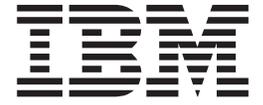


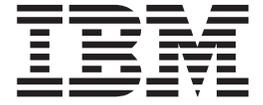
IBM Cluster Systems Management for Linux[®]



Administration Guide

Version 1.2

IBM Cluster Systems Management for Linux[®]



Administration Guide

Version 1.2

Note!

Before using this information and the product it supports, read the information in "Notices" on page 147.

Fourth Edition (July 2002)

This edition applies to version 1, release 2 of IBM Cluster Systems Management for Linux (CSM) licensed program (product number 5765-E88) and to all subsequent releases and modifications of this product until otherwise indicated in new editions. This edition replaces SA22-7873-01. 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 (CSM). It provides information about the tasks required for setting up and maintaining a Linux cluster. This includes tasks such as managing your nodes, monitoring your system, and understanding security issues. This book also provides information about using commands, understanding messages, and resolving problems.

Who should use this book

This book is intended for system administrators who want to use IBM Cluster Systems Management for Linux. The system administrator should have experience in UNIX[®] administration and networked systems.

Highlighting

The following highlighting conventions are used in this book:

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

ISO 9000

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

Related information

The following references contain more information about IBM Cluster Systems Management for Linux:

- IBM CSM for Linux: Software Planning and Installation Guide, SA22-7853-02
- IBM CSM for Linux: Hardware Planning and Control Guide, SA22-7856-03

The following references contain more information about Reliable Scalable Computing Technology (RSCT) for Linux:

- IBM RSCT for Linux: Guide and Reference, SA22-7892-00
- IBM RSCT for Linux: Technical Reference, SA22-7893-00
- IBM RSCT for Linux: Messages, GA22-7894-00
- IBM RSCT for Linux: Group Services Programming Guide and Reference, SA22-7888-00

How to obtain publications

The IBM Cluster Systems Management (CSM) for Linux publications are available as HTML and PDF files on the CD-ROM in the **/doc** directory or on the installed system in the **/opt/csm/doc** directory.

The README information is available on the CD-ROM in the root directory (*/*).

The file names are as follows:

- *IBM CSM for Linux: Software Planning and Installation Guide* (am7lxins.pdf)
- *IBM CSM for Linux: Administration Guide* (am7lxadm.pdf)

| • *IBM CSM for Linux: Hardware Planning and Installation Guide* (am71xhwc.pdf)

| These IBM Cluster Systems Management (CSM) for Linux publications were also available at the time of
| this release at <http://www.ibm.com/servers/eserver/clusters/library>.

How to contact IBM

If you would like to contact us by e-mail, send your comments to cluster@us.ibm.com.

Chapter 1. Cluster Systems Management overview

IBM Cluster Systems Management for Linux (CSM) provides a distributed system management solution for machines, or *nodes*, that are running the Linux operating system. With this software, an administrator can easily set up and maintain a Linux cluster by using functions like installation, hardware control, monitoring, and configuration file management. The concepts and software are derived from IBM Parallel System Support Programs for AIX® (PSSP) and from applications available as open source tools.

You can install CSM alone on the management server, assuming that Red Hat Linux has been installed there first. For the nodes, the CSM-only installation process allows you to install just CSM, assuming you have already installed Linux on the nodes. The full installation process involves installing the operating system with CSM on the cluster nodes. For more information about installing CSM, see *IBM CSM for Linux: Software Planning and Installation Guide*.

Within a CSM cluster, you can add, remove, change, or list nodes or node groups. You can run commands across nodes or node groups in the cluster, and gather responses. Nodes and applications can be monitored as to whether they are up or down. For instance, CPU, memory, and system utilization can be monitored, and automated responses can be run when events occur in the cluster. Configuration File Manager is provided for synchronization of files across multiple nodes. A single management server is the control point for the CSM cluster.

CSM works in conjunction with Reliable Scalable Cluster Technology (RSCT), which is a set of software components that together 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 subsystem (RMC). RMC provides a common abstraction for the resources of the individual system or the cluster of nodes. RMC provides global access to subsystems of resources throughout the cluster, thus providing a single monitoring/management infrastructure for clusters. 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 *IBM RSCT for Linux: Guide and Reference*.

Note that CSM manages a loose cluster of machines. It does not provide high availability services or fail-over technology, although high-availability clusters can be part of the set of machines that CSM is managing.

CSM works with various configurations of IBM and vendor hardware, most notably the IBM @server Cluster 1300 (xSeries™) 330 Cluster and 1300 (xSeries) 342 nodes. See *IBM CSM for Linux: Hardware Planning and Control Guide* for more information about CSM hardware support.

This chapter provides information on the following CSM tasks:

1. Installing CSM
2. Managing node and node group information
3. Monitoring and controlling hardware
4. Running commands remotely
5. Monitoring system events
6. Managing configuration files with Configuration File Manager
7. Providing security

Installing CSM

The *IBM CSM for Linux: Software Planning and Installation Guide* provides a process for installing and configuring CSM on an existing Linux system, or for doing a full installation of both CSM and the operating system. The installation process allows you to do the following:

1. Install IBM CSM and RSCT on the management server.
2. Add nodes to the cluster during the installation process.
3. Install and configure IBM CSM and RSCT CSM on all nodes in a cluster from a single management server.

The following commands and files are used during installation:

- | | |
|-----------------------|---|
| installms | Installs CSM on the management server. |
| definnode | Gathers all the information necessary to install the nodes. |
| nodedef file | Node definition file for cluster nodes. |
| csmsetupks | Sets up Kickstart configuration for the nodes. |
| kscfg.tmpl | Linux operating system configuration file used by Red Hat Kickstart. |
| getmacs | Automatically gathers and stores MAC addresses in the CSM database. |
| updatenode | Updates (installs) CSM packages and CFM configuration files across the cluster. |
| installnode | Installs both the operating system and CSM on the nodes, and brings up the necessary servers on them. |
| monitorinstall | Displays the status of the installation on each of the nodes. |

For more information about CSM commands, see the man pages or Chapter 4, “CSM Commands” on page 33.

Managing node and node group information

CSM provides a set of commands for managing nodes and node group information. It stores information about nodes and node groups in the CSM database. These definitions are then accessible:

- To the Configuration File Manager command for configuration file management
- To the **dsh** command for running shell commands remotely
- For hardware control
- For monitoring the cluster by using the Event Response resource manager (ERRM).

Setting up node group information

Nodegroups can be either static or dynamic. Static node groups are created by explicitly specifying each node's host name — the list of nodes in the node group consists of the explicitly specified node host names. Dynamic node groups are created by specifying a selection criteria — the list of nodes in the node

group is determined by applying the selection criteria to the list of nodes in the cluster. The selection criteria is specified by using an SQL-like select string. See the *IBM RSCT for Linux: Guide and Reference* for more information about the format of the select string.

The persistent node attributes that are used to create the dynamic node group select strings. To determine the persistent attributes, type the following command on the command line:

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

The following are some examples of valid select strings and node groups created using those select strings.

To list the names of all the nodes whose Hostname attribute begins with c54:

- Select string format, Hostname like 'c54%'
- To see the nodes selected by the above select string, issue the following command:

```
lsnode -w 'Hostname like 'c54%'
```
- To create a node group with the above select string, issue the following command:

```
nodegrp -w 'Hostname like 'c54%' (nodegroup_name)
```

To list all node names with the InstallOSName attribute set to 'Linux':

- Select string format, InstallOSName == 'Linux'
- To see the nodes selected by the above select string, issue the following command:

```
lsnode -w 'InstallOSName == 'Linux''
```
- To create a node group with the above select string, issue the following command:

```
nodegrp -w 'InstallOSName == 'Linux'' (nodegroup_name)
```

The following commands are used for managing node and node group information:

- lsnode** Displays information about the nodes in the CSM cluster, for example, the cached status on whether the node is currently reachable.
- chnode** Changes an attribute of a node in the CSM cluster database.
- definenode** Gathers all the information necessary to install the nodes.
- dmsctrl** Displays or changes certain parameters that affect the distributed management server component of CSM.
- nodegrp** Defines node groups within the CSM cluster for use by other functions such as the configuration file manager, the **dsh** command, the event response subsystem, and the hardware control commands.
- rmnode** Removes a node from the CSM cluster database.

For more information about CSM commands, see the man pages or Chapter 4, "CSM Commands" on page 33.

Predefined dynamic node groups

CSM provides the following predefined dynamic node groups.

Name	Select String
AllNodes	Hostname like '%'
ManagedNodes	Mode='Managed'
PreManagedNodes	Mode='PreManaged'
LinuxNodes	InstallOSName='Linux'

Name	Select String
RedHatNodes	InstallDistributionName='Redhat'
RedHat71Nodes	InstallDistributionName='7.1'
RedHat72Nodes	InstallDistributionName='7.2'
KickstartNodes	InstallMethod='kickstart'
NetfinityNodes	PowerMethod='netfinity'

Monitoring and controlling hardware

The following commands are used for hardware control:

- rconsole** Opens a remote console.
- rpower** Boots and resets hardware, powers hardware on and off, and queries the power state.
- systemid** Connects hardware control points.

See the *IBM CSM for Linux: Hardware Planning and Control Guide* for more information on controlling hardware.

See the the man pages or Chapter 4, “CSM Commands” on page 33 for more information about CSM commands.

Running commands remotely

The distributed shell (**dsh**) command runs commands remotely across multiple nodes. It can also use any underlying remote shell that is specified by the user. For example, you could specify a remote shell that complies with the IETF (Internet Engineering Task Force) secure remote command protocol. By default, **rsh** is used, but you may also specify a secure remote command.

The following commands are used for running commands remotely:

- dsh** Issues remote shell commands and the options associated with them to multiple nodes. This command can retrieve a complete list of the nodes in the CSM cluster or the list of nodes in a specified node group.
- dshbak** Presents formatted output from the **dsh** command.

For more information about CSM commands, see the man pages or Chapter 4, “CSM Commands” on page 33.

Managing configuration files with Configuration File Manager

Configuration File Manager (CFM) provides a file repository for the configuration files that are common the among nodes in a cluster. It allows a system administrator to control a cluster’s configuration files in an easy and efficient manner. In general, all the configuration files that need to be shared are stored in one location on the management server, and changes to these files are propagated throughout the cluster. The system administrator’s main responsibility will be to maintain the configuration files stored on the management server.

As an administrator, you have a certain amount of control over your configuration files. Though the files are common, there are mechanisms to allow for variations based on groups, IP address, and host name. You have flexibility in the amount of detail that you include in your configuration files, and you can specify one version of the configuration file for all the nodes of your cluster, while specifying different versions for CSM-defined node groups.

The parts of CFM that you need to know about are the Server File Repository, the **cfmupdatenode** command, the **cfmupdatenode** cron job, ERRM conditions and responses, and the CFM log files. All of these components work together to provide the administrator with control over the configuration files for the cluster.

Server File Repository

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

Note that the pathname of the configuration file on the node is the same as the same file on 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 a configuration file is deleted from **/cfmroot**, it will not be deleted from the nodes. Say you delete a configuration file called **/cfmroot/etc/services** from your management server. The **/etc/services** file will remain. To delete the remaining **/etc/services** file, you would use the **dsh** command as follows:

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

In the example above, *host* represents the hostname of the machines from which the file should be removed.

cfmupdatenode command

The **cfmupdatenode** command is used to prompt the management server to immediately redistribute the configuration files in **/cfmroot** to the nodes. However, the system administrator does not need to run this command if the ERRM condition and response pair (**CFMRootModTimeChanged** and **CFMModResp**) is running.

Checking the status of configuration files

System administrators can use the **cfmupdatenode** command to check the status of the configuration files on the cluster. **cfmupdatenode** can output the node names and configuration files that are backlevel, which helps the administrator understand what will be changed the next time the files get distributed to the nodes. To use **cfmupdatenode** to check the status of the configuration files in the cluster, use the **-q** flag:

```
cfmupdatenode -q
```

See the man page or Chapter 4, "CSM Commands" on page 33 for details on the **cfmupdatenode** command.

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 midnight, but you can set it to run the command at any time interval that you wish. You do this by editing the **cfmupdatenode** cron job with the **crontab** command. For information on using the **crontab** command, see the Linux **crontab** man page.

All errors that are reported by the cron job are e-mailed to root.

CFM log files

As a system administrator, you will be concerned with two log files; the error log and the change log. Both of these logs are located on the management server.

Error log

CFM uses the error log to record the errors that are encountered by the **cfmupdatenode** script. It 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 back log named **cfmerror.log1**. When the size of the new **cfmerror.log** exceeds 10,000 bytes, **cfmerror.log1** is renamed to **cfmerror.log2** and the current **cfmerror.log** is renamed to **cfmerror.log1**. CFM retains a maximum of four backlogs, so at any give time, you could have **cfmerror.log**, **cfmerror.log1**, **cfmerror.log2**, **cfmerror.log3**, and **cfmerror.log4** in the **/var/log/csm** directory, with **cfmerror.log** as the most recent.

Change log

CFM uses the change log to record details about the configuration files, 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**. It uses the following format:

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

Monitoring system events

A flexible distributed system monitoring application is provided by Reliable Scalable Cluster Technology (RSCT). The RSCT monitoring application allows you to define conditions on your system that you want to monitor. 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 take place. Multiple actions can be defined as components of a response. These actions include sending a notification, running a predefined script, or running a user-defined script.

