Linux distribution.

User Response: Install CSM on a supported Linux distribution.

2653-051 **rpm command package is not installed. Please install rpm command package first to get the rpm command.**

Explanation: The package or installp image that has the `rpm` command is not installed on the system.

User Response: Install the `rpm.rte` package.

2653-052 **Trouble comparing *version and release numbers that are being compared*. Eval message: *Eval message*.**

Explanation: None.

User Response: None.

2653-053 **Cannot find a version of the *rpm name* rpm with the condition operator (*like>=*)rpm version, rpm name. (This is required by first rpm is required to install second rpm).**

Explanation: None.

User Response: None.

2653-054 **Improper attr=value form.**

Explanation: The attribute=value operands provided on the command line were not correct. There might be a missing equals (=) sign, or an option might have been mistaken for an attribute. All options must come before the attributes on the command line.

User Response: Check the command's man page for the correct syntax and then rerun the command.

2653-055 **Invalid attribute: *attribute*.**

Explanation: The attribute provided on the command line is not a valid attribute for this command. See the `nodeattributes` man page for the list of valid attributes.

User Response: Check the command's man page for the correct syntax and then rerun the command.

2653-056 **Cannot provide *-c, -C, -H, -m, or -n* with *-f*.**

Explanation: The combination of options provided on the command line cannot be used together. If a `nodedef` file name is provided via the `-f` option, then the options listed in the the message cannot be provided.

User Response: Check the command's man page for the correct syntax and then rerun the command.

2653-057 **Cannot provide *-c, -f, -H, -n* or the *HWControlPoint, HWControlNodeid* or *PowerMethod* attributes with *-M*.**

Explanation: The combination of attributes and options provided on the command line cannot be used together. If the `-M` option is provided, the option and attributes listed in the message cannot be provided.

User Response: Check the command's man page for the correct syntax and then rerun the command.

2653-058 **PowerMethod attribute must be provided when using the *-H* flags.**

Explanation: The `-H` option defines the hardware control attributes of a node. Hardware control requires that the `PowerMethod` attribute is set correctly.

User Response: Rerun the command with both the `-H` option and the `PowerMethod` attribute.

2653-059 **ConsoleMethod attribute must be provided when using *-C* flag.**

Explanation: The `-C` option defines the remote console attributes of a node. Remote console requires that the `ConsoleMethod` attribute is set correctly.

User Response: Rerun the command with both the `-C` option and the `ConsoleMethod` attribute.

2653-060 **Invalid smsoption: *invalid flag*.**

Explanation: You passed an invalid option to `—smsoptions`.

User Response: Pass only options to `—smsoptions` that are designated by `updatenode -h`.

2653-061 **Cannot determine the operating system name on the Management Server.**

Explanation: There was a problem determining the running operating system, probably because it is not Linux.

User Response: Ensure that you are running a supported operating system.

2653-062 **Cannot determine the version of the distribution installed on the Management Server.**

Explanation: There was a problem determining the version of the running operating system, probably because it is not Linux. On Linux, this version is taken from the `/etc/redhat-release` file.

User Response: Ensure that you are running a supported operating system.

2653-063 **Cannot determine the name of the distribution installed on the Management server. Please set the `InstallDistributionName` attribute manually.**

Explanation: There was a problem determining the name of the distribution of the running operating system, probably because it is not Linux. On Linux, this version is taken from the `/etc/redhat-release` file.

User Response: Ensure that you are running a supported operating system.

2653-064 **Cannot determine the architecture of the Management Server. Please set the `InstallPkgArchitecture` attribute manually.**

Explanation: There was a problem determining the architecture of the machine. Probably because the machine is not running Linux. On Linux, the `name` command is run to obtain the architecture.

User Response: Ensure that you are running a supported operating system.

2653-065 **Cannot determine the CSM version installed on the Management Server.**

Explanation: There was a problem determining the version of `csm.core` that is installed on the system.

User Response: Ensure that there are no problems with the installation of `csm.core`.

2653-066 **The following nodes are already defined as `ManagedNodes`:
*space-separated list of nodes.***

Explanation: Nodes that are already defined cannot be redefined.

User Response: Rerun the command with a different set of nodes.

2653-068 **The starting console port number *port number* must be a hexadecimal digit.**

Explanation: If an esp console server is used, the port numbers are in hexadecimal format.

User Response: Rerun the program with the console port number value in hexadecimal format.

2653-069 **The following requested ports for console server *console server name* are already assigned to existing nodes:
*space-separated list of console port numbers in use.***

Explanation: Each console port for a console server can only be assigned to one node.

User Response: Rerun the program and specify a different set of console port numbers.

2653-070 ***number of nodes* nodes were specified, but only *number of console ports* console ports are available.**

Explanation: There must be enough console ports specified to accommodate all the nodes.

User Response: Rerun the command and specify more console ports. Additional console servers may be needed to provide enough console

2653-071 ***number of nodes* nodes were specified, but only *number of service processors* service processors are available.**

Explanation: There must be enough service processors specified to accommodate all the nodes.

User Response: Rerun the command and specify more service processors. Additional hardware control points may be needed to provide enough service processors for all the nodes.

2653-072 **Cannot run *command name*.**

Explanation: There was a problem when *program name* tried to run an external command.

User Response: See the error messages from the external command.

2653-073 **The Autoupdate RPM is missing from *hostname*. This means that Autoupdate is probably not installed on the nodes. Please download the Autoupdate RPM from *list of nodes* and place it in the *directory in which to copy the autoupdate rpm*.**

Explanation: None.

User Response: None.

2653-074 **File not found:** *filename*.

Explanation: A file that *program name* was expecting does not exist.

User Response: Create the file and rerun the program.

2653-075 **The nodedef file has an invalid format on line *line number*. No hostname for the contents of a line in the nodedef file.**

Explanation: A line in the **nodedef** file has a format that cannot be understood. See the **nodedef** man page for details on the nodedef file format.

User Response: Fix the format of the **nodedef** file and rerun the **definnode** command.

2653-076 **The nodedef file has an invalid attribute on line *line number*: *attribute name*.**

Explanation: Only valid attributes may be specified in the **nodedef** file. See the **nodeattributes** man page for the list of valid attributes.

User Response: Fix the attribute name in the **nodedef** file and rerun the **definnode** command.

2653-077 **Errors in nodedef file:** *filename*.

Explanation: There were some errors in the **nodedef** file. See the message that were displayed before this message for details.

User Response: Fix the **nodedef** file and rerun the **definnode** command.

2653-078 **Nodes are already defined.**

Explanation: Some nodes were already defined, and cannot be redefined. See the messages that were displayed before this message for details.

User Response: Rerun the command and specify a different set of nodes.

2653-079 **Autoupdate is not installed. Software Maintenance cannot be performed on this node.**

Explanation: None.

User Response: Consult the *IBM CSM for Linux: Planning and Installation Guide* for the location of the Autoupdate rpm.

2653-080 **Cannot assign console ports to nodes.**

Explanation: Some nodes could not have console ports assigned to them. See the messages that were displayed before this message for details.

User Response: Rerun the command and specify either a different set of nodes or a different set of console ports.

2653-081 **Cannot assign service processors to nodes.**

Explanation: Some nodes could not have service processors assigned to them. See the messages that were displayed before this message for details.

User Response: Rerun the command and specify either a different set of nodes or a different set of service processors.

2653-082 **No nodes were successfully defined.**

Explanation: None.

User Response: None.

2653-083 **Nodes were successfully defined, but there was an error installing the nodes.**

Explanation: Because the **-U** option was provided, the **definnode** command attempted to run the **updatenode** command on the nodes. This message appears if there is a failure in the **updatenode** command.

User Response: See the error messages from the **updatenode** command.

2653-084 **Could not get the list of install packages.**

Explanation: None.

User Response: If CSM failed to install properly during a full install, try issuing the **updatenode** command to install CSM.

2653-085 **An error occurred while checking CSM packages.**

Explanation: The command was not able to test the install of the required packages.

User Response: Check the previous error messages to determine the cause of the problem.

2653-086 **The **-f** flag cannot be used with the **-t** flag.**

Explanation: Usage error.

User Response: Do not specify both the **-f** and **-t** options with the **updatenode** command.

2653-087 **AIX distribution, *AIX distribution name* is not currently supported by CSM. Supported distributions are: *list of supported AIX distribution names*.**

Explanation: The system on which you are installing CSM does not have a supported AIX distribution.

User Response: Install CSM on a supported AIX distribution.

2653-088 **CSM distribution, *CSM distribution version*, is not currently supported. Supported distributions are: *list of supported CSM distributions*.**

Explanation: The system on which you are installing CSM does not have a supported CSM distribution version.

User Response: Install CSM on a system that has a supported CSM distribution version.

2653-089 **IP address *ip address* out of valid range.**

Explanation: None.

User Response: None.

2653-090 **The */etc/dhcpd.conf* file does not look correct. The line *### CSM STATIC ENTRIES* in */etc/dhcpd.conf* file could not be found. Please run *createdhcp* first, and then *updatedhcp*.**

Explanation: The */etc/dhcpd.conf* file has been changed so that the program cannot do any file editing. Most likely, the **createdhcp** command was never run.

User Response: Run the **csmsetupks** command (which runs the **createdhcp** and **updatedhcp** commands).

2653-091 **The MAC address for *ip address of node that was not defined* was not defined.**

Explanation: Could not get the MAC address.

User Response: After checking your network, try to get the MAC address again.

2653-092 **Node *node name* does not have a valid install method. The valid install methods are: *list of valid installation methods*.**

Explanation: None.

User Response: None.

2653-093 **Could not find the following prerequisite RPMs: *list of prerequisite rpms* not found.**

Explanation: Cannot find the prerequisites on the CD or in the given path.

User Response: Rerun the command with the path that contains the file.

2653-094 **ERRM did not start — continuing install of CSM anyway.**

Explanation: None.

User Response: None.

2653-095 **All nodes must have the same value for the *attribute name* attribute.**

Explanation: None.

User Response: None.

2653-096 **The *attribute name* attribute is not set for any of the nodes.**

Explanation: None.

User Response: None.

2653-097 **Invalid value for Mode attribute: *mode attribute*. Valid Mode attributes are: *list of valid Mode attributes*.**

Explanation: None.

User Response: None.

2653-098 **Could not get MAC address for *node name*.**

Explanation: Could not get the MAC address via the **getmacs** command.

User Response: Run the program again and check configurations **atftp**, **nfs**, and **console server**.

2653-100 **Node *node name* failed to reboot.**

Explanation: The node would not reboot.

User Response: Check that **rpower** works correctly.

2653-101 **There are no valid nodes given.**

Explanation: The program was not given any nodes for which to get MAC addresses.

User Response: None.

2653-102 Node: *node name* failed to power off.

Explanation: Node would not reboot.

User Response: Check that **rpower** works correctly.

2653-103 The operating system of this machine: *operating system*, does not match the value stored in the node's **InstallOSName** attribute: *attribute value*.

Explanation: None.

User Response: Set the *InstallOSName* attribute to the correct value.

2653-104 The operating system distribution of this machine: *operating system distribution*, does not match the value stored in the node's **InstallDistributionName** attribute: *attribute value*.

Explanation: None.

User Response: Set the *InstallDistributionName* attribute to the correct value.

2653-105 An error occurred when copying files to *directory name*.

Explanation: An error occurred when attempting to copy files to the */opt/csm/install* directory.

User Response: If CSM was not installed successfully during a full install of a node, run the **updatenode** command to complete the CSM installation of the node.

2653-106 Could not open *name of file*.

Explanation: The open command failed.

User Response: If CSM was not installed successfully during a full install of a node, run the **updatenode** command to complete the CSM installation of the node.

2653-107 This command may only be run on AIX systems.

Explanation: The command is not valid on a Linux system.

User Response: Check CSM documentation for command usage information.

2653-108 Cannot open *file* to add remote console lines.

Explanation: None.

User Response: None.

2653-109 An error occurred when attempting to execute *command* that produced the error.

Explanation: Could not execute the **makenode** command.

User Response: Examine the */var/log/csm/install.log* file on the remote node to determine why the command failed.

2653-110 There is no target for the **installnode** command. Please specify a target with the **-a**, **-P**, **-N** or **hostname** positional arguments.

Explanation: At least one node must be specified.

User Response: Rerun the command with the **-a**, **-P**, **-N**, or **hostnames** option.

2653-111 The following nodes have an unsupported **InstallMethod**: *comma-separated list of nodes*.

Explanation: The only supported *InstallMethod* is **kickstart**. This should have been set when the **csmsetupks** command was run.

User Response: Run the **csmsetupks** command, and then run the **installnode** command again.

2653-112 Error starting *service name* service.

Explanation: A service could not be started. See the message that were displayed before this message for details.