A set of commands is provided for setting up the monitoring application to meet your needs. A set of predefined conditions and responses is also provided. You can use the predefined conditions and responses as they are, or you can copy and then modify them to fit your needs.

System resources that can be monitored include:

- File systems
- Programs
- System resources
- Node availability
- Other resources by means of 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 11. For the full details, refer to *IBM RSCT for Linux: Guide and Reference*. RSCT command syntax, descriptions, and examples are available as integrated man pages or in *IBM RSCT for Linux: Technical Reference*.

CFM ERRM conditions and responses

CSM provides predefined conditions and responses that you can use for monitoring your system. In order for monitoring to become active, you will need to set up an association between a condition and the response you want to take. You do this with the RSCT **mkcondresp** command. After the association between a condition and a response has been set up, you will then use the RSCT **startcondresp** command to start monitoring. For information on using the **mkcondresp** and **startcondresp** command, see the *IBM RSCT for Linux: Guide and Reference*.

When a condition. is met, ERRM runs the **cfmupdatenode** command in response. The monitored conditions are as follows:

Table 1. ERRM conditions and responses

Condition Name	Condition Description	Corresponding Response	Response Description
CFMRootModTimeChanged	Change in <code>/cfmroot</code> directory	CFMModResp	Runs cfmupdatenode to update all nodes in the cluster.
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.

To see a list of the predefined conditions, use the **lcondition** command. See the **lcondition** man page or the *IBM RSCT for Linux: Technical Reference* for more information.

In general, you will be most concerned with the **CFMRootModTimeChanged** condition, which watches for changes to the `/cfmroot` directory. Anytime a file in this directory is updated, or a new file is added, the condition is met. In response, the **cfmupdatenode** command is run after two minutes, which causes the updated configuration files to be copied to the nodes in the cluster. Note that the **CFMRootModTimeChanged** condition is not met when files are removed.

If you add files to the `/cfmroot` directory during heavy system use, the ERRM **CFMRootModTimeChanged** condition may degrade system performance. As a result, you may want to change the response for **CFMRootModTimeChanged** to one that will have a lower impact on the system (such as **EmailEventsToRootAnyTime**). Then, when the system is not under such heavy use, you can run the **cfmupdatenode** command to distribute the new files to the rest of the cluster.

For more information on ERRM, see *IBM RSCT for Linux: Guide and Reference*.

Providing security

Security is provided by the operating system – only root can run functions 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 (Internet Engineering Task Force) 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 by using the `DSH_REMOTE_CMD` environment variable.

dsh security

The distributed shell **dsh** command uses either the underlying **rsh** security protocol, or a *secure remote command* protocol. By default, **rsh** is used. 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. The system administrator is responsible for fulfilling the particular security obligations of a specified security environment. At a minimum, you can configure **rsh** with the `/root/.rhosts` file on the nodes. A more secure environment might have Kerberos configured, or might be using some type of shell that conforms to the IETF (Internet Engineering Task Force) secure remote command protocol.

Note that if you wish to use a secure remote command protocol, Red Hat **OpenSSH**, which is installed with Linux Red Hat 7.1 and 7.2 is required.

For more information about the **dsh** and **dshbak** commands, see the man pages or Chapter 4, “CSM Commands” on page 33.

Specifying a remote security protocol

As a system administrator, you need to decide which remote command protocol you want to use for remote communication; **rsh** or a secure remote command. You can do this with the `$DSH_REMOTE_CMD` environment variable, by setting it to the full pathname of your **rsh** or secure remote command (for example, `/usr/bin/secureremote`). You can also use the `-r` (remote shell path) option of the **cfmupdatenode** command. When the **cfmupdatenode** command is run, it first checks for the value of the `-r` option. If the option has not been set, it checks for the value of the `$DSH_REMOTE_CMD` environment variable. If the environment variable has also not been set, the **cfmupdatenode** command defaults to using **rsh**.

For more information about using the **cfmupdatenode** command, see the man page or Chapter 4, “CSM Commands” on page 33.

If you use **rsh**, make sure each node has a `$HOME/.rhosts` directory that contains the management server host name. Adding `rsh` to the end of `/etc/securetty` on each node allows root to **rsh** into the node. Also, make sure the **rsh** daemon is running on each node. Use the **chkconfig --list** command to check it, or use the **chkconfig rsh on** command to turn on **rsh**.

RSCT security

CSM uses the security function of RSCT to ensure that the software components in your cluster can properly authenticate the identity of the peers, clients and subcomponents they interact with. Since it is possible for one of these peers, clients, or subcomponents to imitate another, it is important that the components of your cluster can verify that the parties they interact with are who they say they are. Instead of merely requiring each party to verify the identity of the other when a connection is established, RSCT security uses a message authentication process to do this.

RSCT message authentication

The authentication mechanism used by RSCT security involves the sending and receiving components in your cluster exchanging message keys. Each message that is sent between the parties is signed by the sender, and the signature is then verified by the receiver. The information needed to verify the signature of a message is contained in a key. Each node has a private key, which it uses to encode the messages that it sends to other nodes. A public key is derived from the private key and distributed to the other nodes of the cluster. The receiving node then uses the public key to decode the messages from the sender. For a more detailed description of message keys and RSCT security’s authentication services, refer to *IBM RSCT for Linux: Guide and Reference*.

When configuring a cluster of nodes, by default, the necessary 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 also copied to each of the managed nodes. If you feel that your system is not secure enough to prevent address and identity spoofing, you need to transfer the public keys between the management server and the nodes manually. For information on how to do this, refer to *IBM RSCT for Linux: Guide and Reference*.

RSCT authorization

CSM implements authorization using the 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 the permissions 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 1) an identifier that matches the user issuing the command and 2) an object type that matches the objects specified by the command is the line used to determine access permissions.

- | For more detailed information about authorization and the ACL file, see the *IBM RSCT for Linux: Guide and Reference*.

Chapter 2. Monitoring your system

This chapter provides a high-level introduction to the concepts of monitoring. Because the monitoring application is provided by the RSCT product, detailed information about planning for monitoring your system, tracking system events, and using and modifying the predefined scripts, expressions, commands, and responses is provided with the RSCT publications (refer to the *IBM RSCT for Linux: Guide and Reference*).

The RSCT Monitoring application 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 user-written 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. You can respond to an event in different ways based on the day of the week and time of day. The following are some examples of how you can use monitoring:

- You can be alerted by e-mail if **/tmp** is unmounted during working hours. And during non-working hours, you can have the problem logged if **/tmp** is unmounted.
- You can be notified by e-mail when **/var** is 80% full.
- You can have a user-written script run automatically to delete the oldest unnecessary 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 *IBM RSCT for Linux: Guide and Reference*. For information about the command line interface to the RMC subsystem, see *IBM RSCT for Linux: Technical Reference*.

Monitoring concepts

Monitoring allows you to detect conditions of interest associated with the cluster nodes and their related resources, and then automatically take action when those conditions occur. 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 found to be true. Actions can include notification, running commands, and logging.

Using conditions for monitoring

System resources that you can monitor are organized into general categories called *resource classes*. Examples of resource classes include Processor, File System, Physical Volume, and Ethernet Device. 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**. 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 change in the system. Note that RSCT provides you with predefined conditions.

You may find it useful to set up a rearm expression. A rearm expression 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 notifies all of the associated event responses, which causes each event response to run its defined actions.

The Monitoring application allows you to use predefined responses, or you can create new responses and associate them with conditions as needed. You can associate *multiple responses* with *one condition*, or you can associate *one response* with *multiple conditions*.

For more detailed information about conditions, responses, and using expressions, see *IBM RSCT for Linux: Guide and Reference*.

Components provided for monitoring

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

Resource Monitoring and Control subsystem

The Resource Monitoring and Control (RMC) subsystem monitors and queries 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 process that maps resource and resource-class abstractions into calls and commands for one or more specific types of resources. A resource manager is a stand-alone daemon. The 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 properties can be manipulated by the user through the command line.

See the man pages or the *IBM RSCT for Linux: Technical Reference* to learn how to access the resource classes and manipulate 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 *IBM RSCT for Linux: Guide and Reference* 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 the nodes and adding, removing, and changing attributes of the nodes and node groups in the cluster. See "Domain Management Server Resource Manager" on page 13 and "Managing node and node group information" on page 2 for details.

Event Response resource manager (IBM.ERRM)

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

File System resource manager (IBM.FSRM)

Monitors file systems. See *IBM RSCT for Linux: Guide and Reference* for details.

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 *IBM RSCT for Linux: Guide and Reference* for details.

Sensor resource manager (IBM.SensorRM)

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

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 part of CSM. For information about the resource managers that are available with RSCT, see *IBM RSCT for Linux: Guide and Reference*.

Managed Node resource class (IBM.ManagedNode)

The program name of this resource class is IBM.ManagedNode. It 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 the attributes of the Managed Node class, see the **nodeattributes** man page or “nodeattributes File” on page 72.

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
ConfigChanged=1	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 program name of the Node Group Resource Class is IBM.NodeGroup. The node group resource class 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.NodeHardwareControl resource class.

NodeGroupMembershipChanged:

Event Expression	Event Description	Rearm Expression	Rearm Description	Notes
MembershipChanged.AddCount !=1 MembershipChanged.DeleteCount !=0	An event is generated when a node is added to or deleted from a previously existing node group.	None	None	NodeNames = {localnode}

Node Hardware Control Resource Class (IBM.NodeHwCtrl)

The program name of the Node Hardware Control Resource class is IBM.NodeHwCtrl. The node hardware control class 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.

Other predefined conditions

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

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 <i>/var</i> directory is in use.	PercentTotUsed<75	The event is rearmed when the amount of space used in the <i>/var</i> directory 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 directory is in use.	PercentTotUsed<75	The event is rearmed when the amount of space used in the /tmp directory 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.

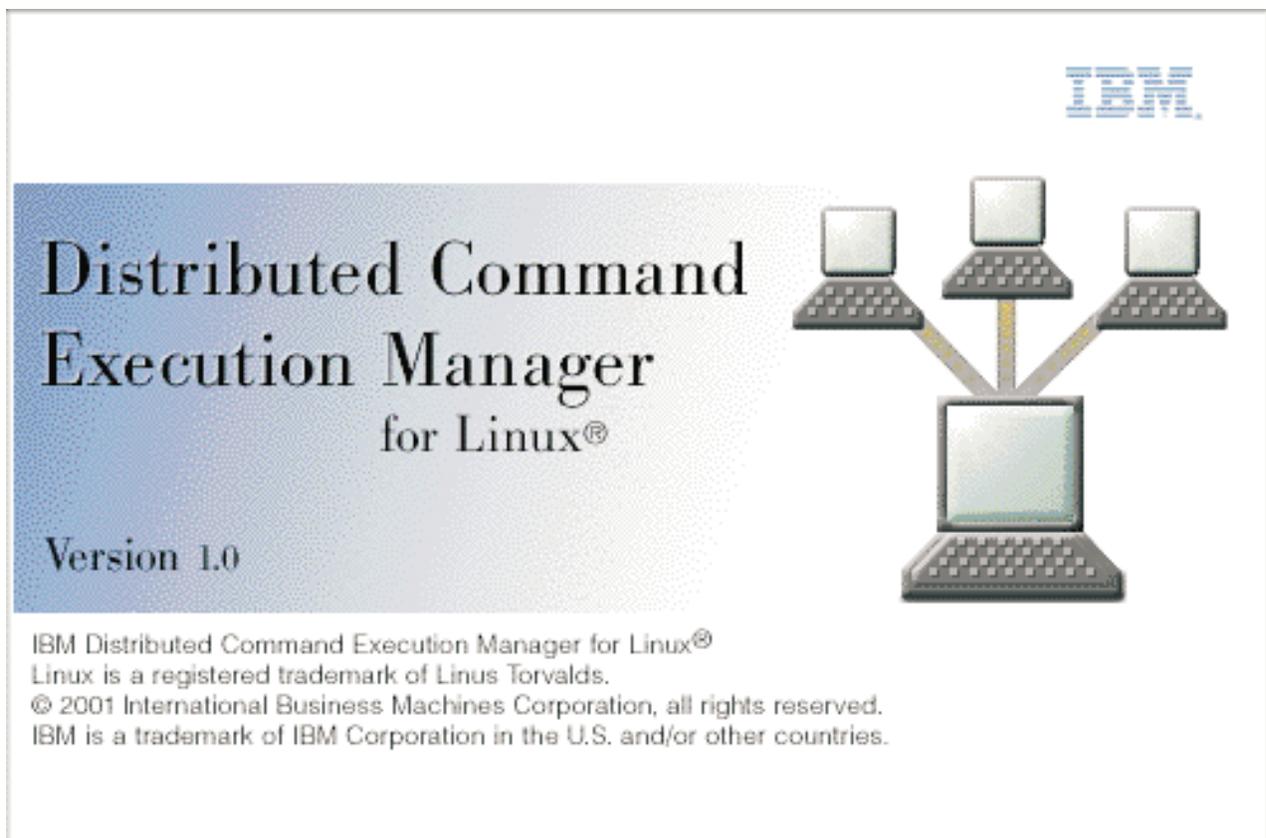
Table 2. Predefined responses

Response Name	Corresponding Command	Notes
CFMModeResp	/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/snmpmsg	Applies to all resource classes
LogOnlyToAuditLogAnyTime	Not applicable.	Applies to all resource classes

Chapter 3. Using the Distributed Command Execution Manager

The Distributed Command Execution Manager (DCEM) provides a variety of services for a network of distributed machines. The DCEM graphical user interface allows you to construct command specifications for executing on multiple target machines, providing real-time status as commands are executed. 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 this command specification to use in the future. When you save a command specification, a Perl script is generated that you can run directly from a Linux or AIX command line. You can create and modify groups of hosts 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 host attributes in a domain. DCEM also creates a log of all distributed command activity.