User Response: Start the service manually and then rerun the **installnode** command.

2653-113 Mode can only be set to **PreManaged**, **Installing**, or **Managed**.

Explanation: This is an internal error and is only displayed if there is an error during execution of the **installnode** command.

User Response: Contact IBM service or send a note to cluster@us.ibm.com.

2653-115 Not installing node *node name*.

Explanation: None.

User Response: None.

2653-116 Error running **csmsetupks**.

Explanation: There was an error when the **csmsetupks** command was run that prevents the **installnode** command from running.

User Response: If it was not run previously, run the

csmsetupks command. If the **csmsetupks** command has already been run, look for errors in **/var/log/csm/csmsetupks.log**. After the **csmsetupks** command has run successfully, run the **installnode** command again.

2653-117 Error setting up /tftpboot/pxelinux/pxe files.

Explanation: The **/tftpboot/pxelinux.cfg** directory could not be created.

User Response: Check the permissions and disk space, and then rerun the **installnode** command.

2653-118 Cannot change the mode of filename or directory to mode.

Explanation: A filename or directory's mode could not be changed with the **chmod** command.

User Response: Check the permissions of the directory and then rerun the command.

2653-119 Cannot create file filename.

Explanation: A file could not be created.

User Response: Check the permissions and disk space, and then rerun the command.

2653-120 Cannot copy file to be copied to destination directory.

Explanation: None.

User Response: None.

2653-121 Node node name is not statically defined in dhcp configuration filename (/etc/dhcp.conf).

Explanation: The node does not appear in a static stanza in the **/etc/dhcpd.conf** file. This is probably due to an error while running the **csmsetupks** command.

User Response: Look at the log file for the **csmsetupks** command (**/var/log/csm/csmsetupks.log**) and then, when the **csmsetupks** command problems have been fixed, rerun the **installnode** command.

2653-122 The following nodes had missing files: newline-separated list of node names.

Explanation: Files were not created or updated by **csmsetupks**.

User Response: Check for errors in the **csmsetupks** log (**/var/log/csm/csmsetupks.log**). Once the **csmsetupks** command runs successfully, rerun the **installnode** command.

2653-123 filename was not copied to /csminstall by installms or copycsmpkgs.

Explanation: The **installms** or **copycsmpkgs** command should have copied this file into the **/csminstall** tree.

User Response: Rerun the **installms** or **copycsmpkgs** command with the correct path and attributes, and then rerun the **installnode** command.

2653-124 Files are missing from /csminstall/csm.

Explanation: Certain files should have been copied to **/csminstall/csm** by **installnode** or **copycsmpkgs**, but those files are not in the directories.

User Response: Rerun **installms** or **copycsmpkgs** with the correct path and attributes, and then rerun the **installnode** command.

2653-125 Cannot start tftp daemon.

Explanation: The tftp daemon cannot be started.

User Response: See the messages that were displayed before this message for details.

2653-126 Cannot start dhcp daemon.

Explanation: The dhcp daemon cannot be started.

User Response: See the messages that were displayed before this message for details.

2653-127 The following nodes had a problem installing: newline-separated list of nodes.

Explanation: This is a summary of all the nodes that had problems when the **installnode** command was run.

User Response: Fix the problems (described in the messages that were displayed before this message), and then rerun the **installnode** command on the nodes that failed.

2653-128 Error initializing the status directory or status file.

Explanation: The **/csminstall/csm/status** directory (with a symbolic link to **/tftpboot/status**) could not be created, or a node's status file could not be created in that directory

User Response: Check the permissions and disk space, and then rerun the **installnode** command.

2653-129 No node defined. Error in program.

Explanation: None.

User Response: None.

2653-130 Invalid cfm option: *invalid flag*.

Explanation: You passed an invalid option to `--cfmoptions`.

User Response: Pass only options that are designated by the `updatenode -h` command to `--cfmoptions`.

2653-131 *package name prerequisite : prerequisite name is not installed.*

Explanation: None.

User Response: None.

2653-132 No Console Methods are defined in the system. At least one Console Method should be defined in `/opt/csm/bin/*_console`.

Explanation: There are no valid console methods. Remote console is not supported on this system.

User Response: Ensure that the `csm.server` package was properly installed.

2653-133 No Power Methods are defined in the system. At least one Power Method should be defined in `/opt/csm/bin/*_power` or `/opt/csm/lib` directory.

Explanation: There are no valid power methods. Hardware control is not supported on this system.

User Response: Ensure that the `csm.server` package was properly installed.

2653-134 *console method attribute is not a valid ConsoleMethod. The valid console methods are comma-separated list of valid console methods.*

Explanation: Only valid console methods may be specified with the `ConsoleMethod=attribute`.

User Response: Rerun the command using one of the valid console methods listed in the message

2653-135 *power method attribute is not a valid Power Method. The valid power methods are comma-separated list of valid power methods.*

Explanation: Only valid power methods may be specified with the `PowerMethod=attribute`.

User Response: Rerun the command using one of the valid power methods listed in the message

2653-136 Required attribute values were not found in the configuration information file for node *node name*.

Explanation: When the CSM installation scripts are executed on a cluster node, they need to get information from a configuration file in order to determine what to install on the node.

User Response: Check the configuration information file for this node which is stored in the `/csminstall/csm/config` directory. Make sure there are valid values for the attributes.

2653-137 The file or directory name **directory is missing. This probably means that xinetd is not installed.**

Explanation: None.

User Response: None.

2653-138 The operating system version of this machine: *operating system version*, does not match the value stored in the node's `InstallDistributionVersion` attribute: *attribute value*.

Explanation: None.

User Response: Set the `InstallDistributionVersion` attribute to the correct value.

2653-139 *dsh, using protocol remote shell protocol, cannot connect to target nodes.*

Explanation: None.

User Response: None.

2653-140 Error: Command *command name* failed with return code *return code (integer)*.

Explanation: None.

User Response: Try running the command manually to diagnose the problem.

2653-141 Cannot open file *file name* for writing.

Explanation: The file does not have write access.

User Response: Ensure the file has write permission for root and that there is enough disk space.

2653-142 Cannot open file *file name* for reading.

Explanation: The file does not have read access.

User Response: Change the permissions of the file so that root has read access.

2653-143 There is no target for this command. Please specify a target with the `-a`, `-P`, `-M`, `-N`, or hostname positional arguments.

Explanation: Usage error.

User Response: Check the command usage and try issuing the command again.

2653-144 Error running command *name of the command*. Reported *return code (integer)*

Explanation: None.

User Response: None.

2653-145 Redefining *condition name* condition to settings needed by CSM.

Explanation: None.

User Response: None.

2653-146 Error: Cannot open file *file name* to lock. Reported *return code*.

Explanation: Could not open a file for exclusive locking.

User Response: Ensure no other process is using the file, and that the file permissions allow the **updatenode** command to open the file.

2653-147 Another execution of *command namemay be running*. Cannot place lock on file *file name*: *return code*.

Explanation: Could not get lock on file. Another process of the **updatenode** command may be running.

User Response: Wait until the other **updatenode** command process has completed, and then run the **updatenode** command.

2653-148 Error: CFM or SMS cannot be run to nodes whose Mode is Premanaged.

Explanation: Usage error.

User Response: If you want to run CFM to a node whose *Mode* is **Premanaged**, you must install CSM on the node first. Run the **updatenode -PIF** command.

2653-149 An error occurred when setting up CSM installation and configuration files.

Explanation: Some part of the setup that was required on the management server did not complete successfully.

User Response: Check the previous message to determine the specific problem.

2653-150 An error occurred when attempting to start NFS.

Explanation: None.

User Response: Check the previous message to determine the problem.

2653-151 An error occurred when attempting to export `/csminstall`.

Explanation: None.

User Response: Check the previous message to determine the problem.

2653-152 An error occurred when attempting to execute DSH.

Explanation: The **dsh** command failed.

User Response: Try running the **dsh** command directly on the node to diagnose the problem.

2653-153 Could not create configuration information files.

Explanation: Configuration information files need to be created in **/csminstall/csm/config** to provide information to the node during installation.

User Response: Check the permissions and disk space, and then rerun the command.

2653-154 Could not create node name mapping file.

Explanation: Could not create the **/csminstall/csm/config/nodemap** file.

User Response: Check the previous message to determine the problem.

2653-155 Could not find `updatenode.client` script.

Explanation: The **/csminstall/csm/updatenode.client** file does not exist and could not be copied from **/opt/csm/csmbin**.

User Response: Make sure this script is copied to **/csminstall/csm** and try issuing the command again.

2653-156 **Could not get hostname as known by the management server.**

Explanation: The node's host name could not be found in the `/csminstall/csm/config/nodemap` file.

User Response: Ensure that the file exists.

2653-157 **Could not get node attribute values from the node config_info file.**

Explanation: None.

User Response: Check previous messages to determine why the file could not be read.

2653-158 **Could not create *directory name* directory.**

Explanation: The `mkdir` command file.

User Response: Try running the `mkdir` command directly to diagnose the problem.

2653-159 **Could not copy the *original file* file to *destination file*.**

Explanation: The copy command failed.

User Response: If CSM failed to install properly during a full install, try issuing the `updatenode` command to install CSM.

2653-160 **The following nodes are not defined: *comma-separated list of nodes*.**

Explanation: Shows the list of nodes that were not successfully defined.

User Response: Fix the problems (listed above) and run the `definnode` command again to define the nodes that were not defined.

2653-161 **Cannot use `-x` with `-p` option.**

Explanation: The `-x` and `-p` options should not be used together. The `-x` option specifies not to copy packages, while the `-p` option specifies to copy them from a path.

User Response: Rerun the program and specify `-x` or `-p`, but **not both** `-x` and `-p`.

2653-162 **`eth0` not up and running on Management Server.**

Explanation: None.

User Response: None.

2653-163 **There is no target for the `csmsetupks` command. Please specify a target with the `-a`, `-P`, `-N` or `-n` flags.**

Explanation: At least one node must be specified.

User Response: Rerun the command with one of the following options: `-a`, `-P`, `-N`, `-n`.

2653-164 **Cannot copy *source file name* to *target filename*. *return code*.**

Explanation: There was a problem copying a file.

User Response: Check the permissions and disk space, and then rerun the command.

2653-165 **Skipping *pathname*. This directory does not look like it contains the contents of a Red Hat CD-ROM.**

Explanation: The `csmsetupks` command attempts to verify that a directory contains a copy of the Red Hat CD-ROMs. The directory must contain the Red Hat/RPMS subdirectory, in which the RPM packages are stored.

User Response: Check that the path is correct, and then rerun the command.

2653-166 **None of the directories had anything to copy (`PKGPATH= colon-separated list of pathnames`).**

Explanation: Nothing was copied. Either all the directories were empty, or none of them looked like Red Hat CD-ROMs.

User Response: Check that the path is correct, and the rerun the command.

2653-167 **Error while copying the Red Hat images.**

Explanation: The Red Hat packages could not be copied.

User Response: Make sure the path is correct and that you have enough disk space to hold all the images. You need about 1.5GB to hold the contents of the Red Hat disks.

2653-168 **Error setting up PXE.**

Explanation: The `/tftpboot/pxelinux.cfg` directory could not be created.

User Response: Check the permissions and disk space, and then rerun the `csmsetupks` command.

2653-169 Error getting MAC addresses.

Explanation: The MAC addresses of one or more nodes could not be obtained, either through **dsh**, or by running the **getmacs** command.

User Response: See the messages that were displayed before this message for details. Rerun the **csmssetupks** command to attempt to get the MAC addresses of the nodes again.

2653-170 Error setting up Kickstart configuration file.

Explanation: One or more of the following failures could have occurred:

- The Kickstart kernel was not found in the **images/pxeboot/vmlinux** directory within the path provided by the **-p** option, or was not found on the CD-ROM.
- The Kickstart ramdisk was not found in the **images/pxeboot/initrd.img** directory within the path provided by the **-p** option, or was not found on the CD-ROM.
- Failure to create files in **/tftpboot/pxelinux.cfg**
- Failure to create the kickstart configuration files, possibly if the template file is not found in **/opt/csm/install/kscfg.tmpl**.

User Response: Ensure that the path provided with the **-p** option contains a full copy of the Red Hat CD-ROMs. Ensure the kickstart template file exists and is in the correct format. Rerun the **csmssetupks** command after fixing the problems.

2653-171 Error running updatedhcp.

Explanation: Could not add static node stanzas to the **/etc/dhcpd.conf** file.

User Response: See the messages that were displayed before this message for details. Rerun the **csmssetupks** command to get the nodes added to the **/etc/dhcpd.conf** file.

2653-172 Error setting InstallMethod attribute to "kickstart".

Explanation: The *InstallMethod* attribute for one or more managed nodes could not be set to **kickstart**. If the attribute is not set to **kickstart**, then the **installnode** command will not allow the node to be installed.

User Response: Try setting the *InstallMethod* attribute to **kickstart** manually using the **chnode** command. If this works, there is no need to rerun the **csmssetupks** command.

2653-173 The IP address of node *node name* is not found in the **/etc/dhcpd.conf file.**

Explanation: You tried to run the **getmacs** command without running the **createdhcp** command first.

User Response: Make sure the node is defined, and then run the **createdhcp** command. Check the **/etc/dhcpd.conf** file and make sure there is an entry with the IP address of this node included in a range.

2653-175 No nodes provided.

Explanation: No nodes were provided to the **definnode** command.

User Response: Rerun the command with the **-n** option.

2653-176 The program was terminated by the user.

Explanation: The program was unexpectedly interrupted by the user.

User Response: Run the program again.

2653-177 Cannot assign the same *attribute name* to more than one node.

Explanation: Some attributes can only be applied to a single node at a time because multiple nodes cannot have the same value for these attributes.

User Response: Rerun the command and only specify a single node to define.

2653-178 Cannot provide ConsolePortNum, ConsoleServerNumber, or ConsoleServerName attributes with **-C.**

Explanation: The **-C** option sets the node's *ConsolePortNum*, *ConsoleServerNumber*, and *ConsoleServerName* attributes automatically, so these attributes should not be provided with the **-C** option.

User Response: Run the command again and do not provide the listed attributes with the **-C** option.

2653-179 Cannot provide HWControlPoint attribute with **-H.**

Explanation: The **-H** option sets the node's *HWControlPoint* attribute automatically, so *HWControlPoint* should not be provided with the **-H** option.

User Response: Rerun the command and do not provide both the *HWControlPoint* attribute and the **-H** option together.

2653-180 Cannot delete directory or file *file* or *directory name*.

Explanation: None.

User Response: None.

2653-181 Cannot erase rpm package *rpm package name*.

Explanation: None.

User Response: None.

2653-182 Cannot uninstall installp package *install package name*.

Explanation: None.

User Response: None.

2653-183 The hostname map file has no hostname on line *line number*.

Explanation: None.

User Response: Add the host name to each line of the hostname map file, and then rerun the `definenode` command.

2653-184 Errors in hostname map file: *filename*.

Explanation: This message appears after more detailed messages have already been displayed. Refer to the prior messages for details.

User Response: Fix the errors in the hostname map file and rerun the `definenode` command.

2653-185 Could not get the CSM version from the system. Please supply the valid CSM version attribute value or please install `csm.core` package first.

Explanation: None.

User Response: None.

2653-186 `/csminstall` cannot be used as an install server directory. Please change the `InstallServer` attribute for this node: *node hostname* (and for any other nodes with `/csminstall` in the `InstallServer` attribute.)

Explanation: None.

User Response: None.

2653-187 The *required rpm name* RPM is required, but *installed rpm name* is installed. Remove *installed rpm name* and run `installms -x`.

Explanation: None.

User Response: None.

2653-188 Skipping to the next valid header.

Explanation: An error was found in a node definition stanza contained in a node definition file. The `definenode` command will skip to the next valid stanza header.

User Response: Correct the error in the node definition file and check the related node definition for accuracy.

2653-189 Node *node name* appears in multiple stanzas. It will not be defined.

Explanation: Multiple stanzas for the same node definition were found in the node definition file.

User Response: Edit the node definition file to remove extra stanzas.

2653-190 No definition files to load in *directory*.

Explanation: CSM commands need to load definition files, depending on the operating system, distribution, level, and so on. This error appears if no definition files match the configuration.

User Response: None.

2653-191 Cannot remove the members of the node group.

Explanation: None.

User Response: None.

2653-192 Cannot remove node group from the system.

Explanation: None.

User Response: None.

2653-193 Cannot use the `-a` flag together with the `-N` flag.

Explanation: The `-a` option indicates all groups and the `-N` option is used to specify a list of group names.

User Response: Chose either the `-a` option or the `-N` option, and then rerun the command.

2653-194 This command may only be run on an AIX management server.

Explanation: The command being executed is only intended to run on CSM management servers that are installed with the AIX operating system.

User Response: Refer to the man page for the command, or *IBM CSM for Linux: Command and Technical Reference*.

2653-195 Either the `-a` or `-N` flag must be specified.

Explanation: This command requires that either the `-a` or `-N` option be specified.

User Response: Check the command usage and then rerun the command.

2653-196 An invalid format was used on the command line.

Explanation: Invalid format was used on the command line.

User Response: Check the command usage and then rerun the command.

2653-197 Could not get list of NIM groups.

Explanation: The command to list NIM groups did not succeed.

User Response: Check NIM documentation for proper command usage and/or diagnostic information.

2653-198 An invalid group name *group name* was provided on the command line.

Explanation: A group name provided on the command line was not a valid CSM group.

User Response: Check for valid groups and rerun the command.

2653-199 Incorrect arguments were used when calling this command.

Explanation: The arguments supported by this command were not used correctly.

User Response: Check the command usage and then rerun the command.

2653-200 Either the *cable_type* or *ring_speed* must be provided.

Explanation: This command requires that either the *ring_speed* or *cable_type* attributes be provided.

User Response: Check the command usage and then rerun the command.

2653-201 There is no target for the `csm2nimnodes` command.

Explanation: Target node names could not be resolved from the command line input.

User Response: Check the command usage and then rerun the command.

2653-202 An invalid value was specified for the *attribute name* attribute.

Explanation: The value given for the specified attribute was not valid.

User Response: See the man page for the command, or *IBM CSM for Linux: Command and Technical Reference*, and then rerun the command.

2653-203 The value of the *attribute name* attribute for node *node name* is missing.

Explanation: The value for the specified attribute in the CSM node definition is not set.

User Response: Set the required attribute and then rerun the command.

2653-204 Could not get list of NIM clients.

Explanation: The command to list NIM clients did not succeed.

User Response: Check the NIM documentation for proper command usage and/or diagnostic information.

2653-205 Node *node name* is its own management server, therefore it does not need an install server and it will use its own CSM files for install.

Explanation: IMPORTANT NOTE: the management server will not use files from an install server.

User Response: Set the *InstallServer* attribute for the management server node to an empty string.

2653-206 `dsh`, using protocol *remote shell* protocol cannot connect to nodes: *node names*.

Explanation: None.

User Response: None.

2653-207 Remote Shell setup failed on nodes *nodes*.

Explanation: The command was trying to set up remote authentication on the given nodes, and it failed.

User Response: Set up remote authentication on the management server manually for the failed nodes.

2653-208 Remote Shell setup failed on the management server. The install of the nodes will continue anyway.

Explanation: The command was trying to set up remote authentication on the management server, and it failed.

User Response: Set up remote authentication of the management server manually.

2653-209 Directory *directory name* has invalid permissions for Remote Shell Setup. Please ensure the write bits for both group and other are turned off.

Explanation: None.

User Response: None.

2653-210 InstallPkgArchitecture attribute must be provided.

Explanation: None.

User Response: None.

2653-211 InstallDistributionName attribute must be provided.

Explanation: None.

User Response: None.

2653-212 InstallDistributionVersion attribute must be provided.

Explanation: None.

User Response: None.

2653-213 The *name of the flag* flag can only be used on a Linux machine.

Explanation: None.

User Response: Run the command again without the Linux-only option.

2653-214 Installation of CSM was unsuccessful (*rc = return code of installation*).

Explanation: None.

User Response: See the error messages that are displayed for the actions to take.

2653-215 Could not get lists of customization scripts.

Explanation: When creating the configuration information files for the nodes, it was not possible to get a list of user-provided customization scripts.

User Response: To debug the problem, check the error messages for the command that you issued.

2653-216 The directory *directory name* does not exist. Skipping to the next directory.

Explanation: None.

User Response: Determine why the directory does not exist and run the command again, if it is appropriate.

2653-217 Skipping to the next script name.

Explanation: A problem was found with the current script name being processed.

User Response: Check the previous error message to debug the problem.

2653-218 *script name* is not executable.

Explanation: The user-provided customization script is not executable.

User Response: Make the script executable and run the command again, if it is appropriate.

2653-219 An incorrect file name format was used for the script *script name*. *target name*

Explanation: The target part of the script name was not a node name or group name.

User Response: Correct the script name and run the command again, if it is appropriate.

2653-220 Cannot use the `-c` flag when multiple nodes or a node range are specified with the `-n` flag.

Explanation: If the node list that is specified with the `-n` flag has more than one node or a node range, the `-c` flag cannot be used.

User Response: Run the command again and do not use both the `-c` flag and a node list or node range of more than one node with the `-n` flag.

2653-221 No target specified for this command. Please specify a target with the `-f` or `-n` option.

Explanation: Usage error.

User Response: Check the command usage and try running the command again.

2653-222 Cannot perform this command on the following nodes whose Mode is *MinManaged* string: *node hostnames*.

Explanation: None.

User Response: None.

2653-223 This machine: *hostname*, is not defined as an install server for any nodes. Run "*!snode -a InstallServer*" for a list of all defined install servers.

Explanation: None.

User Response: Do not specify this host name on the command line.

2653-224 None of the given machines either are install servers, or have install servers defined. Run "*!snode -a InstallServer*" for a list of all defined install servers.

Explanation: None.

User Response: None.

2653-225 The node *node name* is the management server. The *HWControlPoint*, *HWControlNodeld* and *PowerMethod* attributes cannot be assigned to a node that is the management server.

Explanation: None.

User Response: None.

2653-226 The following rpms could not be found: *list of rpms not found*.

Explanation: None.

User Response: Check in the *installsm* path or */csminstall* path for the RPM packages. If you do not find them, provide the path with the RPM packages to the command.

2653-227 The following file sets are not found: *list of the file sets not found*.

Explanation: None.

User Response: Check in the *installsm* path or */csminstall* path for the RPM packages. If you do not find them, provide the path with the RPM packages to the command.

2653-228 *script name* is not a valid customization script name.

Explanation: The customization script name was not in the correct format.

User Response: Correct the script name and run the command again, if it is appropriate.

2653-301 The *file or directory name* file is missing. This probably means that *inetd* is not installed.

Explanation: None.

User Response: None.

2653-302 Error running *csmssetupsis*.

Explanation: There was an error when the *csmssetupsis* command was run that prevents the *installnode* command from running.

User Response: Run the *csmssetupsis* command, if it was not run previously. If it was run previously, look for errors in */var/log/csm/csmssetupsis.log*. After the *csmssetupsis* command runs successfully, run the *installnode* command again.

2653-303 There is no target for the *csmssetupsis* command. Please specify a target with the *-a*, *-P*, *-N* or *-n* flags.

Explanation: You must specify at least one node.

User Response: Run the command again with one of the following options: *-a*, *-P*, *-N*, *-n*.

2653-304 Error setting up SIS configuration file.

Explanation: One or more of the following failures could have occurred:

- The SIS kernel was not found within the path provided by the *-p* option, or was not found on the CD-ROM.
- The SIS ramdisk was not found within the path provided by the *-p* option, or was not found on the CD-ROM.
- Failure to create files in */tftpboot/pxelinux.cfg*.
- Failure to create the SIS configuration files.

User Response: Ensure that the path provided with the *-p* option contains a full copy of the Linux CD-ROMs. After you fix the problems, run the *csmssetupsis* command again.

2653-305 Cannot use *-A* with *-I* option.

Explanation: The *-A* and *-I* options do not make sense together.

User Response: Run the program again and specify

either **-A** or **-I**, but not both.

2653-306 Must specify either **-A or **-I** option.**

Explanation: The **-A** and **-I** options cannot be specified together.

User Response: Run the program again and specify either **-A** or **-I**, but not both.

2653-307 Error creating sis script files.

Explanation: None.

User Response: None.

2653-308 Skipping a pathname that was provided with the **-p flag. This directory does not look like it contains the contents of a SuSE CD-ROM.**

Explanation: None.

User Response: None.

2653-309 Error when making boot server.

Explanation: None.

User Response: None.

2653-310 Pxe daemon did not start up successfully.

Explanation: None.

User Response: None.

2653-311 Error when changing pxe command.

Explanation: None.

User Response: None.

2653-312 Error adding new image.

Explanation: None.

User Response: None.

2653-313 Error creating image script.

Explanation: None.

User Response: None.

2653 – CLOG messages

2653-800 Internal library error error code. Optional extended error message

Explanation: An internal error occurred in the CLOG library.

User Response: Record the above information, save

2653-315 Error while copying the RPM packages.

Explanation: The RPM packages that were needed could not be copied.

User Response: Ensure the path is correct and that you have enough disk space to hold all the RPM packages (approximately 1.5GB).