The DCEM startup window is shown in the following illustration.



Installing DCEM

DCEM uses IBM Cluster Systems Management (CSM). CSM 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 **.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 for each of the nodes to be managed in the CSM

database on the management server where DCEM will run. You can create these definitions when you install CSM. However, if these node definitions do not exist, you can create them by using the CSM **definenode** command, as follows:

```
/opt/csm/bin/definenode -n <host name>
```

See Chapter 4, “CSM Commands” on page 33 for more information on the **definenode** command.

Starting DCEM

To start DCEM, type the following at the command line:

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

The DCEM command line options are as follows:

```
/opt/csm/dcem/bin/dcem [-h | --help] [-V | --version] [-v | --verbose] [-N | --groups  
<group,group,group,...>] [-n | --hosts <host_name,host_name,host_name,...>]  
[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` option 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 executed commands. To reset DCEM to the default values, click the **Defaults** button in the dialog.

You can also use the following flags:

- **-h | --help** writes the usage message for the **dcem** command to standard output.
- **-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.
- **-N | --groups *group,group,group,...*** specifies the groups displayed in the Groups of hosts field of the DCEM dialog at startup. If you use this flag with a command specification name, the host names and groups that are stored as part of the command specification are ignored.
- **-n | --hosts *host_name,host_name,host_name,...*** specifies the hosts displayed in the **Host names** field of the DCEM dialog at startup. If you use this flag with a command specification name, the host names and groups that are stored as part of the command specification are ignored.

Example:

The following example specifies 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, type:

```
dcem
```

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

```
dcem -N g4,g5 myCommand
```

This results in the following output in the following GUI fields:

Host names:{empty}

Groups of hosts: g4,g5

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

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

This results in the following output in the following GUI fields:

Host names: h4

Groups of hosts: g4,g5

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

```
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:

```
export DISPLAY=IP address of the machine on which you wish to display the GUI:0
```

Using DCEM

The following panels help you to define command specifications:

- General panel
- Options 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 Groups and Dynamic Groups panels provide an interface for creating and modifying groups of host machines.

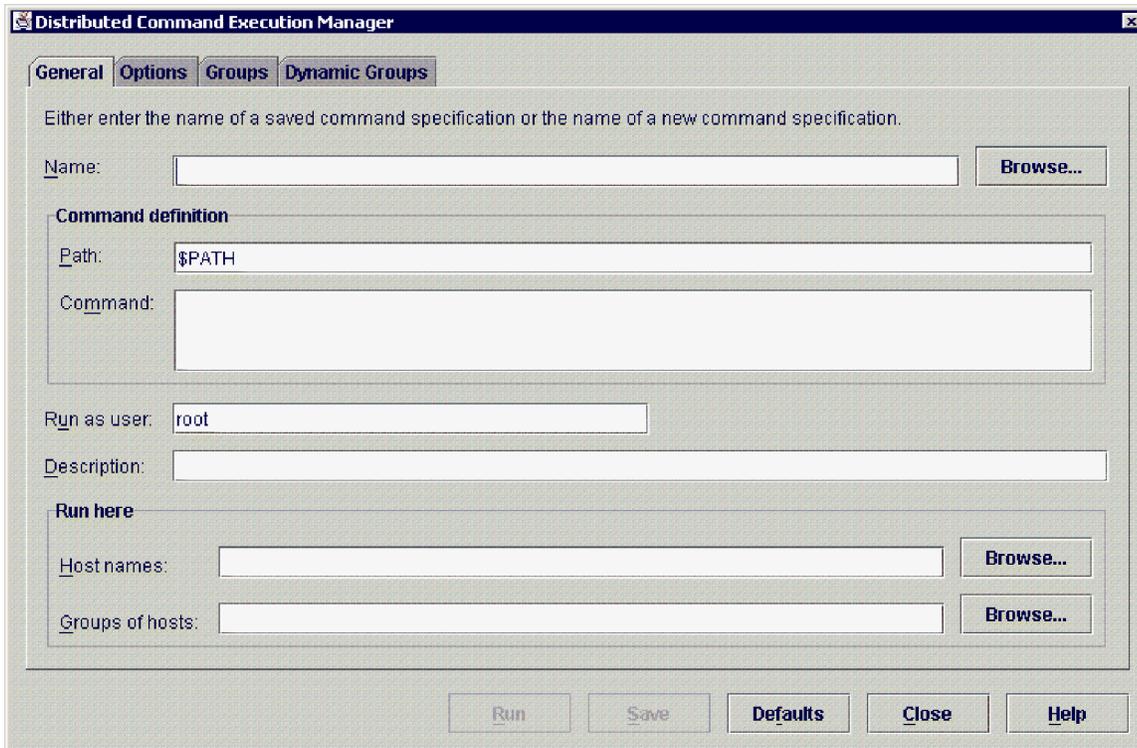
Creating command specifications

DCEM allows you to create, save, and edit command specifications, which reduces your 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 hosts or groups of hosts 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 hosts.



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 hosts. 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 host groups. You can type a list of host groups separated by commas or spaces. You can also select host 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 of hosts. For more information, see Creating Groups of Hosts “Creating groups of hosts” on page 27.

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

- **Run as User** - The user name that the command will run under. By default, it is populated with 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. (see Security Considerations and Remote Shells “Security considerations and remote shells” on page 134)
- **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 hosts 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.

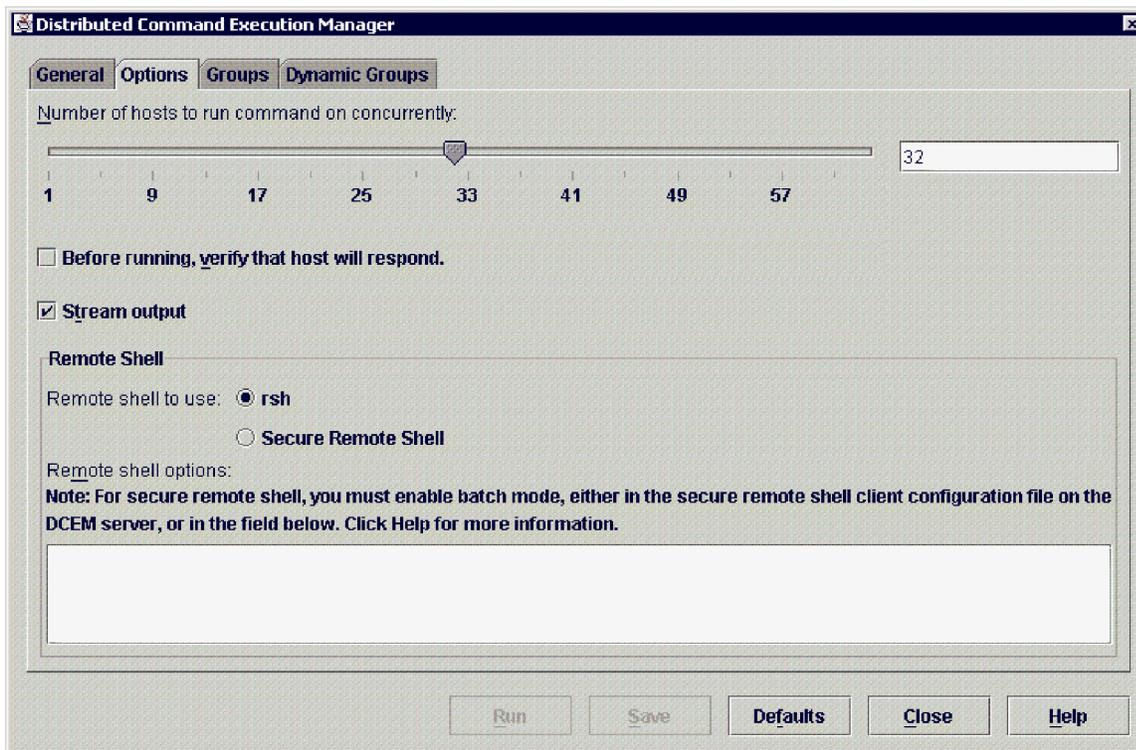
If you leave the **Path** field empty, it is the same as having \$PATH.

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 executing 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 at the same time. 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 hosts 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 command execution completes.
- **Remote Shell** - Displays the remote shell under which distributed commands will be run. The remote shell options for **rsh** listed in this section are for the AIX platform. On Linux, these options could be different. The default shell on AIX is **rsh**, and if a secure remote shell is not installed, **rsh** will be the

only option available. You can enter options for either **rsh** or a secure remote shell in the text box provided. Enter the options as you would enter them on the command line.

Because the DCEM application is not interactive, you must configure a secure remote shell to run in batch mode. If a secure remote shell is not configured properly and you are prompted for a password during authentication, the command that you attempted to run cannot execute. You must then click the **Stop** button at the bottom of the Execution Progress dialog to stop the execution.

Options for **rsh** include the following:

- **-f** causes DCE credentials to be forwarded to remote hosts. This option is valid only if the underlying **rsh** uses Kerberos authentication and you have valid Kerberos credentials. It will be ignored if Kerberos 5 is not the current authentication method, and authentication will fail if the current DCE credentials are not marked forwardable.
- **-F** causes the credentials on the remote system to be marked forwardable (allowing them to be passed to another remote system). This setting will also be ignored if Kerberos 5 is not the current authentication method.

DCEM supports a variety of secure remote shells and has been tested, to a limited basis, using RedHat OpenSSH, a secure remote shell. If a secure remote shell supports batch mode, you must enable the batch mode. You can do this 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. (If a secure remote shell is installed, you can select the **Secure Remote Shell** radio button, and in the field where the options for this selection display, you can type the flag that enables batch mode.) For detailed information about secure remote shell client configuration, see the specific secure remote shell documentation.

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 “Example of a saved command script” on page 137). The saved script contains all the information on the DCEM General and Options panels. Saved command specifications are located in the following directory:

```
home/dcem/scripts/script file name.pl
```

home is the home directory of the user under whose name the distributed command is run. *script file name.pl* 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 “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.

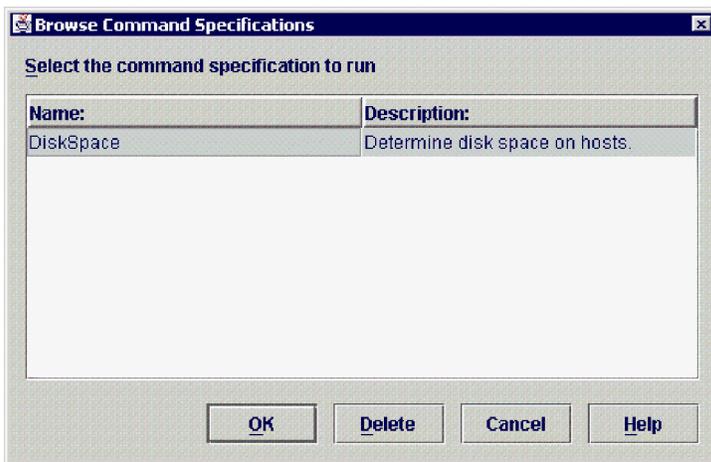
From the DCEM dialog

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, then click the **OK** button to load the selected command specification into the General and Options panels.