2653-316 This command can only be run on the Management Server.

Explanation: None.

User Response: None.

2653-317 The conserver rpm must be 7.2.2-6 or higher. Copy the correct level of the rpm into *directory name* and run **installms -x.**

Explanation: None.

User Response: None.

2653-318 The fstab file has an invalid format.

Explanation: None.

User Response: None.

2653-319 The network type *valid network type* specified in config file *dhcp* or *static* is invalid.

Explanation: None.

User Response: None.

2653-320 Error defining partition table with the image.

Explanation: None.

User Response: None.

2653-321 Error while configuring the image based on the config file and distribution.

Explanation: None.

User Response: None.

the applications trace file, and contact your software service organization.

2653-801 Memory allocation error

Explanation: Memory could not be allocated in the CLOG library.

User Response: None.

2653-802 Unable to start RMC session.

Explanation: Could not establish an RMC connection to the Resource Monitoring and Control daemon (ctrmc).

User Response: Ensure that the ctrmc daemon is running and allows connections from the user running this program.

2653-803 IBM.AuditRM connection error.

Explanation: Could not establish an RMC connection to the Resource Monitoring and Control daemon (ctrmc).

User Response: Ensure that IBM.AuditRM is running and allows connections from the user running this program.

2653-804 Unable to fetch nodes ID.

Explanation: Could not fetch the node ID of this machine.

User Response: Ensure that you have sufficient permissions when running this program and that the node ID of the machine is set.

2653-975 Bad, missing, or unusable clogger command.

Explanation: The `/opt/csm/bin/csmbin/clogger` command is bad, missing, or unusable.

User Response: Ensure that `/opt/csm/bin/csmbin/clogger` is installed, has correct permissions, and runs.

2653-976 Internal error *parameter name* in CLOG.pm.

Explanation: An internal error occurred in `CLOG.pm` module.

User Response: Record the above information and contact your software service organization.

2653-977 Invalid parameter *parameter name*.

Explanation: An invalid parameter was passed.

User Response: None.

2653-978 Missing parameter *parameter name* - may not be present.

Explanation: A required parameter was not passed.

User Response: None.

2655 – Domain Management Server messages

2655-001 **Attribute** *resource attribute name* **cannot be specified when defining a new resource.**

Explanation: You specified an attribute that is not valid when a resource is defined.

User Response: Remove this attribute from the define resource call.

2655-002 **Attribute** *resource attribute name* **appears in request more than once.**

Explanation: The attribute name was specified more than once in the request.

User Response: Make sure that the attribute is specified only once in the request.

2655-003 **Class name** *resource class name* **is not recognized by this resource manager.**

Explanation: The Distributed Management Server resource manager does not recognize the named resource class as belonging to it. This is an internal error or indicates a corrupted RMC configuration.

User Response: Record the information above and contact your software service organization.

2655-004 **Could not initialize control point for the class** *resource class name*.

Explanation: The Distributed Management Server resource manager was unable to initialize the named resource class.

User Response: Record the information above and contact your software service organization.

2655-005 **Attribute** *resource attribute name* **must be specified when defining a new resource.**

Explanation: A required attribute was not specified when you attempted to define a new resource.

User Response: Add the missing attribute and try the define operation again.

2655-006 **A node with the hostname** *hostname of the node* **already exists.**

Explanation: The host name of each node must be unique. As a result, you cannot specify a host name that is assigned to an existing node.

User Response: Provide a unique host name.

2655-007 **An error occurred when trying to create a node hardware control resource.**

Explanation: There were problems in creating a node hardware control resource. The log entries preceding this entry should provide more information about this problem.

User Response: Record the log entries and contact your software service organization.

2655-008 **An error occurred during a rollback operation when recovering from a previous error. There will be a data inconsistency problem.**

Explanation: There were problems during a rollback operation. The error log entries prior to this entry can be used to diagnose the problem.

User Response: Record the log entries and contact your software service organization.

2655-009 **An error occurred when trying to remove a node hardware control resource.**

Explanation: There were problems in removing a node hardware control resource. The log entries preceding this entry should provide more information about this problem.

User Response: Record the log entries and contact your software service organization.

2655-010 **An error occurred when trying to update a node hardware control resource.**

Explanation: There were problems when updating a node hardware control resource. The log entries preceding this entry should provide more information about this problem.

User Response: Record the log entries and contact your software service organization.

2655-011 **Incorrect number of elements in input for converting a premanaged node to a managed node.**

Explanation: The required number of elements are not provided for converting a premanaged node to a managed node.

User Response: Provide the correct number of input elements.

2655-012 **Incorrect datatype for the elements in input for converting a premanaged node to a managed node.**

Explanation: The data type of input elements is not correct.

User Response: Provide input elements with the correct data type.

2655-013 **A node group with name *NodeGroup* name already exists.**

Explanation: An existing node group has the same name as the node group you specified.

User Response: Provide a unique name to the node group.

2655-014 **ValidateNodes attribute value should be 1 or 0.**

Explanation: The value assigned to the *ValidateNodes* attribute must be with 1 or 0.

User Response: Specify either 1 or 0 as the value for the *ValidateNodes* attribute.

2655-015 **Duplicate member names in list.**

Explanation: The *MemberList* node group resource attribute contains members that are repeated more than once.

User Response: Make sure that a value appears only once in the member list.

2655-016 **The select string specified for the node group could not be validated. Please check the select string syntax.**

Explanation: The select string does not have a valid syntax.

User Response: Provide a valid select string. Refer to *IBM RSCT for Linux: Technical Reference* for more information about the select string syntax.

2655-017 **Both MemberList and SelectStr attributes cannot be specified for the same node group.**

Explanation: A node group can be based on either a select string or a member list, but not both.

User Response: Provide either the *MemberList* attribute or the *SelectStr* attribute, but not both, for a node group.

2655-018 **Unable to define the node group because a row could not be added to the CSM Database.**

Explanation: There were problems when updating the database with the node group information.

User Response: Verify that the database is accessible on the management server machine.

2655-019 **The node group cannot be removed because it is a member of another NodeGroup.**

Explanation: You specified a node group that was a member of another node group.

User Response: Before attempting to remove the node group, make sure that it is not a member of any other node group.

2655-020 **Unable to remove node group *Node group name* because the CSM database could not be updated.**

Explanation: There were problems when updating the database with the node group information.

User Response: Verify that the database is accessible on the management server machine.

2655-021 **Unable to remove node group *node group name* because the CSM database could not be updated.**

Explanation: There were problems when updating the database with the node group information.

User Response: Verify that the database is accessible on the management server machine.

2655-022 **The member name *Node* or *Nodegroup* specified as part of the MemberList is not a valid node.**

Explanation: That *ValidateNodes* attribute was set for the node group, and the member you specified was not a node in the cluster.

User Response: Make sure that the member is a valid node in the cluster.

2655-023 **The NodeGroup *NodeGroup name* cannot be added as a member of the node group because it leads to cyclic dependency between the node groups.**

Explanation: None.

User Response: Do not attempt to add the node group to this node group.

2655-024 **The ValidateNodes attribute is not set for node group *Node Group name*, so it cannot be added as a member of the node group for which the ValidateNodes attribute is set.**

Explanation: If the *ValidateNodes* attribute is set for a node group, then any node group added to its member list must have its *ValidateNodes* attribute set.

User Response: Do not attempt to add a node group that does not have its *ValidateNodes* attribute set to this node group.

2655-025 **Unexpected error in method *method name*.**

Explanation: There were errors in the method. The log entries preceding this entry should provide more information about this problem.

User Response: Record the log entries and contact your software service organization.

2655-026 **MemberList attribute cannot be specified for the node group because the SelectStr attribute is set.**

Explanation: None.

User Response: Before attempting to set the *MemberList* attribute, set the *SelectStr* attribute to an empty string.

2655-027 **SelectStr attributes cannot be specified for the node group because the MemberList attribute is set.**

Explanation: None.

User Response: Before attempting to set the *SelectStr* attribute, set the *MemberList* attribute to have no members.

2655-028 **Incorrect number of fields in input to action *action name*.**

Explanation: The required number of elements are not provided for the action.

User Response: Provide the correct number of input elements.

2655-029 **Incorrect datatype for the elements in input to action *action name*.**

Explanation: The data type of input elements is not correct.

User Response: Provide input elements with the correct data type.

2655-030 **At least one of the member names in input list already exists in the node group current member list.**

Explanation: One or more members of the input list is already a member of the node group.

User Response: Make sure that none of the member names in the input list is an existing member of the node group.

2655-031 **Number of nodes in the domain exceeded the maximum limit of *maximum number of nodes allowed in the domain*. Node was not defined to the management domain.**

Explanation: None.

User Response: Either remove an existing node before adding this node, or purchase a version of CSM that allows a higher scaling limit.

2655-032 **A node with the specified node identifier exists in the management domain.**

Explanation: None.

User Response: None.

2655-033 **Unable to select the node resource to be updated because there are two ManagedNode resources; one matching the hostname and the other matching the specified universal id.**

Explanation: None.

User Response: None.

2655-034 **Unable to select the node resource to be updated because the ManagedNode resource matching the specified hostname has an universal id that is different from the specified universal id.**

Explanation: None.

User Response: None.

2655-035 **Hostname attribute value specified for the node is not valid.**

Explanation: The *Hostname* attribute value must be a nonzero length string.

User Response: Provide a valid value for the *Hostname* attribute.

2655-036 An error occurred when updating the distributed domain information in the RMC subsystem.

Explanation: There were problems when updating the node or node group information that belongs to the distribute domain.

User Response: Record the information above and contact your software service organization.

2655-037 An error occurred when updating the CSM database.

Explanation: There were problems when updating the database.

User Response: Verify that the database is accessible on the management server machine.

2655-038 An error occurred when verifying the validity of the request from the node.

Explanation: There were problems when verifying that the node is allowed to make a request to manage the management server. The log entries preceding this entry should provide more information about this problem.

User Response: Record the log entries and contact your software service organization.

2655-039 The exchange of public key between the node and the management server is not allowed.

Explanation: The node is not allowed to make a request to exchange the public key with the management server. At least one of the following three conditions must be satisfied to allow the public key exchange:

- There must be a premanaged node whose host name matches the host name of the node that is making the request.
- The *AddUnrecognizedNode* attribute must be set.
- If a managed node exists with the same host name as the node that is making the request, the *AllowManageRequest* attribute should be set.

User Response: Make sure that at least one of the condition mentioned in the explanation above is satisfied.

2655-040 An error occurred when storing the public key of the node *node name* to the trusted host list file on the management server.

Explanation: There were problems when attempting to store the node's public key in the trusted host list file on the management server.

User Response: Record the log entries and contact your software service organization.

2655-041 An error occurred when retrieving the public key of the management server.

Explanation: There were problems in obtaining the public key of the management server machine.

User Response: Record the log entries and contact your software service organization.

2655-042 An error occurred when preparing the response.

Explanation: There were problems in preparing a response to an action request. This is an internal error.

User Response: Record the log entries and contact your software service organization.

2655-043 The management server is not authorized to accept the manage request from node *node name*.

Explanation: The node is not allowed to make the request to the management server. At least one of the following three conditions must be satisfied for the management server to accept the node's request:

- There must be a premanaged node with the hostname matching the host name of the node making the request.
- The *AddUnrecognizedNode* attribute must be set.
- If a managed node exists with the same hostname as the node making the request, the *AllowManageRequest* attribute should be set.

User Response: Make sure that at least one of the conditions mentioned in the explanation above is satisfied.

2655-044 Create or Update of the node resource failed.

Explanation: There were problems when creating or updating a managed node. The log entries preceding this entry should provide more information about this problem.

User Response: Record the log entries and contact your software service organization.

2655-045 An error occurred when creating the message signature.

Explanation: None.

User Response: None.

2655-046 An error occurred when verifying the message signature.

Explanation: None.

User Response: None.

2655-047 An error occurred when initializing the logging facility. The return code was *return code* and the error message was *error message*.

Explanation: None.

User Response: None.

2655-048 An error occurred when initializing the logging facility. The return code was *return code*.

Explanation: None.

User Response: None.

2655-049 The following error message was returned by function *function name*: *error message*.

Explanation: None.

User Response: None.

2655-050 Invalid input to action.

Explanation: None.

User Response: None.

2655-051 Unable to set RMC subsystem as a distinguished daemon. Return code is *return code*.

Explanation: None.

User Response: None.

2655-052 Failed to remove ManagementServer resource entry on node *node name*.

Explanation: None.

User Response: None.

2655-053 The *SelectStr* attribute can be specified for a node group only if the *ValidateNodes* attribute is set to 1.

Explanation: None.

User Response: Make sure that the *ValidateNodes* attribute is set to 1 for the node group.