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 19), 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, type the following:

```
/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

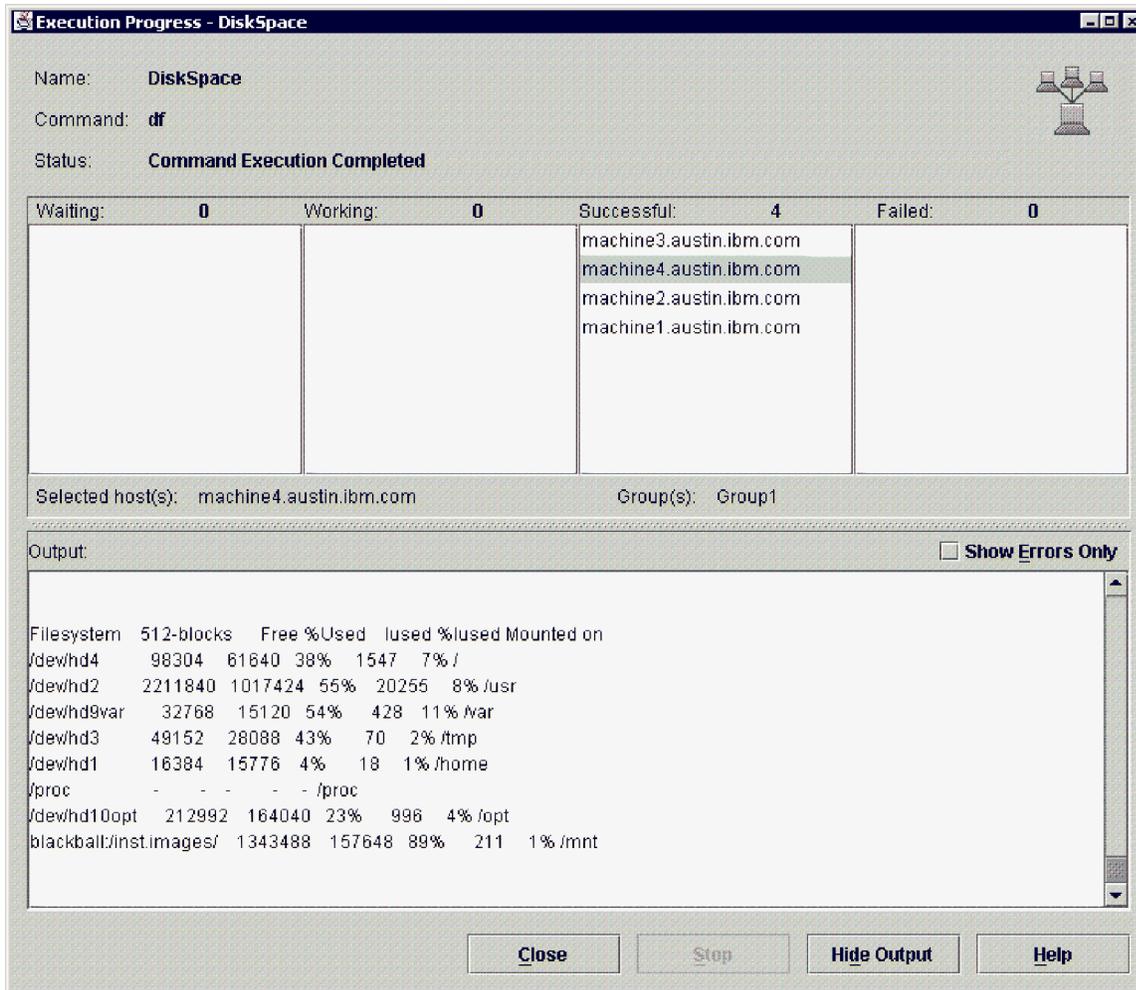
To run the command specification script directly on the command line, type the following:

```
<user_home_directory>/dcem/scripts/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, for example, `/opt/csm/bin/dsh -f 11 -s -l root -N sysmgt-testbed "date"`.
- **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 stdout 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 valid hosts or groups of hosts, DCEM displays the following Execution Progress Dialog to show the status of the command execution on all of the hosts.



In this dialog, a series of lists show hosts on which command execution is in one of the following states:

- Waiting
- Working
- Successful
- Failed

The bottom of the window displays output from the command execution on selected hosts. To display output from a host, select its name from any of the lists. Multiple selections made from the Successful or Failed lists result in combined output in the output window. To view real-time output, select a host that is currently in the working state. The Waiting and Working lists do not support multiple selections.

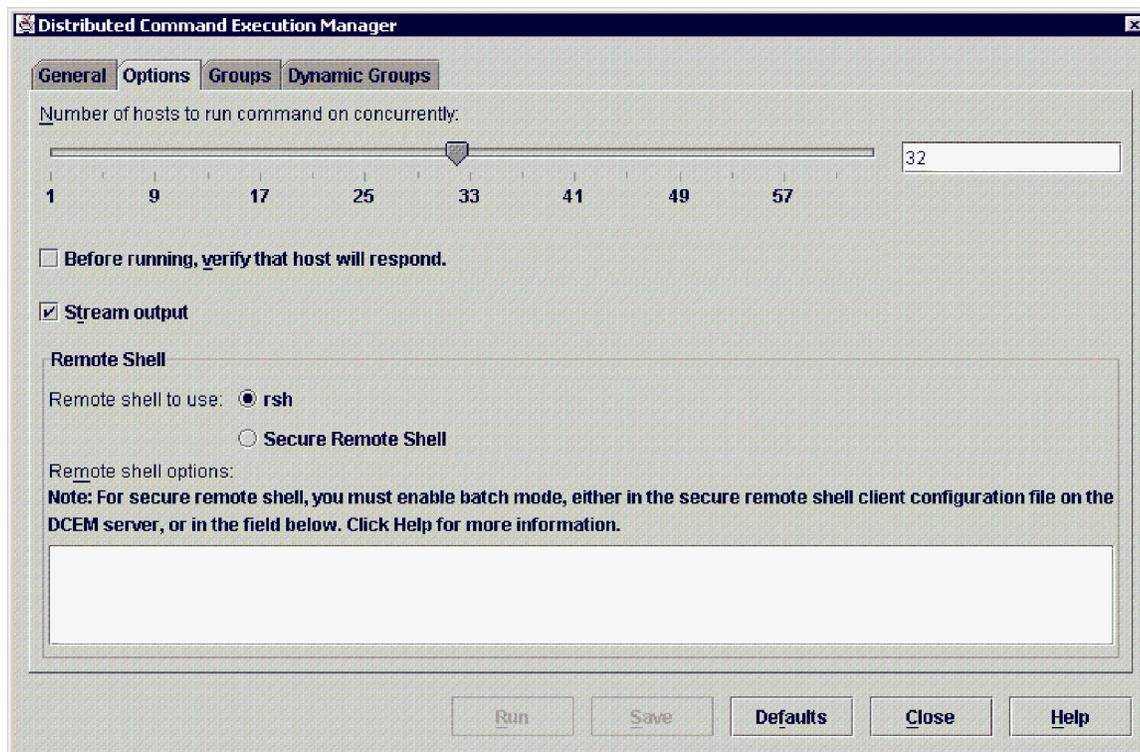
To stop the distributed command execution on all hosts, click the **Stop** button. If a command has not been completed on a host, command execution for that host is terminated. Hosts that have been stopped move to the Failed list. Command that have already completed may appear in either the Successful 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 **Close** button hides the Execution Progress Dialog, but does not stop execution on any hosts. If the DCEM dialog is closed before these hosts have completed execution, then these hosts will be stopped.

Fine-tuning run-time parameters

You can adjust several run-time options for your command using the DCEM Options panel, shown in the following illustration.



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 at the same time. 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 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 execution completes on that host 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**.

Working with groups of hosts

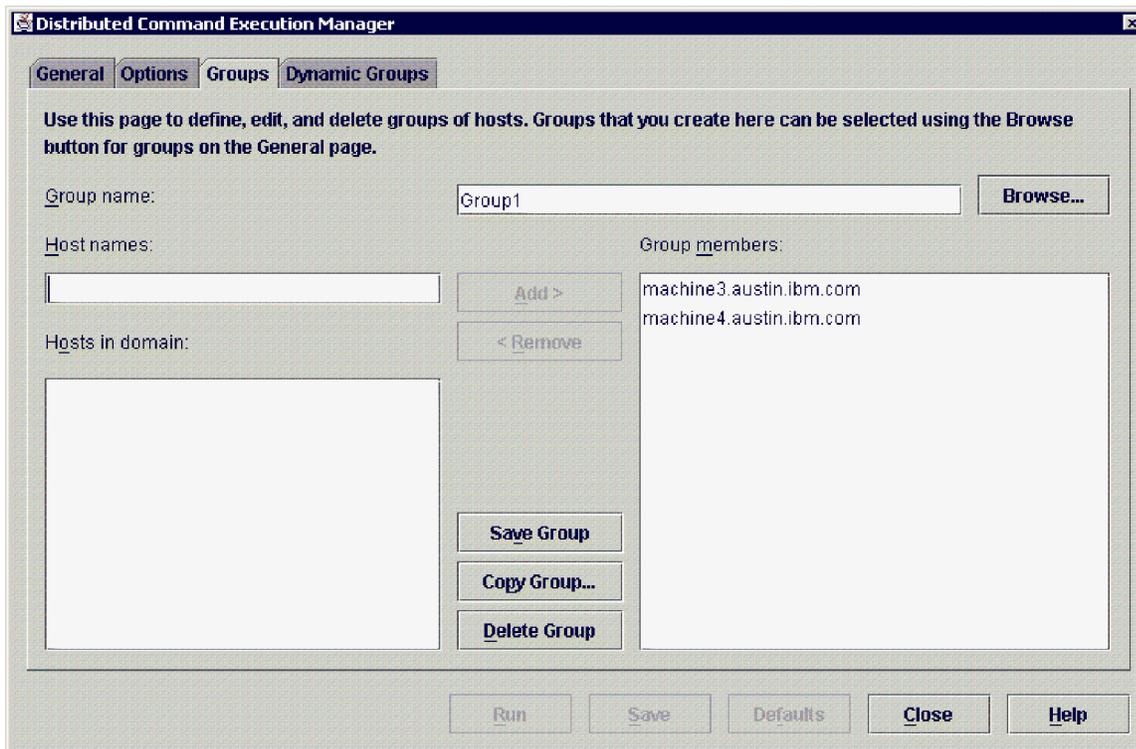
The ability to organize hosts into groups and to save these groups for later use can make it more convenient to run commands on the same groups of hosts repeatedly. Node groups can either be explicit lists of node host names, created by explicitly specifying each host, or they can be dynamic groups of hosts, created by specifying the desired selection criteria, such as "Hostname like 'websvr%'". 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 and 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.ac1s` file. You can modify this file, then run the **refresh -s ctrmc** command to refresh the systems. For more information, see the Security Considerations section of this book.

Groups panel

Use the Groups panel to create explicit groups of hosts. 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 hosts that are already in the group.



Creating groups of hosts

Use the Groups panel to create a group of hosts. To create a group of hosts 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 host 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 those hosts defined in CSM that have CSM client code installed.
3. To add hosts 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 group of hosts, click the **Save Group** button.

Editing groups of hosts

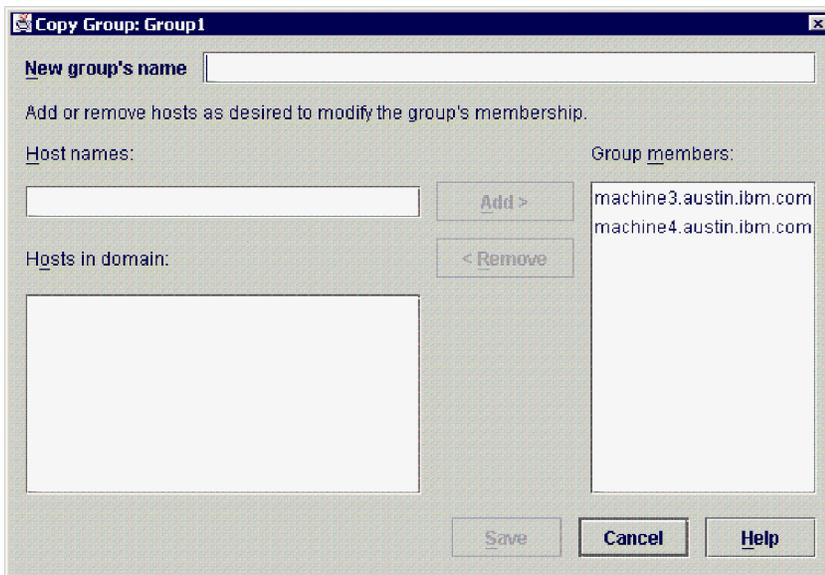
Use the Groups panel to edit an existing group of hosts. You can select group members to remove host names or add new host names. To edit a group of hosts, do the following:

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 host 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 host 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 groups of hosts

Use the **Copy Group** dialog to copy an existing group of hosts. When you copy a group, you can also add new hosts to the group or remove hosts from the group before you save the copy.



To copy a 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 host 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 host 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.

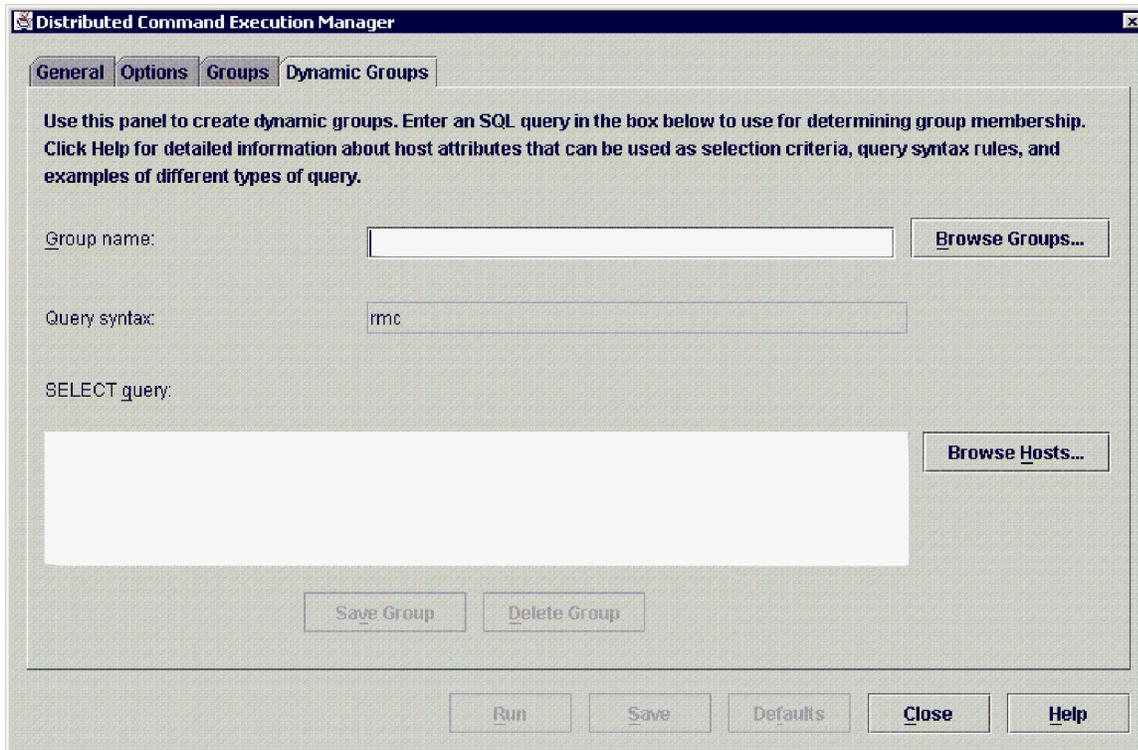
Deleting groups of hosts

Use the Groups panel to delete existing groups of hosts. To delete a group of hosts, 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 in the following illustration, allows you to create dynamic groups of hosts based on a select (SQL-like) string. This select string is used to search the hosts database to dynamically determine the list of hosts in the group.



Creating a dynamic group of hosts

To create a dynamic group of hosts 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 is of **rnc** type, use the syntax described in *IBM RSCT for Linux: Guide and Reference*.
3. To show the hosts that match your specified selection criteria after you specify a valid select string, click the **Browse Hosts** button.
4. To create the group of hosts, click the **Save Group** button.

Displaying dynamic group host Members

To view host members of an existing dynamic 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 hosts 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 hosts 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 hosts matching a select string, you do not need to provide a group name.

Editing a dynamic group

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

To edit an existing dynamic 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 group

To copy a dynamic 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 group

To delete a dynamic 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 “Setting up node group information” on page 2.

Command output and activity logs

DCEM command output and activity are saved in log files. Log files are stored in the following directory:

```
home/dcem/log/log file name
```

home is the home directory of the user under whose name the distributed command is run. *log file name* is the name of the log file containing the **dcem** command activity. All DCEM command activity of failures and successes are saved in this log file.

The default log file name is `dcem1.log`. The default maximum size for a log file is 10M. When `dcem1.log` is full, it is renamed to `dcem2.log`. New log entries are always written to `dcem1.log`.

The following is an example of DCEM log file contents:

```
TIME:      Sep 20 18:55:57.076
INFO:      Command Name:listing
Command:   ls -l
Successful Machines: wsm14 wsm12 wsm06 wsm04 wsm15 wsm03
Failed Machines: wsm01 wsm00
```

```
TIME:      Oct 08 11:32:10.868
```

```
INFO:      Command Name:DiskSpace
command: df
Successful Machines: endive.austin.ibm.com
Failed Machines: westwing.austin.ibm.com
```

Chapter 4. CSM Commands

cfmupdatenode Command

Name

cfmupdatenode - Distributes configuration files across the cluster. The **cfmupdatenode** command is called by the **updatenode** command.

Synopsis

```
cfmupdatenode [-h] [-v | -V] [-a | -N node_group[,node_group...]] [-b] [[-y] | [-c]] [-q [-s]] [-r remote_shell_path] [-t timeout] [-M max_child_process] [-d distfile_location] [-f filename] [host[, host...]]
```

Description

The **cfmupdatenode** command provides the major function of the Configuration File Manager (CFM) application. CFM provides a file repository on the management server (**/cfmroot**) to contain all the files that are shared among CFM managed nodes. The system administrator builds **/cfmroot** directory to be the repository of files or links to files of interest, in particular, configuration files.

The **cfmupdatenode** command is run on the management server and causes immediate distribution of the configuration files located in the server file repository (**/cfmroot**). The target nodes must be supplied to the **cfmupdatenode** command through the use of the **-a**, **-N**, or positional arguments.

Symbolic links can be placed in the **/cfmroot** directory, but **cfmupdatenode** will transfer the target of the symbolic link. If symbolic links need to be maintained throughout the cluster, they should be created with **filename.post** files.

A file in the server file repository can either be sent to all nodes, or to a defined node group. To associate a file with a specific group add a **._GroupName** extension to the file name. This file will now only be distributed to nodes in this CSM node group. During file transfer this **._GroupName** extension is removed. The **._GroupName** extension must come at the end of the directory or filename. In addition it cannot contain the **"|"** character.

Note: Adding a **._GroupName** extension to a file creates a persistent association between a CSM node group and the file. Please keep this in mind when you change node group definitions.

The default remote transfer protocol for **cfmupdatenode** is **rsh**. CFM can use any remote shell whose usage follows the syntax of **rsh** and allows remote automated login. The remote shell can be specified with the **-r** flag. If not specified, **cfmupdatenode** checks the **DSH_REMOTE_CMD** environment variable for a remote shell path, and if that fails, uses the default, **rsh**.

There is a query option on **cfmupdatenode** that displays which CFM files are out of date across the cluster. This can be invoked with the **-q** command line option. The query can also compare the last time CFM updated a node to the last modification time in **/cfmroot**. This quickly displays which nodes are out of date and can be invoked through the combination of the **-q** and **-s** command line options.

CFM allows file preprocessing and postprocessing; for example, to start and stop daemons. In cases where a **filename.pre** or **filename.post** script exists, the **filename.pre** script or executable is run on the destination node before the configuration file is copied, and **filename.post** script is run after the configuration file is copied. The scripts are run under the same user as **cfmupdatenode**. All stdout and stderr from these scripts is redirected by **cfmupdatenode** to both stdout and stderr on the management server (stdout is only displayed if **cfmupdatenode** is run with the **-v** verbose option). These scripts may be written in any shell-based scripting language.

Note: The *filename.pre* and *filename.post* scripts are retained on each node in the */var/opt/csm/cfmlocal/* directory. File permissions should be set so that these are not accessed by unauthorized users. The file permissions should be set in */cfmroot* so they will be maintained throughout the cluster.

Files transferred by CFM retain their original modification time stamp from the management server. While the cluster does not need to have synchronized time clocks for the successful operation of CFM, the administrator should exercise caution when operating CFM in younger (-y) mode.

CFM is designed to facilitate in the distribution of individual configuration files across a cluster. It should not be used to distribute or maintain copies of entire file systems as this could result in extremely slow performance. CFM can transfer both text and binary files. However, it should be noted that CFM provides no support for Endian byte conversion between architectures.

Options

- a** Files are distributed to all the nodes in the ManagedNode class. This option cannot be used with the **-N** or host positional arguments.
- h** Writes the command's usage statement to standard output.
- v | -V**
Verbose mode.
- b** Backup. Preserve existing configuration files (on nodes) as *filename.OLD*.
- y** Younger mode. Files are normally updated if their modification times and sizes disagree with those of the master copy (located in */cfmroot*). This option causes **cfmupdatenode** not to update files that are younger than the master copy. This option should only be used if the administrator is confident that the time clocks on the client nodes are in sync with the time clock on the management server. A warning message is printed for files which are newer than the master copy.
- c** Perform binary comparison on files and transfer them if they differ.
- q** Queries which CFM files are out of date across the cluster. These files will be updated by the next normal execution of **cfmupdatenode**. If all files are current, nothing is reported.
- r remote shell path**
Path to use for remote commands. Can either point to rshell or secure remote command executable.
- s** Reports which ManagedNodes are up-to-date by comparing the last CFM update time with the modification time of files in the */cfmroot* directory. Only for use with the **-q** flag.
- t timeout**
Set the timeout period (in seconds) for waiting for responses from a remote process. The default is 900 seconds.
- M max_child_processes**
Set the number of nodes to update concurrently. The default is **32**. Please note that depending on the number of files that need to be transferred, **cfmupdatenode** can take a while to update a node and that this number should be set accordingly.
- d distfile location**
Generates a distfile but does not call **Rdist** (the open source utility used for file transfer). This way the administrator can run **Rdist** with whatever options she chooses.
- f filename**
Only updates the given filename. The filename should contain the absolute path name of the file and the file must reside in the */cfmroot* directory.

cfmupdatenode

-N *node_group[,node_group...]*

Resolves one or more node groups (separated by spaces or commas) and sends the resulting nodes their configuration files.

host[,host...]

Specify hostnames (separated by spaces or commas) to which files should be distributed.

Exit Status

Exit codes 1-4 mean that **cfmupdatenode** aborted file transfer when it received this error. Exit codes 10+ mean that **cfmupdatenode** tried to distribute as many files as possible.

- 0** All files transferred successfully.
- 1** Usage error.
- 2** Could not write distfile at **/tmp/cfm_distfile** (on management server).
- 3** Another executing of **cfmupdatenode** is currently running.
- 4** Could not run **lsnodes** or **nodegrp**. CTRMC down.
- 10** **Rdist** returned a non zero exit code. Some file distribution probably failed.
- 11** **Clocal** reported an error on a remote node.
- 21** Hostname or node group name resolution error. The administrator should consider running the CTRMC probe and checking the input to the CFM command.
- 22** One or more nodes experienced severe errors (they probably did not receive any configuration files). This includes unreachable (Fping status = 0) nodes.
- 23** There were errors concerning filenames in **/cfmroot**. Some files may not have been distributed.

Examples

1. To force **cfm** to run on all nodes, enter:

```
cfmupdatenode -a
```

2. To run **cfm** on one particular managed node, in this case, a node with the host name of **puppy**, enter:

```
cfmupdatenode puppy
```

Files

- | | |
|-----------------------------------|--|
| /cfmroot | The directory on the management server that contains the cluster's configuration files. |
| /opt/csm/bin/cfmupdatenode | Location of the cfmupdatenode command. |
| /tmp/cfm_distfile | Location of the file that is created with the -d option of cfmupdatenode and contains instructions on how and where to transfer files. |
| /var/log/csm/cfmerror.log | Location of CFM error logs. |
| /var/log/csm/cfmchange.log | Location of the log, on the management server, that contains updates to files. |

See Also

The **updatenode** man page.

Author

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chnode Command

Name

chnode - Changes a node definition in the CSM database.

Synopsis

chnode [-a] [-h] [-v | -V] {*host* | -f *file* | -N *group* | -w *selectstr*} *Attr=value* [*Attr=value* ...]

Description

The **chnode** command changes a managed node definition in the CSM database by setting one or more attribute values. Attribute values can be set in the database for this node definition by specifying attribute/value pairs on the command line in the form *Attr=value*. If the value is a string that contains spaces or other special characters, the value must be enclosed in quotation marks. The *host* parameter can be specified by host name or by IP address. If -w *selectstr* is specified, **chnode** uses that string in the "where" part of an SQL select statement against the database of nodes and changes the nodes that are matched.

The **chnode** command can only be run from the management server to change a node definition in the CSM database on the management server.

Note: The -P option is no longer valid for this command.

Options

-a Change all the nodes.

-h Writes the command's usage statement to standard output.

-v | -V

Writes the command's verbose messages to standard output.

-f *file* Specifies a file that contains a list of nodes names. If the file name is "-", then the list is read from stdin. The file can contain multiple lines and each line can have one or more node names, separated by spaces and/or commas.

-N *group*

Changes the nodes that are in the node groups specified. The node group is evaluated by the **nodegrp** command. Multiple node groups can be separated by commas or spaces (if the list is quoted).

-w *selectstr*

Changes the nodes that match the "where" part of the select string. It is easiest to put the whole string in double quotation marks, especially if you need to put attribute values in single quotation marks (when they are strings). As a convenience, "*" means all nodes, as if a "where" string were not specified.

Exit Status

1 A combination of options and arguments has been entered that is not valid.

12 Node not found.

13 No nodes matched the specified string.

If an error occurs in the RMC layer, the RMC return code will be returned as the exit status.

chnode

Examples

- 1. To change the operating system version for **websvr** in the CSM database, type:

```
chnode websvr InstallDistributionVersion='7.2'
```

Files

/opt/csm/bin/chnode Location of the **chnode** command

See Also

- The **definnode**, **lsnode**, **nodeattributes**, **nodegrp**, **rmnode** man pages.
- See the **rmcli** man page for information on *attr=value* syntax.

See the *IBM RSC T for Linux: Guide and Reference* for information on selection string syntax.

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csmsetupks Command

Name

csmsetupks – Configures Kickstart and defines the nodes to be installed to the CSM database.

Synopsis

csmsetupks [-h]

csmsetupks [-v | -V] [-ppath | -x] [-P | -a | [-Nnode_groups][[-n node_list]]]

Description

The **csmsetupks** command collects configuration information and uses the Linux Kickstart configuration file template to generate a Kickstart configuration file for each node. The Linux Kickstart configuration template is located in `/opt/csm/install/kscfg.tmpl.InstallDistributionNameInstallDistributionVersion`. For example, `/opt/csm/install/kscfg.tmpl.RedHat7.1`. The generated configuration file contains the information that the **csmsetupks** command has collected. The generated configuration file on the node is called `/csminstall/csmInstallCSMVersion/kickstart.InstallDistributionNameInstallDistributionVersion/node-ipaddr-kickstart`. For example, `/csminstall/csm/1.2/kickstart.Linux7.1/9.117.241.32-kickstart`. For more details on the template and the generated file, particularly how and when to modify them, see “kscfg.tmpl File” on page 64, and see the sample annotated **kscfg.tmpl** file in *IBM CSM for Linux: Software Planning and Installation Guide*.

Note: For the current version of the template, see `/opt/csm/install/kscfg.tmpl.RedHat7.1` and `/opt/csm/install/kscfg.tmpl.RedHat7.2` on your system.