2655-054 *AddUnrecognizedNode* attribute value should be 1 or 0.

Explanation: The value assigned to *AddUnrecognizedNode* attribute must be either 1 or 0.

User Response: Specify either 0 or 1 as value for the *AddUnrecognizedNode* attribute.

2655-055 The valid values for *AllowManageRequest* attribute are 0 or 1.

Explanation: The value assigned to *AllowManageRequest* attribute must be 0 or 1.

User Response: Specify 0 or 1 as value for the *AllowManageRequest* attribute.

2655-056 The member name *node group name* specified as part of the *MemberList* is not a valid node group.

Explanation: The member you specified was not an existing node group.

User Response: Ensure that the member is an existing node group.

2655-057 Could not find a resource corresponding to this management server on the node.

Explanation: None.

User Response: Ensure that the node is managed by this management server.

2655-058 The value provided to the *RemoteShell* attribute is not valid. Please provide a string that is not empty.

Explanation: The value assigned to the *RemoteShell* attribute must be a nonzero length string.

User Response: Specify a nonzero length string as the value for the *RemoteShell* attribute.

2655-059 *SetupRemoteShell* attribute should be 1 or 0.

Explanation: The value assigned to the *SetupRemoteShell* attribute must be 1 or 0.

User Response: Specify either 1 or 0 as the value for the *SetupRemoteShell* attribute.

2655-060 Unable to retrieve the hostname of the node or the management server name as known to the node.

Explanation: None.

User Response: None.

2655-061 **Obtained a license for CSM. The scaling limit is set to *scaling limit*.**

Explanation: None.

User Response: None.

2655-062 **The license expiration date is *expiration date*.**

Explanation: None.

User Response: None.

2655-063 **Could not obtain license for CSM. The scaling limit is set to *scaling limit*.**

Explanation: None.

User Response: None.

2655-064 **Unable to list the nodes in the domain because the license has expired.**

Explanation: None.

User Response: Obtain and enroll a valid CSM license to list the nodes in the cluster.

2655-065 **Registry Synchronization Delay value should be greater than 0 and less than 60.**

Explanation: The value assigned to the *RegSyncDelay* attribute must be between 0 and 60.

User Response: None.

2655-066 **Heartbeat frequency value should be greater than 0 and less than 900.**

Explanation: The value assigned to the *Frequency* attribute must be between 1 and 900.

User Response: None.

2655-067 **Heartbeat sensitivity value should be greater than 1 and less than 100.**

Explanation: The value assigned to the *Sensitivity* attribute must be between 2 and 100.

User Response: None.

2655-200 **Bad or missing parameters to invocation of class action.**

Explanation: None.

User Response: None.

2655-201 **Node was not authenticated — action ignored.**

Explanation: None.

User Response: None.

2655-202 **Unable to update RMC acl file.**

Explanation: None.

User Response: None.

2655-203 **Unable to store the public key of the node.**

Explanation: None.

User Response: None.

2655-204 **Memory allocation error while preparing action response.**

Explanation: None.

User Response: None.

2655-205 **Input to NodeHwCtrl resource class action, *powerAction*, is not valid.**

Explanation: NodeHwCtrl resource class action, *powerAction* requires structure data input elements:

- [0] string specifying the action to be performed
- [1] array of strings to perform action again
- [2] integer to turn debugging on (1) or off (0)

User Response: Ensure that the proper structured data members are passed into the action.

2655-206 **Could not find hardware control point for the node.**

Explanation: None.

User Response: None.

2655-207 **Could not load hardware control library.**

Explanation: None.

User Response: None.

2655-208 **Could not perform action because one or more node attributes HWControlPoint, HWControlNodeid or PowerMethod are not set.**

Explanation: The node attributes *HWControlPoint*, *HWControlNodeid* and *PowerMethod* must be defined to perform the power action.

User Response: Use the **chnode** command to add

valid values to the node object for *HWControlPoint*, *HWControlNodeId* and *PowerMethod* if the node is capable of power control.

2655-209 **Hostname attribute value specified for the node is not valid.**

Explanation: The *Hostname* attribute value must be a nonzero length string.

User Response: Provide a valid value for the *Hostname* attribute.

2653 – Probe Manager messages

2655-400 **There was an error executing: name of command that failed.**

Explanation: A program could not be run.

User Response: The program may not be in the correct path, doesn't exist, or does not have the correct permission to run.

2655-401 **file name or program name does not appear to be installed on this system.**

Explanation: The image is not installed.

User Response: The image needs to be installed in order for this to pass successfully.

2655-402 **daemon name (IBM.DMSRM) does not appear to be active, try running /bin/startsrc -s IBM.DMSRM.**

Explanation: None.

User Response: In order for DMSRM to be running, it needs to be active. Try changing the DMSRM state to active.

2655-403 **There was an error executing program name.**

Explanation: None.

User Response: Check that the path is correct, that the program is readable at that location, and that the program exists.

2655-404 **file name or program name does not appear to be installed on this system.**

Explanation: None.

User Response: Install the file set or RPM.

2655-210 **Hostname of the node or hardware control point specified Could not allocate system resources to perform action.**

Explanation: The *Hostname* attribute value must be a nonzero length string.

User Response: The user must provide a valid value for the *Hostname* attribute.

2655-405 **daemon name (IBM.ERRM) does not appear to be active. Try executing /bin/startsrc -s IBM.ERRM.**

Explanation: IBM.ERRM is not functioning.

User Response: Try starting IBM.ERRM.

2655-410 **Exit code exit code number from command: command string Error message from cmd: string message from command.**

Explanation: None.

User Response: None.

2655-411 **rsct.core is required for RMC, but not installed.**

Explanation: None.

User Response: None.

2655-412 **The ctrmc daemon is not running. Try running: /usr/sbin/rsct/bin/rmcctrl.**

Explanation: None.

User Response: None.

2655-413 **The ctcas daemon is not running. Try running: /usr/bin/startsrc -s ctcas.**

Explanation: None.

User Response: None.

2655-414 **The IBM.Sensor daemon is not running. Try running: /usr/bin/startsrc -s IBM.Sensor.**

Explanation: None.

User Response: None.

2655-415 RMC resource class *class name* does not exist.

Explanation: None.

User Response: None.

2655-425 *file name* does not exist.

Explanation: None.

User Response: Check to see if the specified file exists.

2655-426 Could not open file *file name*.

Explanation: None.

User Response: Check the file permissions or to see if the specified file exists.

2655-427 *file system name* is mounted read-only and should be read-write.

Explanation: None.

User Response: Mount the required file system in read-only mode.

2655-428 *file system name* is mounted read-write and should be read-only.

Explanation: None.

User Response: Mount the required file system in read-write mode.

2655-429 Cannot execute the command *command name*.

Explanation: None.

User Response: None.

2655-430 *file name* does not exist.

Explanation: None.

User Response: None.

2655-431 Cannot ping *machine name*. Please ensure that interface *interface name* (*tr0, en0/enth0*) is working.

Explanation: None.

User Response: Check to see if the target machine or interface is up and running.

2655-432 *file name* does not exist.

Explanation: The file was not found where it should be.

User Response: Locate the file and put it in the correct place. Ensure that you are also using the correct version of Linux or AIX.

2655-433 *dir name* does not exist.

Explanation: The directory did not exist.

User Response: Make the directory. In some cases, you may be using an unsupported version of Linux or AIX.

2655-434 Could not open the file *file name*.

Explanation: The file was not readable.

User Response: If the file exists, check the permissions.

2655-435 No route exists for the network *network ip address* using device *device name*.

Explanation: There is a route defined in the network scripts directory, but there is not one defined when the route **-n** command is invoked.

User Response: You may be using an unsupported operating system. You will need to set up the network correctly.

2655-436 The route to the network *network ip address* uses a different netmask than its interface (*network interface*).

Explanation: Your network has probably been configured incorrectly.

User Response: Check with the system administrator to get the correct values for the *netmask* and *ipaddress*.

2655-437 No route to *ip address* exists using device *network interface*.

Explanation: None.

User Response: Check with the system administrator to correctly set up the network.

2655-438 The route to the host *host ip address* or network *network ip address* using device *network interface* is not up.

Explanation: None.

User Response: Start the network using the operating system's network managing programs.

2655-439 There is no default route using the interface *interface name* and the gateway *gateway IP address*.

Explanation: None.

User Response: Set up the routing correctly.

2655-440 The default route is not up.

Explanation: None.

User Response: Turn the route on using the network programs such as **ifconfig**.

2655-441 Cannot find directory **/proc/sys/net/ipv4**. Cannot verify forwarding settings. Ensure that the **proc** filesystem is enabled in the kernel and has been mounted.

Explanation: None.

User Response: None.

2655-443 **/proc/sys/net/ipv4/ip_forward** is missing. IP forwarding cannot be controlled at runtime.

Explanation: None.

User Response: None.

2655-444 Cannot access **/proc/sys/net/ipv4/ip_forward**. Check file permissions.

Explanation: None.

User Response: None.

2655-447 IP forwarding is disabled.

Explanation: Packets will not be forwarded to other machines.

User Response: Set up IP forwarding, if desired. Otherwise, no action is needed.

2655-448 Networking has been disabled. Modify *file name that can be modified to enable networking* to enable it.

Explanation: None.

User Response: None.

2655-449 Hostname not equal to configured hostname. Run *program name* to check actual hostname. Configured hostname is located in *file name*. Check for scripts that may modify the hostname.

Explanation: None.

User Response: None.

2655-450 Cannot find program *program name*. Check **PATH** environment variable.

Explanation: None.

User Response: In order for the script to find the program, the program must be in a directory that is in the path. By changing the **PATH** environment variable to include that directory, the script will be able to find it.

2655-453 Unknown remote protocol *file*.

Explanation: Currently **dsh** only supports **rsh** and **ssh** protocols.

User Response: None.

2655-454 Command *command name* Failed.

Explanation: Something went wrong with the execution of the command.

User Response: Ensure the above command exists on the machine and is functioning properly.

2655-455 For node *hostname* **RSH** reported this error: *error*.

Explanation: None.

User Response: None.

2655-456 The file **/usr/bin/rsh** does not exist! Please install Remote Shell on your system and link the executable to **/usr/bin/rsh**.

Explanation: The CSM commands look for **rsh** in **/usr/bin/rsh**.

User Response: None.

2655-457 Cannot open file *file*.

Explanation: None.

User Response: Verify that that the file either does not exist, or does not have file permissions that allow it to be opened by this command, and then correct the problem.

2655-458 There is no *hostname* (management server) listing in file *file*.

Explanation: In order to automate remote authentication with **rsh**, the name of the management server must be listed in either an **.rhosts** or **/etc/hosts.equiv** file on every node.

User Response: Add the name of the management server to the **\$HOME/.rhosts** file.

2655-459 There is no listing for the management server in either **/etc/hosts.equiv** or **\$HOME/.rhosts**. The *hostname* of the management server must be listed in at least one of these files.

Explanation: In order to automate remote authentication with **rsh**, the name of the management server must be listed in either an **.rhosts** or **/etc/hosts.equiv** file on every node.

User Response: Add the full host name of the management server to the **\$HOME/.rhosts** or **/etc/hosts.equiv** file on this node.

2655-460 There is no "rsh" listing in the **/etc/securetty** file. Either append "rsh" to this file, or remove the entire file.

Explanation: Every allowed tty line from which root is allowed to login must be listed in the **/etc/securetty** file.

User Response: Add the line **rsh** to **/etc/securetty**.

2655-492 RSH to node *hostname* failed.

Explanation: None.

User Response: None.

2655-493 Cannot execute *command name*.

Explanation: None.

User Response: Change the permissions on the file to allow execution.

2655-461 The **rshd** daemon is not managed by *daemon name*. Please see the *command name* documentation to see how this is accomplished.

Explanation: In order to respond to **rsh** requests, the **rshd** daemon must be running or managed by an **inetd** daemon. The setup of this varies by operating system type.

User Response: None.

2655-462 The root listing in **/etc/security/user** has the line *line from configuration file*. This may be impeding automated logins.

Explanation: None.

User Response: None.

2655-463 The line *line from configuration file* in **/etc/pam.d/rsh** may be impeding automated login.

Explanation: None.

User Response: None.

2655-464 The file permissions for *file* are not set to *file permissions*.

Explanation: None.

User Response: The file permissions should be set to the second value that is listed in the error message.

2655-465 Command *command* Failed.

Explanation: Something went wrong with the execution of the command.

User Response: Ensure the above command exists on the machine and is functioning properly.

2655-466 For node *hostname* SSH reported this error: *error*.

Explanation: None.

User Response: None.

2655-467 *file* does not exist.

Explanation: The given file does not exist.

User Response: None.