Specifically, **csmsetupks** performs these tasks:

- Copies the RPMs from the Red Hat CD-ROMs or from the directories specified by **-p**. Prompts for CD-ROMs as needed. If the **-x** flag is provided, no RPMs are copied. The RPMs are copied into `/csminstall/InstallOSName/InstallDistributionName/InstallDistributionVersion/InstallPkgArchitecture/RedHat/RPMS/*.rpm`. For example, `/csminstall/Linux/RedHat/7.1/i386/RedHat/RPMS/*.rpm`.
- Starts the DHCP, NFS and ATFTP daemons, if they are not already running.
- Sets up the `/etc/dhcpd.conf` file for MAC address collection and for full install of the nodes. The first time **csmsetupks** runs, it replaces any existing `/etc/dhcpd.conf` file with its own, in a format that it can understand. From then on, **csmsetupks** just updates the existing file. The original file is saved to `/etc/dhcpd.conf.preesm`. After **csmsetupks** runs the first time, you may customize the `/etc/dhcpd.conf` file, as long as you do not alter the section marked with:

```
# CSM RANGE (DO NOT REMOVE THIS LINE)
```

and

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

- Creates the files that are necessary for network boot in `/csminstall`.
- Creates a Kickstart configuration file for each node in `/csminstall`.
- Gets the MAC addresses of all specified nodes by running **dsh**, if possible, or by running the **getmacs** command. The **getmacs** command may take a while to run, because it reboots all the nodes in parallel. If it has a problem getting MAC addresses, it times out after approximately 5 minutes.
- Sets the `InstallMethod` attribute to `kickstart` for each node provided.

Attribute values can be set by specifying attribute/value pairs on the command line in the form `Attr=value`. If the value is a string that contains spaces or other special characters, the value must be enclosed in quotation marks. Valid attributes are:

- Netmask

csmsetupks

- Gateway
- Nameservers (a comma-separated list of nameserver host names or IP addresses)

The default value for the attributes is the value that those attributes have on the management server. These values are used when creating the `/etc/dhcpd.conf` file.

Options

- h** Writes usage information to standard output.
- P** Set up Kickstart for all nodes whose *Mode* attribute is **PreManaged**.
- a** Setup Kickstart for all nodes. This cannot be used with the **-n**, **-N** or **-P** flags.
- N** *node_groups* Provide a comma-separated list of node groups for Kickstart setup. This cannot be used with the **-a** or **-P** options.
- n** *node_list* Provide a comma-separated list of nodes for Kickstart setup. This cannot be used with the **-a** or **-P** options.
- p** *pkg_path* Specifies one or more directories, separated by colons, that contain copies of the Red Hat CD-ROMs (*path1:path2:path3*). The default is **/mnt/cdrom**.
- v** | **-V** Writes the verbose messages of the command to standard output.
- x** Specifies to not copy Red Hat disks. This cannot be used with the **-p** option.

Examples

1. To set up Kickstart for all premanaged nodes:
`csmsetupks -P`
2. To set up Kickstart for all nodes in a node group named *mynodes*, plus one other node:
`csmsetupks -N mynodes -n c1snode14`
3. To set up Kickstart for a single node and copy any Red Hat files:
`csmsetupks -n c1snode4 -p /images/disk1:/images/disk2`
4. To set up Kickstart on a node, but not copy any Red Hat files:
`csmsetupks -n c1snode2 -x`

Files

- /opt/bin/csmsetupks** Location of the **csmsetupks** program.
- /var/log/csm/csmsetupks.log** Location of the log file on the management server for the **csmsetupks** command. Up to five copies of this log are maintained. Old logs receive a numeric suffix up to 4. The oldest file is **csmsetupks.log.4**.
- /opt/csm/install/kscfg.tmpl**.*InstallDistributionNameInstallDistributionVersion* Location of the Kickstart configuration file template. Currently, **RedHat** is the only supported value for *InstallDistributionName*, and **7.1** and **7.2** are the valid values for *InstallDistributionVersion*.
- /opt/csm/install/firstboot.tmpl**.*InstallDistributionNameInstallDistributionVersion* Location of the Kickstart configuration file template. Currently, **RedHat** is the only supported value for *InstallDistributionName*, and **7.1** and **7.2** are the valid values for *InstallDistributionVersion*.
- /etc/dhcpd.conf** Location of the DHCP configuration file.
- /etc/dhcpd.conf.precsm** Location of the DHCP configuration file that is backed up the first time **csmsetupks** is run.

| **/etc/dhcpd.conf.bak** Every time **csmsetupks** modifies the **/etc/dhcpd.conf** file, it is backed up
| with this name.

| **/csminstall/pxelinux.cfg/node-ipaddr-in-hex**
| Location of the **PXE** configuration file, where *node-ipaddr-in-hex*
| represents the host IP address in hexadecimal format (use the
| **/usr/bin/gethostip** tool to help translate from IP address format to HEX
| format). This file is modified by the **csmsetupks** and **installnode**
| command during different phases of the installation.

| **/csminstall/csm/InstallCSMVesion/kickstart.InstallDistributionNameInstallDistributionVersion/node-**
| **ipaddr-kickstart** Location of the Kickstart configuration file generated for the node.

| See Also

| The **definnode**, **getmacs**, **installms**, **installnode** man pages.

- | • *IBM CSM for Linux: Software Planning and Installation Guide* for more information on the installation processes.
- | • *IBM CSM for Linux: Hardware Planning and Control Guide* for information on hardware control.

| Author

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dcem Command

Name

dcem - Provides a graphical user interface (GUI) that allows you to run a command or script on multiple distributed nodes on a network at the same time.

Synopsis

```
dcem [-h | --help] [-V | --version] [-v | --verbose] [-N | --groups [group,group,group,...]] [-n | --hosts [host_name,host_name,host_name,...]] [command_specification_name]
```

Description

Distributed Command Execution Manager (DCEM) provides a GUI that allows you to run a command or script on multiple distributed machines on a network at the same time. You can specify a collection of individual nodes, or you can create groups of nodes and save them to use again. DCEM provides real-time command execution status on the individual nodes that you specify, showing them in a waiting, working, successful, or failed state. It helps you to create, save, and edit command specifications, and it also creates a log of all distributed command activity. DCEM provides the capability of saving command specifications as PERL scripts. These saved command specifications can be executed at the command line. The command specifications are saved under the user's home directory **/home/dcem/scripts**.

The *command_specification_name* parameter initializes the input fields with the specified command. This is the name that is used when the command is saved in the DCEM GUI.

For the first release, the **dsh** command provides the underlying function.

Options

-h | --help

Writes the command's usage message to standard output.

-V | --version

Writes version information to standard output.

-v | --verbose

Runs in debug mode and writes the command's verbose messages to standard output.

-N | --groups [group, group,group,...]

Specifies the name of a group of hosts displayed in the **Groups of hosts** field in the DCEM dialog. If you use this option with the command specification name, the host names and groups that were saved with the command are ignored.

-n | --hosts [host_name,host_name,host_name,...]

Specifies the name of the hosts displayed in the **Host names** field of the DCEM dialog. If you use this option with the command specification name, the host names and groups that were saved with the command are ignored.

Examples

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

1. To run DCEM, type:

```
dcem
```

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

```
dcem -N g4,g5 myCommand
```

This results in the following output in the following GUI fields:

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

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

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

This results in the following output in the following GUI fields:

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

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

```
dcem -V
```

Files

/home/dcem/scripts/script_filename.pl

Location of the DCEM command specification scripts

/home/dcem/logs/log_filename

Location of DCEM log files

See Also

The **dsh** man page.

Author

Sandy Amin - cluster@us.ibm.com

definenode

definenode Command

Name

definenode - Defines the nodes in a cluster.

Synopsis

definenode [-h]

definenode [-v | -V][-s] [-U] -f *nodedef_file*

definenode [-v | -V][-s] [-U] [-n *starting_node*] [-c *count*] [-H *HWControlPoints*] [-C *ConsoleServers*] [Attr=value [Attr=value...]]

Description

The **definenode** command runs on the management server and is used to define all of the nodes of a cluster. Before running this command, you must run the **installms** command to install the cluster management server. The **definenode** command creates node definitions in the CSM database.

This command provides several different techniques that may be used to create cluster node definitions. A user could:

- Create one definition at a time.
- Use the node definition file as input to the command to define multiple nodes.
- Use the *starting_node* and *count* values to automatically generate a set of node definitions with consecutive IP addresses.
- Use either of the previous two techniques to create a node definition file (use the **-s** option and redirect to a file) that could be easily modified and then used as input to the **definenode** command.

Defining a Single Node

The basic information that is needed when defining a node is:

- The host name or IP address of the node.

To enable hardware control, the following information must be provided:

- The *HWControlPoint* attribute, which is set with the **-H** flag.
- The *PowerMethod* attribute.
- The *HWControlNodeID* attribute.
- The *ConsoleServer* attribute, which is set with the **-C** flag.
- The hostname of the ESP console server.
- The *ConsoleMethod* attribute.
- The *ConsoleServerNumber* attribute.
- The *ConsolePortNumber*.
- The *InstallCSMVersion* and *InstallOSName* attributes. The values for these attributes both default to whatever is installed on the management server. For information about the attributes that do not have defaults, see the *nodeattributes* man page or “nodeattributes File” on page 72.

To define a node whose Hardware Control Point is an ASM adapter on a netfinity node, whose service processor is the short hostname of the node, and which uses an ESP console server:

```
definenode -n <node_name> -H <asm_hostname> -C <esp_hostname>:<console_server_number>:  
<esp_port> PowerMethod=netfinity ConsoleMethod=esp InstallCSMVersion=1.2.0  
InstallDistributionVersion=7.2
```

Defining Multiple Nodes

You can define multiple nodes by using the *starting_node* and *count* method. The *starting_node* and *count* technique of defining nodes will define the *starting_node*, and the increment the node's IP address to determine the name of the next node. The IP addresses are incremented up to the *count* number of nodes. The nodes are *assigned* to hardware control points in order, up to the number of service processors for each hardware control point. In this example, there are 10 service processors connected to each hardware control point. So, the first hardware control point (**asm1**) is assigned to the first 10 nodes (**node1** - **node10**), the second hardware control point (**asm2**) is assigned to the next 10 nodes (**node11** - **node20**), and so on. The nodes are assigned to the console servers in order, up to the number of ports for each console server. For this method to work correctly the nodes to be defined must be set up with consecutive IP addresses. To define thirty nodes, starting with **node1**, you could issue the following:

```
definenode -n node1 -c 30 -H asm1:10,asm2:10,asm3:10 -C esp1:1:0:12,
esp2:2:0:12,esp3:3:0:12 -s PowerMethod=netfinity ConsoleMethod=esp
InstallCSMVersion=1.2.0 InstallOSName=Linux > nodedef
```

In this case the list of node definitions that would be created is displayed to standard out and is redirected to a node definition file. The definitions are not actually created in the CSM database. This is a good way to check the correctness of the definitions or to make modifications before actually creating the definition. Once the file is checked and edited if necessary it can be used as input to the **definenode** command.

When the node definition file is ready, rerun the **definenode** command as follows:

```
definenode -f nodedef
```

See the “nodedef File” on page 76 man page for a description of the node definition file format.

Options

-C ConsoleServers

Specifies the list of console server definitions. Multiple console server definitions are separated by commas. The *ConsoleMethod* attribute must be specified when using this flag. This information will be used to set the *ConsoleServerName*, *ConsoleServerNumber*, and *ConsolePortNum* attributes of the node definition. The entries must have the following format:

```
-C console_server_name[:console_server_num[:starting_port_num
[:num_console_ports]]], ...]
```

where:

console_server_name

Represents the host name or IP address of the console server.

console_server_num

Represents the console server number. The default is 1.

starting_portnum

Represents the starting console port number. The default is 0.

num_console_ports

The total number of ports on the console server.

-c count

Specifies how many nodes to define. The IP addresses are determined by incrementing the starting node IP address by one. To use this option it is necessary to set up the nodes to define with consecutive IP addresses and to enter that information into the nameserver.

-f nodedef_file

Represents the node definition file. A sample node definition file is supplied in **/opt/csm/install/nodedef.sample**. See the “nodedef File” on page 76 for more information.

-H HWControlPoints

Specifies the list of hardware control points. Multiple hardware control point definitions are

definenode

separated by commas. The *PowerMethod* attribute must be specified when using this flag. This information will be used to set the *HWControlPoint*, and *HWControlNodeId* attributes of the node definition. Each definition must be specified using the following format:

```
-H HWCtrlPt[:num_nodes][, ... ]
```

where:

HWCtrlPt

Represents a hardware control point by host name or IP address.

num_nodes

The total number of nodes controlled by this hardware control point.

-h Writes the command's usage statement to standard output.

-U Runs **updatenode** to install the nodes once they are defined.

-n *starting_node*

Specifies the IP address or host name for the first node to be added. A list of nodes is generated by incrementing IP addresses up to the value specified by the **-c count** value.

-s Send the list of node definitions that the **definenode** command would be creating to standard output. This output can be redirected to a file that can be used as a node definition file.

-v | **-V**

Writes the command's verbose messages to standard output.