2655-468 Since there is no **known_hosts** file, SSH may have trouble verifying that you have encountered target nodes before. Either create the **known_hosts** file through manually running **ssh** to the target nodes or using **ssh-keyscan**. Alternatively, you can disable **StrictHostKeyChecking** in the **/etc/ssh/ssh_config** file, although this is not recommended as it reduces security.

Explanation: None.

User Response: None.

2655-469 You must have a private/public key pair in order to automate login. Run `ssh-keygen` to create this public/private key set. Then distribute the public key to target nodes.

Explanation: None.

User Response: None.

2655-470 None of the following files exist: *files*.

Explanation: None.

User Response: None.

2655-471 The file `/usr/bin/ssh` does not exist! Please install Secure Shell on your system and link the executable to `/usr/bin/ssh`.

Explanation: CSM expects the `ssh` command to be in `/usr/bin/ssh`.

User Response: Either place the `ssh` executable in `/usr/bin/ssh` or symbolically link it to that directory.

2655-472 The `sshd` daemon is not running. It must be running in order to receive incoming `ssh` sessions.

Explanation: None.

User Response: Start the `sshd` daemon.

2655-473 You must have the management servers public keys listed in either *filename* or *filename*, depending on the `ssh` protocol in use.

Explanation: None.

User Response: None.

2655-474 There is no *hostname* (management server) listing in file *file*.

Explanation: None.

User Response: None.

2655-475 There is no listing for the management server in either `$HOME/.ssh/authorized_keys` or `$HOME/.ssh/authorized_keys2`. The management server's name should be included in a comment on a public key, its absence from both these files means that the management server's public key might not be stored on this machine.

Explanation: None.

User Response: Ensure the management server's public key is stored on this machine.

2655-476 The line in `/etc/pam.d/sshd` may be impeding automated login.

Explanation: None.

User Response: Consider removing the given line.

2655-477 The file permissions for *file* are not set to *file permissions*.

Explanation: None.

User Response: The file permissions should be set to the second value listed in the error message.

2655-478 The program *program name* was not found.

Explanation: The program could not be found.

User Response: Ensure this program is on the system, in the directory in which the script is looking.

2655-479 The hostname found is inconsistent between *file name* and *file name*.

Explanation: The name of the host name is inconsistent in the system.

User Response: Change one of host names so that the two host names match. If you do not do this, network problems could result.

2655-480 Cannot read file *file name*.

Explanation: The script could not read the file.

User Response: Ensure that the file exists and that the permissions are correct.

2655-481 Device *device name* has a problem: *error message from internal command*.

Explanation: The device (`eth0`, `tr0`, and so on) is not configured or functioning correctly.

User Response: Check for configuration problems, as well as possible physical problems.

2655-482 Command *command* failed with error code: *error code*.

Explanation: Something went wrong with the execution of the command.

User Response: Ensure the above command exists on the machine and is functioning properly.

2655-483 NFS is not listed in the */proc/filesystems* file. You must compile your kernel with NFS enabled.

Explanation: None.

User Response: None.

2655-484 The file permissions for *file* must be at least *file permissions*.

Explanation: None.

User Response: None.

2655-485 There is no listing of *directory* in */etc/exports*. In order to NFS Mount this directory it must be listed in the */etc/exports* file.

Explanation: None.

User Response: See the NFS documentation and list this directory in */etc/exports*.

2655-486 The *directory* listing in */etc/exports* does not have the specified permissions: *permissions*.

Explanation: None.

User Response: None.

2655-487 The *nfsd* daemon does not appear to be running. You must start *nfsd*. *nrpcinfo* output: *command output*.

Explanation: None.

User Response: Ensure that the *nfsd* daemon is running.

2655-488 The *nfsd* daemon needs servicing. Run service *nfs* *command*.

Explanation: None.

User Response: None.

2655-489 The specified directory *directory* is not mounted.

Explanation: None.

User Response: None.

2655-491 The *nfsd* daemon does not appear to be running on NFS server *hostname1*. You must start *nfsd*. *nrpcinfo* output: *command output*.

Explanation: None.

User Response: Ensure that the *nfsd* daemon is running on the NFS server.

2655-494 Cannot execute *command*.

Explanation: None.

User Response: Change the permissions on the file to allow execution.

2655-600 The *nfsd* daemon does not work because of some problem: *reason*.

Explanation: None.

User Response: None.

2655-601 The management server *server host name* is not listed in *\$HOME/.rhosts*. The hostname of the management server must be listed in the file.

Explanation: None.

User Response: None.

2655-602 The file *file name* does not exist!

Explanation: None.

User Response: None.

2655-603 Cannot stat *file name*.

Explanation: None.

User Response: None.

2655-605 *device* is not mounted as *file system*.

Explanation: None.

User Response: None.

2655-903 System error when trying to run probe *probe name*.

Explanation: None.

User Response: None.

2655-904 Exiting probe manager because of problems.

Explanation: None.

User Response: None.

2655-905 **Cyclic dependency between probes**
probe name and probe name.

Explanation: The probes express dependency on each other, which is not allowed.

User Response: None.

2655-906 **Unable to access probe** *probe name.*

Explanation: The probe was either not found or did not have the correct permission.

User Response: Ensure that the probe is available and has the correct execute permission.

2655-907 **Probe was not run because one or more of the probes on which it expressed dependency failed.**

Explanation: None.

User Response: None.

Chapter 5. CSM diagnostics

To diagnose problems, it is helpful to understand the relationship between CSM and the tools that it uses. These tools are described in the following table:

Tool	What It Does	CSM Interface
Resource Monitoring and Control (RMC) subsystem	Monitors conditions and communicates with all nodes. RMC needs to be running on each node, and the security access control list (ACL) file needs to allow the nodes to communicate with the management server. See “Cluster security” on page 24.	CSM and ERRM commands.
dsh	Runs commands remotely on the nodes. Security needs to be set up on each node to allow this for the remote shell that is used by dsh . The default for dsh is stored in the CSM <i>RemoteShell</i> attribute, which is accessible through the csmconfig command.	The CSM csmsetupyast , csmsetupks and updatenode commands.
diagnostic probes	Diagnostic probes can be run on both AIX and Linux nodes to determine the root cause of system problems.	The CSM probemgr command.
syslinux	Enables network booting during installation.	The CSM csmsetupyast , csmsetupks , getadapters , and installnode commands.
tftp-hpa	Trivial File Transfer Protocol. Handles file transfers during installation.	The CSM csmsetupyast , csmsetupks , getadapters , and installnode commands.

The following tips can help you diagnose problems with a CSM cluster:

- To ensure that the database attributes are correct for each node, enter:

```
lsnode -l
```
- To list the status of the RMC daemons, enter:

```
lssrc -a
```
- To review the audit log for monitoring events, enter:

```
lsaudrec
```
- If you have modified the RMC access control list (ACL) file, ensure that it is correct on each node. If the default permissions have been modified, the RMC ACL file is located at **/var/ct/cfg/ctrmc.acls**. See the *IBM RSCT for Linux: Administration Guide* for detailed information on authorization and the ACL file.
- If you are using **rsh** as the remote shell for **dsh**, ensure that the **\$HOME/.rhosts** file on each node contains the host name of the management server.
- To test **dsh** access on all nodes, enter:

```
dsh -a -s date
```

Using CSM diagnostic probes

CSM diagnostic probes are designed to identify the root cause of system problems. CSM probe architecture includes a probe manager and a set of probes. A probe manager is a utility that builds a dependency tree of probes and runs the probes based on their position in the tree. Probes are run from the leaves of the tree to the root, and the results are returned to the system administrator.

Probe manager

The probe manager **probemgr** command runs the specified probes on nodes in a CSM cluster. Probe manager uses the dependency list returned by each probe to build a dependency tree, runs the probes in order from the leaves of the tree to the root, and returns the probe results to the system administrator. By running the probes from the leaves of the tree to the root, the root cause of a software or system problem can be determined.

For example, probes A, B, C and D could have their dependencies defined as follows:

- A [depends on] B
- B [depends on] C, D

The run order of the probes with the above dependencies would be:

1. Run C & D (specific order is not deterministic)
2. Run B
3. Run A

Any system error detected by a probe causes the probe manager to stop running the dependent probe, thus isolating the problem in a component to the realm of items checked by the probe that detected the error. The probe manager has an option to continue to run probes that depend on a probe that detected an error.

A probe to probe manager interface is defined and the interaction between the probe and the probe manager is through this interface. See the **probemgr** command or the *IBM CSM for Linux: Command and Technical Reference* for detailed usage information.

Probes

Probes are small, stand-alone programs that diagnose a specific part of a system or subsystem. Probes are invoked indirectly by running the **probemgr** command. Each probe specified by the **probemgr** command is responsible for determining the status of a particular part of the system and reporting its findings back to the probe manager. Since system components are usually interdependent, a probe can have dependencies on other probes. For example, a probe checking the root cause of problems on a network server will check specific characteristic of the server daemon, and thus has a dependency on a probe that checks the root cause of problems on the network. Each probe determines the environment in which it is running and performs the appropriate diagnostics for that environment.

The following probes are provided with CSM 1.3.2:

Table 3. CSM diagnostic probes

Probe Name	Dependencies	Description
ibm.csm.HWCtrl	None.	The probe verifies that the hardware control points and console servers are available. It generates a list of hardware control points and console servers based on the attributes in the ManagedNode table.
ibm.csm.ms	None.	The probe checks for problems resulting from installing the management server. It checks the required packages and directory structures.
fs.mounts	None	The probe checks that all file systems specified in /etc/fstab as automount (noauto option is not given) are mounted. Also ensures that the files are read-only if specified and read-write if nothing is specified.
network	<ul style="list-style-type: none"> • network-enabled • network-hostname • network-ifaces • network-ip_defrag • network-ip_forward • network-ping • network-routes 	This is a dummy probe that has dependencies on all other network probes. The probe verifies proper operation of network devices and verifies IP settings. It checks route configuration and also attempts to ping the local machine.
network-enabled	None.	The probe checks for the NETWORKING=yes environment variable in /etc/sysconfig/network . It returns an error if the value is NETWORKING=no or if /etc/sysconfig/network does not exist.
network-hostname	None.	The probe checks that the host name in /etc/sysconfig/network is consistent with the hostname as given by the program "hostname"
network-ifaces	network-enabled	The probe checks that the interfaces specified in /etc/sysconfig/network-scripts/ifcfg -* have the specified IP address, netmask, and broadcast address values. It also checks that the interfaces are running. For dynamically configured interfaces the probe only checks that the device exists and that the interface is running.
network-ip_forward	None.	The probe checks that the enabled status IP forwarding is consistent with /etc/sysconfig/network . This probe relies on the /proc file system and the ability to configure IPv4 parameters at run time.
network-ping	<ul style="list-style-type: none"> • network-enabled • network-ifaces • network-routes 	The probe tries to ping each interface for the local machine to check if it is responding properly. It sends 10 ICMP echo packets to each interface and counts the number of replies. No replies implies there is an error. If fewer than 10 replies are received, a warning is displayed. The probe times out after 10 seconds.

Table 3. CSM diagnostic probes (continued)

Probe Name	Dependencies	Description
network-routes	<ul style="list-style-type: none"> • network-enabled • network-ifaces 	The probe checks that the routes for each interface are in the kernel route table. The probe does not check for the routes specified in /etc/sysconfig/static-routes . It prints a warning for any interface that does not specify its IP address in its configuration file. Attention: This probe incorrectly gives error messages if host or network names are used in the configuration files instead of IP addresses in dotted quad notation.
RMC	None.	The probe verifies the following: <ul style="list-style-type: none"> • rsct.core is installed • ctrmc and ctcas are running • status from the ctrmc daemon is retrievable • IBM.Host, IBM.Program, IBM.FileSystem, IBM.AuditLog, and IBM.Sensor resource classes are defined • IBM.Host information is retrievable
DMSRM	RMC	The probe checks that IBM.DMSRM has been installed properly and is functioning on the node.
ERRM	RMC	The probe checks that IBM.ERRM has been installed properly and is functioning on the node.
NFS	None.	The probe checks the usability of the NFS file system, which CSM components depend on. When run on a management server, the NFS probe ensures that the machine is set up to act as a NFS server. When run on a node, the probe ensures that the node can mount NFS from the management server.
Remote Protocol	None.	The Remote Protocol probes are the dsh , rsh-protocol , and ssh-protocol probes. Remote Protocol probes check the status of automated remote command capability through the protocol defined in the <i>RemoteProtocol</i> variable in the CSM database. The probes ensure that CSM applications using the established remote protocol can gain access to the remote machines. These applications, such as dsh and CFM, require the ability to run either rsh or ssh commands as root on remote nodes.

Increasing TCP/IP buffer size

In large clusters the TCP/IP buffer size on the management server **only** should be increased to prevent incorrect node status from being returned. If the buffer size is low for the number of nodes in the cluster, a node could be reported as down even though it can be reached using ping and the RMC subsystem on the node is active.

To increase the TCP/IP buffer size, first enter the following command on the management server:

```
echo 262142 > /proc/sys/net/core/rmem_max
echo 262142 > /proc/sys/net/core/rmem_default
```

By default the effects of these commands are lost after a reboot, so buffer size must be specified in a script that is automatically run during start up. IBM suggests adding the following lines to the `/etc/sysctl.conf` file:

```
# CSM support. Increase socket buffer size to allow large incoming messages
net.core.rmem_max = 262142
net.core.rmem_default = 262142
```

Security keys

A CSM system administrator has control over the public and private RSCT keys used for cluster node security. Public and private RSCT keys are generated by cluster security services and used by cluster security services exploiters. These RSCT keys cannot be used with **rsh**, **OpenSSH**, or any other remote command technology. They are installed by default in the following locations:

- `/var/ct/cfg/ct_has.qkf` (private keys)
- `/var/ct/cfg/ct_has/pkf` (public keys)
- `/var/ct/cfg/ct_has.thl` (trusted host list)

CSM manages the RSCT keys and exchanges the public keys between the management server and the nodes. If you suspect that the keys have not been exchanged properly, or the host name or private key of a machine has changed, run the **updatenode -k** command for the node to re-exchange the keys and to adjust the Trusted Host List files on the CSM management server and managed nodes accordingly. For detailed information on public and private keys, see the RSCT security section in the *IBM RSCT for Linux: Administration Guide*.

Diagnosing problems with RMC

If RMC is not working properly, first check to see if the RMC daemon (`ctrmc`) and the resource managers are running by using the **lssrc** command, as follows:

```
lssrc -a
```

At least `ctrmc`, `IBM.ERRM`, and `IBM.DMSRM` should be running. Other resource managers are not started until they are required. If you need to restart RMC, run the `/usr/sbin/rsct/bin/rmctr1` command with the **-z** option:

```
rmctr1 -z
```

Then run the command again with the **-s** option:

```
rmctr1 -s
```

After you are sure that RMC is running, run the **lsrsrc** command to see if the RMC daemon is responding and recognizing the RMC resource classes such as `IBM.ManagedNode`, `IBM.NodeGroup`, `IBM.Condition`, `IBM.EventResponse`, and `IBM.Association`. To list the contents of these resource classes use the **lsrsrc** command.

Diagnosing problems with dsh

If you experience problems using **dsh** to run distributed commands on CSM cluster nodes, IBM suggests taking the following diagnostic steps:

1. Run the **dsh -a -s date** command to determine if the remote shell is prompting for a password. If you receive a password prompt, enter **Ctrl - c** to exit the **dsh** command, and configure your remote shell using the following steps.

2. You can configure remote shell authentication manually or by using the **updatenode** command. To use **updatenode**, set the *SetupRemoteShell* variable to **1** using the **csconfig** command. Then run the **updatenode -k** command on the specified nodes to set up remote shell authentication. When the **updatenode** completes, run the **dsh -a -s date** command to ensure that the remote shell is working. See the *IBM CSM for Linux: Planning and Installation Guide* for more information on which remote authentication methods **updatenode** will set up.
3. If problems continue, or to set up remote shell authentication manually, first determine the remote shell being used by **dsh**. The remote shell is usually described by the *RemoteShell* attribute value in the CSM database, but can be overridden by the **DSH_REMOTE_CMD** environment variable. Then take the following steps on the specified nodes:
 - If you are using **rsh** run the following commands on the node after verifying that **rsh** is installed on the node:
 - a. **chkconfig rsh on**
 - b. If an **/etc/securetty** file exists, run **echo rsh >> /etc/securetty**
 - c. **echo management_server_hostname root >> \$HOME/.rhosts**

Diagnosing problems with DCEM

Distributed Command Execution Manager (DCEM) uses CSM, which uses several other tools. Understanding the relationships between these tools can be helpful in diagnosing problems with DCEM.

Insufficient setup of underlying subsystems

CSM uses the Resource Monitoring and Control (RMC) subsystem to monitor and communicate with all nodes. If you are experiencing problems communicating with managed nodes, verify that RMC is running on each node, and that the security access control list (ACL) file has been set up to allow the nodes to communicate with the management server.

DCEM uses the CSM **dsh** command to run commands on the nodes. For the **dsh** command to work, security needs to be set up on each node so that **dsh** is allowed to run commands on that node. The security setup is dependent upon the type of remote shell you are using. The default remote shell is **rsh**. To set up security on each node to allow **dsh** to run commands on that node (using **rsh**), you must add the management server host name to the **\$HOME/.rhosts** file on the nodes that will be managed nodes. For example, if you want to run commands as root on machine2 from machine1, add the line **machine1 root** to the **\$HOME/.rhosts** file on machine2.

To verify the successful installation of CSM, list the active nodes by running the **lsnode -p** command and verify that **dsh** is working by running the **dsh -a date** command. For detailed information, see the *IBM CSM for Linux: Planning and Installation Guide*.

Migration

Command specifications and preference files in earlier DCEM releases are not compatible with DCEM version 1.3. If you are migrating from an earlier version, you must take the following steps to use DCEM 1.3 without any errors:

1. Remove the **cmdsspecs** subdirectory in **\$HOME/dcem**.
2. Remove the **preferences** file in **\$HOME/dcem/preferences**.

Interactive commands and GUI applications

The CSM **dsh** command does not support interactive commands. Attempting to run an interactive command that requires information from DCEM standard input will not work.

To run an XWindows GUI application from DCEM, make sure the DISPLAY variable is set to your system's DISPLAY address. For example, in the General panel command area, you could export the DISPLAY variable to your display's address before issuing the command name. If you run a GUI application correctly from DCEM, the application will remain in the "Working" state until you exit the GUI.

Security considerations and remote shells

DCEM uses the same underlying security considerations as the CSM **dsh** command. You can use any underlying remote shell, but it is the system administrator's responsibility to configure and enable remote shell access. DCEM uses the CSM **dsh** command, which uses the underlying **rsh** security protocol by default. For more information about security considerations for **dsh** and preparing for **dsh** and configuring the remote shell, see the *IBM CSM for Linux: Planning and Installation Guide*.

Diagnostic information

All DCEM command activity of problems and successes are saved in log files to use later for diagnosis. These log files are located in **\$HOME/dcem/log/log_file_name.pl**.

For details on the underlying CSM command string specified as a result of running your created command specification, run the Perl script outside of DCEM in debug mode directly from the command line as follows:

```
commandSpecificationName.pl -debug
```


Appendix. DCEM command script

The following example of a saved DCEM command script is stored in **\$HOME/dcem/scripts**. A system administrator can easily modify the script that was saved by changing the options (for example, groups, security, fan out levels) in the declared variables at the top of the script. The rest of the script functions will build a new execution environment based on the changes that the administrator makes (not supported on pSeries hardware).

```
#!/usr/bin/perl -w

#####
#
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# All Rights Reserved
#
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# disclosure restricted by GSA ADP Schedule Contract with IBM Corp.
#
#####

#####
#
# Example perl file -
# Run via:
# perl <this-perl-scrip.pl> [-debug] [-non_interactive] [-format_output]
# E.g.
# perl listusers.pl
# perl listusers.pl -debug
# perl listusers.pl -non_interactive
# perl listusers.pl -format_output
#
# Author : Generated by Distributed Command Execution Manager
#
#####

#####
# perl information
#
#####

$| = 1;          # Flush output buffer
require 5.003;   # need this version of Perl or newer
use English;    # use English names, not cryptic ones
use FileHandle; # use FileHandles instead of open(),close()
use Carp;       # get standard error / warning messages
use strict;     # force disciplined use of variables

#####
# GLOBAL VARIABLES AND CONSTANTS
#
#####

my ($TRUE)           = "TRUE";
my ($FALSE)          = "FALSE";

# -----
# Command Environment Variables
# -----

my (@HOSTS)          = ();
my (@GROUPS)         = ('AllNodes');
```

```

# -----
# Command Definition
# -----

my ($CMD_DEFINITION)=<<'END_CMD_DEFINITION'
if [ `uname` = "AIX" ]
then
df -k
else
df -h
fi

END_CMD_DEFINITION
;

# -----
# Script options and user default settings
# NOTE: You must add any new options to
# the OPTION_FLAGS array.
# -----

my ($DEBUG_FLAG)           = "-debug";
my ($LAUNCH_GUI_FLAG)     = "-gui";
my ($FORMAT_OUTPUT_FLAG)  = "-format_output";
my ($PROMPT_USER_FLAG)    = "-non_interactive";
my (@OPTION_FLAGS)        = ($DEBUG_FLAG,
                             $LAUNCH_GUI_FLAG,
                             $FORMAT_OUTPUT_FLAG,
                             $PROMPT_USER_FLAG);

my ($DEBUG)                = $FALSE;
my ($LAUNCH_GUI)          = $FALSE;
my ($FORMAT_OUTPUT)       = $FALSE;
my ($PROMPT_USER)         = $TRUE;

# -----
# Csm Distributed Services
# -----

my ($DISTRIB_SERVICE)      = "/opt/csm/bin/dsh";
my ($DISTRIB_POST_PROCESSING_COMMAND) = "/opt/csm/bin/dshbak";

# -----
#      Dsh Options
# -----

my ($DISTRIB_HOST_OPTION)  = "-n";
my ($DISTRIB_GROUP_OPTION) = "-N";
my ($DISTRIB_FANOUT_OPTION) = "-f";
my ($DISTRIB_STREAMING_OPTION) = "-s";
my ($DISTRIB_VERIFY_HOSTS_OPTION) = "-v";
my ($DISTRIB_USER_OPTION) = "-l";
my ($DISTRIB_REMOTE_SHELL_PATH_OPTION) = "-r";
my ($DISTRIB_REMOTE_SHELL_OPTIONS_OPTION) = "-o";
my ($DISTRIB_TIMEOUT_OPTION) = "-t";
my ($DISTRIB_REPORTING_OPTION) = "--reports";
my ($DISTRIB_LOGGING_OPTION) = "--log";
my ($DISTRIB_REPORT_NAME_OPTION) = "--reportName";
my ($DISTRIB_COMMAND_NAME_OPTION) = "--commandName";
my ($DISTRIB_COMMAND_DESCRIPTION_OPTION) = "--commandDescription";
my ($DISTRIB_NO_FILE_WRITING_OPTION) = "--noFileWriting";

# -----
# Additional Csm Command Environment Variables
# -----

my ($FANOUT)               = 32;

```

```

my ($STREAMING_REQUESTED)           = $TRUE;
my ($VERIFY_HOSTS_REQUESTED)       = $TRUE;
my ($TIMEOUT_REQUESTED)            = $FALSE;
my ($TIMEOUT_VALUE)                = "30";
my ($USER)                         = "root";
my ($REMOTE_SHELL)                 = "/usr/bin/rsh";
my ($REMOTE_SHELL_OPTIONS)         = "";
my ($COMMAND_PATH)                 = '$PATH';
my ($COMMAND_NAME)                 = "UX_DiskSpace";
my ($REPORT_NAME)                  = "UX_DiskSpace";
my ($REPORTING_DIR)                = "/dcem/reports";
my ($LOGGING_PATH)                 = "/dcem/logs/dcem.log";

# -----

# -----
# Command Description
# -----

my ($COMMAND_DESCRIPTION)=<<'END_CMD_DESCRIPTION'
Report file system disk space usage.
END_CMD_DESCRIPTION
;

# -----
#####
# Sub Functions
#####

#####
# This sub-function displays the string passed to it.
# This sub-function should be used only for debug messages.
#
# @param the messages string to be displayed
#
#####

sub debug_message ($)
{
    if ($DEBUG eq $TRUE)
    {
        display_message (@_);
    }
}

#####
# This sub-function displays the string passed to it.
# This sub-function should be used to convey information to
# users
#
# @param the messages string to be displayed
#
#####

sub display_message ($)
{
    my ($str) = @_;
    print "$str";
}

#####
# This sub-function executes the command.
#
#####

sub run_distributed_command_line ()
{