Examples

1. Create CSM node definitions for the 18 nodes that are controlled by the ASM adapters **asm06** and **asm07**. Set the *InstallDistributionName* attribute of all the node definitions to **RedHat** and the *InstallCSMVersion* to **1.2.0**.

```
definenode -n clsn01 -c 18 -H asm06:10,asm07:10 -C esp1:0:0:16,esp2:1:0:16 PowerMethod=netfinity  
ConsoleMethod=esp InstallDistributionName=RedHat InstallCSMVersion=1.2.0 InstallOSName=Linux
```

2. Add two nodes to the cluster that was defined in the previous example. The nodes use hardware control point **asm07** and console server **esp2**, ports 2 and 3. The *InstallDistributionName*, *InstallCSMVersion*, and *InstallOSName* values are taken from the management server.

```
definenode -n clsn19 -c 2 -H asm07:10 -C esp2:1:2:16 PowerMethod=netfinity ConsoleMethod=esp
```

3. Create a node definition file by redirecting the output of the **definenode** command to a file:

```
definenode -s -n clsn01 -n 10 -H asm06:10 -C esp1:0:0:16 PowerMethod=netfinity ConsoleMethod=esp  
InstallCSMVersion=1.2.0 > /tmp/mynodes
```

4. Create node definitions for each node described in a node definition file:

```
definenode -f /tmp/mynodes
```

5. Create four cluster node definitions:

```
definenode -n cls18 -c 4 -H asm04:10 -C esp02 PowerMethod=netfinity InstallDistributionName=RedHat  
InstallCSMVersion=1.2.0 InstallOSName=Linux
```

Exit Status

0 The command has run successfully.

1 An error has occurred.

Files

/opt/csm/bin/definenode Location of the **definenode** command.

/opt/csm/install/nodedef.sample

Location of sample node definition file.

See Also

- The **chnode**, **installms**, **lsnode**, **nodeattributes**, **nodedefrmnode**, and **updatenode** man pages.
- *IBM CSM for Linux: Software Planning and Installation Guide*, *IBM CSM for Linux: Hardware Planning and Control Guide*

Author

Sean Safron - cluster@us.ibm.com

dmsctrl Command

Name

dmsctrl - Displays or changes certain parameters that affect the distributed management server of CSM.

Synopsis

| **dmsctrl** [-h] -u [yes | no][**-v**]

Description

| The **dmsctrl** command, which is run on the management server, allows you to manipulate the parameters that CSM uses in the distributed management server.

| One or more of the parameters can be set using the options that follow. If no option is specified, the value of all parameters is displayed.

| **Note:** The **-i**, **-p**, and **-t** options are no longer valid for this command.

Options

-h Writes the command's usage statement to standard output.

| **-u yes | no**
| Sets the *AddUnrecognizedNodes* attribute.

| **-v** Writes the command's verbose messages to standard output.

Examples

1. To show the values currently set for the ping interval and for the timeout, type:

```
dmsctrl
```

2. To set the *AddUnrecognizedNode* attribute, type:

```
dmsctrl -u yes
```

Files

/opt/csm/bin/dmsctrl Location of the **dmsctrl** command.

See Also

| The **lsnode** man page.

Author

Bruce Potter - cluster@us.ibm.com

dsh Command

Name

dsh - Concurrently issues remote shell commands to multiple hosts and formats results.

Synopsis

dsh -q

dsh [**-h**] [**-a**] [**-c**] [**-i**] [**-m**] [**-v**] [**-z**] [**-l** *login_name*] [**-n** *host[,host...]*] [**-N** *node_group[,node_group...]*] [**-w** { *host[,host...]* | **-** }] [**-o** "*remote_shell_options*"] [**-r** *remote_shell_path*] [**-f** *fanout_value*] [**-s**] [*command*]

Description

The **dsh** command invokes commands on a set of nodes concurrently. It issues a remote shell command concurrently for each node that is specified and returns the output from all the nodes, formatted so that command results from all the nodes can be managed. **/bin/rsh** is the model for syntax and security. It is assumed that the remote login shell of the user of **dsh** is the bash shell.

The set of nodes to which the commands are sent can be determined in two ways:

The first way is called the **node list**. The node list is obtained from the first existence of one of the following:

1. A list of host names is specified on the command line when the **-n** option is used. A list of node groups is specified on the command line when the **-N** option is used.
2. The contents of a file named by the **DSH_LIST** environment variable. The node-list file format is one host name per line. Blank lines and comment lines beginning with **#** are ignored.

This is the preferred manner.

The second way is called the **working collective**. The working collective is obtained from the first existence of one of the following:

1. A list of host names is specified on the command line when the **-w** option is used. A list of node groups is specified on the command line when the **-N** option is used.
2. The contents of a file named by the **WCOLL** environment variable. The working collective file format is one host name per line. Blank lines and comment lines beginning with **#** are ignored.

If neither a node list nor a working collective exists when this approach is used, an error has occurred, and no commands are issued.

If nodes are specified in more than one way, only the highest priority specification is used, as follows:

1. **-n** option
2. **-w** option
3. **DSH_LIST**
4. **WCOLL**

If the *command* parameter is not specified, **dsh** reads lines from the command line or standard input and issues each input as a command on each host in the node list or working collective. The commands use the syntax of the remote shell command.

To exit the **dsh** command line mode, type `exit` or press Enter at the **dsh** prompt.

dsh

When commands are resolved on the remote node, the path used is determined by the **DSH_PATH** environment variable specified by the user. If **DSH_PATH** is not set, the path used is the remote shell default path, **/usr/ucb/bin:/usr/bin**. (For example, to set **DSH_PATH** to the path set on the source node, use **DSH_PATH=\$PATH**).

The maximum number of concurrent remote shell commands can be specified with the fanout (**-f**) option or by means of the **DSH_FANOUT** environment variable. If desired, sequential invocation can be obtained by specifying a fanout value of 1. The fanout is kept at the fanout number that is specified. When one command is completed on a node, another command is started. If fanout is not specified by the **DSH_FANOUT** environment variable or by the **-f** option, then a default fanout of 64 is used. Each remote shell command that **dsh** runs requires a reserved TCP/IP port, and only 512 such ports are available per node.

If the streaming mode is specified by the **-s** option instead of the fanout mode, then output is returned from each node as the command is completed on that node rather than waiting for the command to be completed on all nodes before the results are returned. This can improve performance but causes the output to be unsorted.

Exit values for the remote shell commands are displayed in messages from the **dsh** command if the exit values are nonzero. A nonzero return code from a remote shell indicates that the remote shell has failed. This has nothing to do with the exit code of the remotely issued command. If a remote shell fails, that node is removed from the current node list. Use the **-z** option to obtain the return code from the last command issued on the remote node.

The **dsh** exit value is 0 if no errors occurred in the **dsh** command and all remote shell commands finished with exit codes of 0. If internal errors occur or the remote shell commands fail, the **dsh** exit value is greater than 0. The exit value is increased by 1 for each remote shell failure.

No particular error recovery for command failure on remote hosts is provided. The application or user can examine the command results in the standard error and standard output of the **dsh** command and take appropriate action.

The **dsh** command waits until results are in for each command for all hosts and displays those results before reading more input commands. This is true only if the **-s** option is not specified on the **dsh** command line.

The **dsh** command does not work with interactive commands, including those read from standard input.

The **dsh** command output consists of the output (standard error and standard output) of the remotely issued commands. The **dsh** standard output is the standard output of the remote shell command. The **dsh** standard error is the standard error of the remote shell command. Each line is prefixed with the host name of the node which produced the output. The host name is followed by ":" and a line of the command output.

For example: a command was issued to a node list of host1, host2, and host3. When the command was issued on each of the hosts, the following lines were written by the remote commands:

```
For host1 stdout:
h1out1
h1out2

For host2 stdout:
h2out1
h2out2

For host3 stdout:
h3out1

For host3 stderr:
```

```

h3err1
h3err2

dsh stdout will be
host1: h1out1
host1: h1out2
host2: h2out1
host2: h2out2
host3: h3out1

dsh stderr will be
host3: h3err1
host3: h3err2

```

A filter to display identical outputs grouped by node is provided separately. See the **dshbak** command.

If a node is detected as down (for example, a remote shell command issues a nonzero return code), subsequent commands are not sent to this node on this invocation of **dsh** unless the **-c** option is specified.

An exclamation point (!) at the beginning of a command line causes the command to be passed directly to the local host in the current environment. The command is not sent to the node list.

Signal 2 (INT), Signal 3 (QUIT), and Signal 15 (TERM) are propagated to the remote commands.

Signal 19 (CONT), Signal 17 (STOP), and Signal 18 (TSTP) are defaulted. This means that the **dsh** command responds normally to these signals, but the signals do not have an effect on the remotely running commands. Other signals are caught by **dsh** and have their default effects on the **dsh** command. In the case of these other signals, all current child processes, and, by means of propagation, their remotely running commands, are terminated (SIGTERM).

Note: The **-P** and **-B** options are no longer valid for this command.

Note: The `DSH_REMOTE_CMD` environment variable can be used to specify a remote shell other than the default (**rsh**), for example, a secure remote command that conforms to the IETF (Internet Engineering Task Force) secure remote command protocol. Be aware, however of the following limitations:

1. The **dsh** itself has no security configuration or obligations. All security issues are related to the remote execution environment enabled by the user and the security configuration level that the user has implemented. For example, if the remote shell requires public keys, it is the responsibility of the user to implement this.
2. Use the fully qualified host name when you define a node for the remote shell. If the remote shell requires a list of nodes in its configuration, then the nodes must be defined by their fully qualified host names. This allows the **dsh** command to recognize the node. You can also use an alias to define a node. Aliases are permitted provided the fully qualified host name is also provided.

command Specifies a command to invoke on the node list. It is passed to remote shell. This command is specified by using the remote shell command syntax.

Options

-a Adds all nodes defined to IBM Cluster Systems Management for Linux (CSM) to the node list.

-c Specifies that commands that failed continue to be sent to the remote nodes for execution.

-f *fanout_value*

Specifies a fanout value. The default value is 64. It indicates the maximum number of concurrent

dsh

remote shell commands to issue. Sequential execution can be specified by indicating a fanout value of 1. The fanout value is taken from the **DSH_FANOUT** environment variable if the **-f** option is not specified.

- h** Writes the command's usage statement to standard out.
- i** Informs the user that a node is not responding and prompts the user as to whether the node should be included in the node list.
- l** *login_name*
Specifies a remote user name under which to invoke the commands. If **-l** is not used, the remote user name is the same as the local user name. Use this option as you would with the remote shell command.
- m** Prints the results of monitoring for each node in the form of the starting and completion messages for each node.
- n** {*host[,host...]* | - }
Specifies a list of host names, separated by commas, to include in the node list. If "-" is specified, you enter standard input mode. You know that you are in standard input mode because a new line is provided that has no **dsh** prompt. Enter the host names a line at a time. When you are finished, press **<Ctrl+d>** to exit standard input mode and return to the **dsh** prompt. If **-n -** is used, commands cannot be read from standard input.

Note: Duplicate host names are included only once in the node list.

- N** *node_group[, node_group...]*
Resolves one or more CSM-specified node groups, separated by commas, and adds the nodes to the node list or working collective.
- o** "*remote_shell_options*"
Forwards options for the remote shell. The information within the quotation marks is forwarded and included in the remote shell.
- q** Displays the current environment variable settings. For example, the list of nodes in the current node list or working collective file and the value of the **DSH_FANOUT** environment variable are displayed.

Note: This option must exist on the **dsh** command line alone. It cannot be used in conjunction with any other **dsh** option or with the *command* argument.

- r** *remote_shell_path*
Provides the full path of the remote shell that is used to access the remote systems. The default remote shell is **rsh**.
- s** Specifies output in streaming mode. The output is unsorted, but performance is likely to improve, and memory utilization is reduced.
- v** Verifies a node before adding it to the node list. If a node is not responding, it is not included in the node list. If the **/opt/csm/bin/lsnode** command is installed, then it can be used to check the **ping** status of the node. If **lsnode** is not installed or if the status returned is not zero, then the command **/bin/ping** can be used to check the node. The **/bin/ping** command takes 10 seconds to check the node that is not responding, rather than the minute typically taken for the remote shell command to time out.
- w** {*host[,host...]* | - }
Specifies a list of host names, separated by commas, to include in the working collective. If "-" is specified, you enter standard input mode. You know that you are in standard input mode because a new line is provided that has no **dsh** prompt. Enter the host names a line at a time. When you are finished, press **<Ctrl+d>** to exit standard input mode and return to the **dsh** prompt. If **-w -** is used, commands cannot be read from standard input.

Note: Duplicate host names are included only once in the working collective.

- z** Prints the return code of the last command that was run remotely. The return code is appended at the end of the output for each node.

Environment

DSH_PATH

Sets the path that is used on the remote nodes. If DSH_PATH is not set, the default path for the remote shell is used. For example, **DSH_PATH=\$PATH** sets the path on the remote node to the same path that is used on the source node.

DSH_REMOTE_CMD

Specifies the path of the remote shell executable to use instead of the default.

DSH_REMOTE_OPTS

Includes the options specified in the remote command when the command is forwarded to the remote nodes.

DSH_FANOUT

Sets the maximum number of concurrent remote shell commands. This can also be set by the **-f** option.

DSH_LIST

Specifies a file that contains definitions of the set of nodes that comprise the node list.

WCOLL

Specifies a file that contains definitions of the set of nodes that comprise the working collective.

Security

Security considerations are the same as for the remote shell command.