```

```

debug_message ("\nEnter sub-function run_distributed_command()...\n");

# construct the execution string based on the parameters
my (@execution_string) = build_execution_string();

# run the command
if ($FORMAT_OUTPUT eq $TRUE) {
    debug_message ("Running the command: @execution_string |
    $DISTRIB_POST_PROCESSING_COMMAND\n\n");

    pipe(INPUT, OUTPUT);
    my ($current_pid) = fork;

    if ($current_pid == 0) {
        close(INPUT);
        open(STDOUT, ">&=OUTPUT") or die "Couldn't redirect STDOUT for
        post processing: $!";
        exec (@execution_string); # Will exit.
    }
    elsif ($current_pid) {
        debug_message("In parent process, before wait.\n");

        close(OUTPUT);
        open(POST_PROCESSING_PIPE, "| $DISTRIB_POST_PROCESSING_COMMAND") or
        die "Couldn't open post processing pipe: $!";

        while (<INPUT>) {
            print POST_PROCESSING_PIPE $_;
        }
        close(POST_PROCESSING_PIPE);

        waitpid($current_pid, 0); # To handle death of child.

        debug_message("In parent process, after wait.\n");
    }
    else {
        die "Fork error before command execution: $!\n";
    }
}
else {
    debug_message ("Running the command: @execution_string \n\n");

    my ($current_pid) = fork;

    if ($current_pid == 0) {
        exec (@execution_string);
    }
    elsif ($current_pid) {
        debug_message("In parent process, before wait.\n");

        waitpid($current_pid, 0);

        debug_message("In parent process, after wait.\n");
    }
    else {
        die "fork error: $!\n";
    }
}

debug_message ("\nLeave sub-function run_distributed_command().\n");
}

#####
# This sub-function invokes the
# Distributed Command Execution Manager GUI
#
#####

```



```

sub run_distributed_command_gui ()
{
    debug_message ("Enter sub-function run_distributed_command_gui()...\n");

    my ($cmd_name) = $0;
    $cmd_name =~ s/\.\.p!$//;
    debug_message ("Command name to load is $cmd_name\n");

    `~/opt/csm/bin/dcem $cmd_name`;

    debug_message ("Leave sub-function run_distributed_command_gui()...\n");
}

#####
# This sub-function constructs the complete execution string.
#
#####

sub build_execution_string ()
{
    debug_message ("Enter sub-function build_execution_string()...\n");

    my ($i) = 0;
    my ($cmd_path) = "";
    my (@execution_string);

    $execution_string[$i] = $DISTRIB_SERVICE;
    $execution_string[++$i] = $DISTRIB_FANOUT_OPTION;
    $execution_string[++$i] = $FANOUT;
    debug_message ("Execution string is: @execution_string\n");

    if (($TIMEOUT_REQUESTED eq $TRUE))
    {
        $execution_string[++$i] = $DISTRIB_TIMEOUT_OPTION;
        $execution_string[++$i] = $TIMEOUT_VALUE;
        debug_message ("Execution string is: @execution_string\n");
    }

    $execution_string[++$i] = $DISTRIB_REPORTING_OPTION;
    $execution_string[++$i] = $REPORTING_DIR;
    debug_message ("Execution string is: @execution_string\n");

    $execution_string[++$i] = $DISTRIB_LOGGING_OPTION;
    $execution_string[++$i] = $LOGGING_PATH;
    debug_message ("Execution string is: @execution_string\n");

    if (($FORMAT_OUTPUT eq $FALSE) && ($STREAMING_REQUESTED eq $TRUE))
    {
        $execution_string[++$i] = $DISTRIB_STREAMING_OPTION;
        debug_message ("Execution string is: @execution_string\n");
    }

    if ($FORMAT_OUTPUT eq $TRUE)
    {
        $execution_string[++$i] = $DISTRIB_NO_FILE_WRITING_OPTION;
        debug_message ("Execution string is: @execution_string\n");
    }

    if ($COMMAND_NAME ne "")
    {
        $execution_string[++$i] = $DISTRIB_COMMAND_NAME_OPTION;
        $execution_string[++$i] = $COMMAND_NAME;
        debug_message ("Execution string is: @execution_string\n");
    }

    if ($REPORT_NAME ne "")

```

```

    {
        $execution_string[++$i] = $DISTRIB_REPORT_NAME_OPTION;
        $execution_string[++$i] = $REPORT_NAME;
        debug_message ("Execution string is: @execution_string\n");
    }

    if ($COMMAND_DESCRIPTION ne "")
    {
        $execution_string[++$i] = $DISTRIB_COMMAND_DESCRIPTION_OPTION;
        $execution_string[++$i] = $COMMAND_DESCRIPTION;
        debug_message ("Execution string is: @execution_string\n");
    }

    $execution_string[++$i] = $DISTRIB_USER_OPTION;
    $execution_string[++$i] = $USER;
    debug_message ("Execution string is: @execution_string\n");

    $execution_string[++$i] = $DISTRIB_REMOTE_SHELL_PATH_OPTION;
    $execution_string[++$i] = $REMOTE_SHELL;
    debug_message ("Execution string is: @execution_string\n");

    if ($REMOTE_SHELL_OPTIONS ne "")
    {
        $execution_string[++$i] = $DISTRIB_REMOTE_SHELL_OPTIONS_OPTION;
        $execution_string[++$i] = $REMOTE_SHELL_OPTIONS;
        debug_message ("Execution string is: @execution_string\n");
    }

    if (@GROUPS)
    {
        $execution_string[++$i] = $DISTRIB_GROUP_OPTION;
        $execution_string[++$i] = join(",", @GROUPS);
        debug_message ("Execution string is: @execution_string\n");
    }

    if ($VERIFY_HOSTS_REQUESTED eq $TRUE)
    {
        $execution_string[++$i] = $DISTRIB_VERIFY_HOSTS_OPTION;
        debug_message ("Execution string is: @execution_string\n");
    }

    if (@HOSTS)
    {
        $execution_string[++$i] = $DISTRIB_HOST_OPTION;
        $execution_string[++$i] = join(",", @HOSTS);
        debug_message ("Execution string is: @execution_string\n");
    }

    if ($COMMAND_PATH ne '')
    {
        $cmd_path = "export PATH=$COMMAND_PATH;";
        debug_message ("Command path string is: $cmd_path\n");
    }

    $execution_string[++$i] = join(" ", $cmd_path, $CMD_DEFINITION);
    debug_message ("Execution string is: @execution_string\n");

    debug_message ("Leave sub-function build_execution_string().\n");
    return (@execution_string);
}

#####
# This sub-function asks the user whether the program should
# continue or not.
#
# @param cmd_spec - the command specification
# @param hosts    - the host machines to run the command on

```

```

# @param groups - the groups to run the command on
#
#####

sub confirm_command_execution ($$$)
{
    debug_message ("Enter sub-function confirm_command_execution()...\n");

    my ($cmd_spec, $hosts_ref, $groups_ref) = @_ ;
    my (@hosts) = @$hosts_ref;
    my (@groups) = @$groups_ref;
    my ($host);
    my ($group);
    my ($reply) = "";

    display_message("The command \"$cmd_spec\" ");

    if ((scalar(@hosts) == 0) && (scalar(@groups) == 0))
    {
        display_message("has no targets specified.\n");
        return($FALSE);
    }

    display_message ("is about to be executed on the following ");

    if (scalar(@hosts))
    {
        display_message( "hosts:\n\t");

        foreach $host (@hosts)
        {
            display_message ("$host ");
        }
        display_message ("\n");

        if (scalar(@groups))
        {
            display_message ("and ");
        }
    }

    if (scalar(@groups))
    {
        display_message ("groups:\n\t");

        foreach $group (@groups)
        {
            display_message ("$group ");
        }
        display_message ("\n");
    }

    while (defined($reply) && $reply !~ /[yYnN]/ )
    {
        display_message ("Do you wish to continue (y/n)? : ");
        $reply = <STDIN>;
        chop ($reply);
    }

    debug_message ("Leave sub-function confirm_command_execution()...\n");

    # Check the reply to determine whether to continue
    if ($reply =~ /[yY]/)
    {
        return($TRUE);
    }
    else

```



```

#####
# This sub-function check all the options, in the
# @ARGV array.
# Flags are assumed to begin with a '-' (dash or minus sign).
#
#####

sub check_options ()
{
    debug_message ("Enter sub-function check_options ()...\n");

    my ($CMD_OPTION) = "";
    my ($TMP_CMD_OPTION) = "";
    my ($OPTION_FLAG) = "";

    foreach $CMD_OPTION (@ARGV)
    {
        $TMP_CMD_OPTION = "";

        # Check for incomplete and/or ambiguous options
        foreach $OPTION_FLAG (@OPTION_FLAGS)
        {
            if (index ($OPTION_FLAG, $CMD_OPTION) == 0)
            {
                if ($TMP_CMD_OPTION eq "")
                {
                    $TMP_CMD_OPTION = $OPTION_FLAG;
                }
                else
                {
                    $TMP_CMD_OPTION = "AMBIGUOUS"; #ambiguous
                    last;
                }
            }
        }

        if ($TMP_CMD_OPTION eq $PROMPT_USER_FLAG)
        {
            debug_message ("Setting PROMPT_USER to FALSE.\n");
            $PROMPT_USER = $FALSE;
        }
        elsif ($TMP_CMD_OPTION eq $LAUNCH_GUI_FLAG)
        {
            debug_message ("Setting LAUNCH_GUI to TRUE.\n");
            $LAUNCH_GUI = $TRUE;
        }
        elsif ($TMP_CMD_OPTION eq $FORMAT_OUTPUT_FLAG)
        {
            debug_message ("Setting FORMAT_OUTPUT to TRUE.\n");
            $FORMAT_OUTPUT = $TRUE;
        }
        elsif ($TMP_CMD_OPTION eq $DEBUG_FLAG)
        {
            $DEBUG = $TRUE;
            debug_message ("Setting DEBUG to TRUE.\n");
        }
        elsif ($TMP_CMD_OPTION eq "AMBIGUOUS")
        {
            usage ("Ambiguous option: $CMD_OPTION\n\n");
        }
        else
        {
            usage ("Error! Bad option: $CMD_OPTION\n\n");
        }
    }

    debug_message ("Leave sub-function check_options ()...\n");
}

```

```

}

#####
# This sub-function invokes all other subfunctions and is
# responsible for executing the command.
#
#####

sub main_driver ()
{
    # Check if any command line arguments have been passed in
    check_options ();

    debug_message ("Enter function main_driver()...\n");

    my ($host) = "";
    my ($group) = "";
    my ($continue_program) = "TRUE";
    my ($error_code) = 0;

    debug_message ("hosts:\n");
    foreach $host (@HOSTS)
    {
        debug_message ("\t$host\n");
    }

    debug_message ("groups:\n");
    foreach $group (@GROUPS)
    {
        debug_message ("\t$group\n");
    }

    # What about the GUI option.....
    if ($LAUNCH_GUI eq $TRUE)
    {
        display_message ("Launching GUI...\n");

        run_distributed_command_gui();

        exit_program ("", 0 );
    }

    debug_message ("User prompt setting is: $PROMPT_USER\n");

    if ($PROMPT_USER eq $TRUE)
    {
        $continue_program = confirm_command_execution ($CMD_DEFINITION,
                                                       \@HOSTS, \@GROUPS);
        if ($continue_program eq $FALSE)
        {
            my ($exit_msg) = "Program exited without executing command.\n";
            exit_program ($exit_msg, 1 );
        }
    }

    # After all the GUI and PROMPT options have been processed,
    # we are now ready to run the script
    run_distributed_command_line ();

    debug_message ("Leave function main_driver()...\n");
}

#####
# This the start of the script.
#
#####

```

|
|
|
|
|
|
|

```
main_driver ();  
  
0; # return 0 (no error from this script)  
  
#####  
#----- This is the END of the Script -----  
#  
#####
```


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Publicly Available Software

IBM Cluster Systems Management for Linux 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 for Linux product.

Note: The distribution for SYSLinux includes the source code and associated documentation. All copyright notices and license conditions in the documentation must be respected. You can find version and distribution information for each of these products in the *Specified Operating Environment* section of the *IBM CSM for Linux: Planning and Installation Guide*. For these non-IBM products, the following license terms apply in lieu of the International Program License Agreement.

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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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The following components in the Program are Excluded Components: (a) conserver 7.2, (b) perl-libnet 1.0703, (c) expect 5.3, (d) perl-to-c extensions and (e) fping 2.4b2, (f) rdist 6.15, and (e) tftp-HPA 0.34.

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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.

fileset. 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**.

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

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)	http://techsupport.services.ibm.com/server/cluster
CSM driver downloads	http://techsupport.services.ibm.com/server/cluster2/fixes/csmdriverdownload.html
README file	/opt/csm/README/csm.README
Documentation Errata	http://publib.boulder.ibm.com/clresctr/docs/csm/docerrata.html

Information about CSM	Location
Frequently Asked Questions (FAQ)	http://techsupport.services.ibm.com/server/cluster/tips/csm_faq.html
Read This First document	http://www.ibm.com/servers/eserver/clusters/library

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>.

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 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, 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
- CSM for Linux:
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.

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