Examples

1. To issue the **ps** command on each host listed in the **dshhosts** file, enter:


```
DSH_LIST=./dshhosts dsh ps
```
2. To list the current node list file as specified by the **DSH_LIST** environment variable, enter:


```
dsh -q
```
3. To set the node list to three nodes and start reading commands from standard input, enter:


```
dsh -n otherhost1,otherhost2,otherhost3
```
4. To set the current node list to three nodes and issue a command on those nodes while formatting the output, enter:


```
dsh -n host1,host2,host3 -a cat /etc/passwd | dshbak
```
5. To append the file **remotefile** on the node named **otherhost**, to the file named **otherremotefile**, which is located on **otherhost**, enter:


```
dsh -n otherhost cat remotefile '>>' otherremotefile
```
6. To run the **ps** command on the node list and filter results locally, enter:


```
dsh ps -ef | grep root
```
7. To run the **ps** command and filter results on the node list hosts (this can improve performance considerably), enter:


```
dsh 'ps -ef | grep root'
```

or

```
dsh ps -ef "|" grep root
```
8. To **cat** a file from **host1** to the local system, stripping off the preceding host name to preserve the file, enter:

dsh

```
dsh -n host1 cat /etc/passwd | cut -d: -f2- | cut -c2- >myetcpasswd
```

9. To run the **needs_auth_program** with the **-D** option specified on the remote shell, on all of the nodes in the cluster, enter:

```
dsh -a -o "-D" /usr/bin/needs_auth_program
```

10. To enter a list of host names in standard input mode by specifying **-n-** and then request the date from the specified nodes, enter:

```
dsh -n -
```

When you complete the list of host names, press **<Ctrl+d>** to return to the **dsh** prompt. At the **dsh** prompt, specify:

```
date
```

The output will be similar to the following:

```
# dsh -n -
host1
host2
host3
dsh> date
host1: Fri Mar 23 08:46:59 EST 2001
host2: Fri Mar 23 08:46:59 EST 2001
host3: Fri Mar 23 08:46:59 EST 2001
dsh> exit
#
```

Files

/opt/csm/bin/dsh

Location of the **dsh** command.

/opt/csm/bin/dshbak

Location of the command that is supplied as the back-end formatting filter.

node list file

File that contains host names, one per line, that defines a set of nodes which comprise the node list. This file is specified by the **DSH_LIST** environment variable.

working collective file

File that contains host names, one per line, that defines a working collective. This file is specified by the **WCOLL** environment variable.

See Also

The **dshbak** and **rsh** man pages.

Author

Patrick Ladd - cluster@us.ibm.com

dshbak Command

Name

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

Synopsis

dshbak [-c]

Description

The **dshbak** command is used to format output from the **dsh** command. The **dshbak** command takes lines in the following format:

```
host_name: line of output from remote command
```

The **dshbak** command formats the lines as follows and writes them to standard output. Assume that the output from `host_name3` and `host_name4` is identical, and the **-c** option was specified:

```
HOSTS -----
host_name1
-----
.
.
lines from dsh with host_names stripped off
.
.
HOSTS -----
host_name2
-----
.
.
lines from dsh with host_names stripped off
.
.
HOSTS -----
host_name3          host_name4
-----
.
.
lines from dsh with host_names stripped off
.
.
```

When output is displayed from more than one node in collapsed form, the host names are displayed alphabetically.

When output is not collapsed, output is displayed sorted alphabetically by host name.

The **dshbak** command writes "." for each 1000 lines of output filtered.

Options

-c Collapses identical output from more than one node so that it is displayed only once.

Examples

1. To display the results of a command issued on several nodes, in the format used in the **Description** section above, enter:

```
dsh -n node1,node2,node3 cat /etc/passwd | dshbak
```

dshbak

2. To display the results of a command issued on several nodes with identical output displayed only once, enter:

```
dsh -w host1,host2,host3 pwd | dshbak -c
```

Diagnostics

When the **dshbak** filter is used and standard error messages are generated, all error messages on standard error appear before all standard output messages. This is true with and without the **-c** option.

Files

/opt/csm/bin/dshbak Location of the **dshbak** command.

See Also

| The **dsh** man page.

Author

Patrick Ladd- cluster@us.ibm.com

getmacs Command

Name

getmacs - Automatically gathers and stores MAC addresses in the CSM database.

Synopsis

```
getmacs [-h] [-v | -V ] [node_list ]
```

Description

The **getmacs** command automatically gathers MAC addresses and stores them in the *InstallAdapterMacaddr* attribute of the *PreManagedNode* object in the CSM database. It is called by **csmsetupks** to gather MAC addresses during installation, but it can also be used manually by an administrator to update the database, for example, when a network adapter card is changed manually for a node.

The following prerequisites must be met before running the **getmacs** command:

1. Set the node boot order to the following:
 - Floppy
 - CD-ROM
 - Network
 - Hard disk
2. The **definenode** command must be run with the *HwControlPoint* and *ConsoleServer* attributes provided before **getmacs** is run. This is because a node must have the service processor and remote console attributes defined in order for **getmacs** to gather its MAC address; that is, the **rpower** and the **rconsole** commands must already having been set up for all nodes.
See the **rpower** and **rconsole** man pages and the *IBM CSM for Linux: Hardware Planning and Control Guide* for more details on the remote power commands.
3. The **csmsetupks** command must be run before **getmacs** can be run manually.

The **getmacs** command reboots each node to gather its MAC address. If a *Macaddr* value is already defined for a node and **getmacs** is run, the original *Macaddr* value is overwritten with the new MAC address.

Note: When **getmacs** is called and run by **csmsetupks**, it does not overwrite an existing *Macaddr* value.

The *node_list* parameter is a space-separated list of *ManagedNode* or *PreManagedNode* objects. If a MAC address already exists, it will be overwritten. After running **getmacs** manually, you should rerun **csmsetupks** so that the */etc/dhcpd.conf* file gets updated with the correct MAC address.

Options

- h** Displays usage information to standard output.
- v | -V** Writes the command's verbose messages to standard output.

Files

- /opt/csm/bin/getmacs** Location of the **getmacs** command.
- /csminstall/pxelinux.cfg/HEX** Location of the pxelinux configuration file. HEX represents the node IP address as a hexadecimal value. This file is created for each node by **csmsetupks**.

getmacs

See Also

- The **definnode** and **csmsetupks** man pages.
- *IBM CSM for Linux: Software Planning and Installation Guide* for more information on the installation processes.
- *IBM CSM for Linux: Hardware Planning and Control Guide* for more information about the remote control commands.

Author

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installms Command

Name

installms - Installs CSM on a management server.

Synopsis

installms [-f] [-h] [-v | -V] [[-x] -p *pkg_path*]

Description

This **installms** command is used to install CSM on a Management Server. It can be used to automatically install both CSM and its prerequisite packages.

A supported level of the Linux operating system must already be installed on the system.

The **installms** command will copy the CSM packages and their required prerequisite packages to the correct CSM directory. The packages must be copied to the correct CSM directory so that they will be available when installing CSM on the nodes of the cluster. If **installms** cannot find the required Red Hat packages it will prompt you to insert the Red Hat CD-ROMs. If **installms** has been run before and all the correct levels of packages have been copied to the CSM directory, you can tell **installms** to not copy the packages again by supplying the **-x** flag.

The correct CSM directory for the CSM packages and open source prerequisites is `/csminstall/Linux/RedHat/csm/<InstallCSMVersion>/packages`, where *InstallCSMVersion* is in the format: "`<version.release.mod>`". For example:

```
1.2.0
```

The CSM directory for the required packages from the Red Hat CD-ROMs is: `/csminstall/Linux/RedHat/<InstallDistributionVersion>/RedHat/RPMS`. Where *InstallDistributionVersion* is either 7.1 or 7.2.

Options

-f Forces installation regardless of the status of the existing installation.

-h Writes the command's usage statement to standard output.

-v | -V

Writes the command's verbose messages to standard output.

-x Do not copy packages.

-p *pkg_path*

Specifies one or more directories, separated by colons, where packages can be found. To copy from the CD-ROM, use `/mnt/cdrom`.

Examples

1. To install CSM and copy CSM packages from the CD-ROM:

```
installms -p /mnt/cdrom
```

2. To create a CSM Management Server using the packages contained in the current directory, type:

```
installms -p .
```

3. To install a CSM Management Server node using the CSM 1.2.0 packages that were previously copied to the `/csminstall/Linux/RedHat/csm/1.2.0/packages` directory.

```
installms -x
```

installms

Exit Status

- 0 The command has run successfully.
- 1 An error has occurred.

Files

/var/log/csm/installms.log	Location of the log file on the management server for the installms
	command. Up to five copies of this log are maintained. Old logs receive a
	numeric suffix up to 4. The oldest file is installms.log.4 .

See Also

- | • The **definnode**, **installnode**, **monitorinstall**, **csmsetupks**, and **updatenode** man pages.
- | • *IBM CSM for Linux: Software Planning and Installation Guide*.

Author

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installnode Command

Name

installnode - Installs the operating system and CSM on all the nodes in a cluster.

Synopsis

```
installnode [-h] [-v | -V] [-P | -a | [ -N node_groups] [node_list]]
```

Description

The **installnode** command runs on the management server and performs a full installation on each node that is specified. The **installnode** command installs the operating system along with CSM on the nodes.

If given no arguments, the **installnode** command will display its usage statement. This prevents an unintended install of all the nodes. To install all the nodes whose *Mode* attribute is **PreManaged**, use the **-P** flag. To install all the nodes, use the **-a** flag. To install a specific set of nodes or node groups, specify the **-N** flag or give a list of nodes. Both a list of node groups and a list of nodes may be provided in the same invocation of **installnode**.

The **installnode** command only installs Linux nodes whose *InstallMethod* attribute is set to **kickstart**. All other nodes are skipped and a warning is displayed. The *InstallMethod* attribute is set to **kickstart** by **csmsetupks**, or can be changed with **chnode**.

The following logs provide a history of the installation process. The **installnode.log** is located on the management server in **/var/log/csm**. This log records the verbose output of the **installnode** command. A log is also created on each node in **/var/log/csm/install.log**. This log records the details of what happened to the node as it was installed. The **monitorinstall** command also displays install status.

As each node is installed, it is added to the cluster and becomes a managed node.

Before **installnode** can be run, the following prerequisites are needed:

1. NFS must be available on the management server for mounting **/csminstall** and **/tftpboot** to the nodes.
2. The **installms**, **definnode** and **csmsetupks** commands must have already been run.
3. Before running a full installation, set each node's boot order to the following:
 - Floppy
 - CD-ROM
 - Network
 - Hard disk

During a Kickstart install, **installnode** does the following:

1. Sets up the **/tftpboot/pxelinux.cfg/<node-ip-addr-in-hex>** file for each node so that when the node reboots, it does a Kickstart install.
2. Reboots the node.
3. As the node reboots, broadcasts its MAC address.
4. The **dhcp** server on the management server accepts the node's **dhcp** request and **pxelinux** is used to initiate a Kickstart install.
5. Kickstart installs the Operating System on each node.
6. After the Kickstart install of the OS is complete, the Kickstart post-install script (found in **/csminstall/csm<InstallCSMVersion>kickstart.<InstallDistributionName><InstallDistributionVersion>/<node-ipaddr>-kickstart**) is run on the node. After some additional configuration, the Kickstart post-install script adds the **csmfirstboot** script

installnode

(`/csminstall/csm/<InstallCSMVersion>/csmfirstboot`) to `/etc/inittab`. It then modifies the `pxelinux` configuration file on the management server (`/tftboot/pxelinux.cfg/<node-ip-addr-in-hex>`) so the next reboot of the node reboots from the local hard drive.

7. The node reboots to the local hard drive.
8. As the reboot completes, the `csmfirstboot` script (which was listed in `/etc/inittab`) is run on the node.
9. The `csmfirstboot` script runs `makenode` (which installs CSM and its dependencies and sets its management server), and then removes itself from `/etc/inittab`.
10. When the `Mode` attribute for this node is changed to **Managed**, the node is installed and ready for use in the cluster.

Options

-a Install all nodes whose `InstallMethod` attribute is **kickstart**. This flag cannot be used with the **-P** or **-N** flags, or `node_list`.

-v | -V
Writes command's verbose messages to standard output.

-h Display this usage information.

-P Installs all nodes whose `Mode` attribute is **PreManaged** and whose `InstallMethod` attribute is **kickstart**. This flag cannot be used with the **-a** or **-N** flags or `node_list`.

-N [node_groups]
Provide a comma-separated list of node groups to install. This cannot be used with the **-a** or **-P** flags.

node_list
Space-separated list containing a list of nodes. This cannot be used with the **-a** or **-P** flags.

Environment

CSM_FANOUT

Sets the maximum number of concurrent reboots. If this is not set, 16 nodes are rebooted concurrently. If set to 0, all nodes are rebooted concurrently.

CSM_FANOUT_DELAY

Sets the delay in seconds between rebooting groups of nodes. If this is not set, the delay is 10 seconds.

Examples

1. Install the operating system and CSM on all the `ManagedNodes` defined in the cluster whose `InstallMethod` attribute is **kickstart**:

```
installnode -a
```

2. Install all the nodes in the cluster whose `Mode` is **PreManaged**:

```
installnode -P
```

3. Install a list of nodes:

```
installnode c1snode5 c1snode6 c1snode14 c1snode16
```

4. Install all the nodes in nodegroup **mynodes**:

```
installnode -N mynodes
```

Files

`/csminstall/csm/status/<node-hostname>`

Location of the installation status file. Used by `monitorinstall`.

`/opt/csm/bin/installnode`

Location of the `installnode` command.

- | **/var/log/csm/installnode.log** Location of the log file on the management server for the **installnode**
| command. Up to five copies of this log are maintained. Old logs receive a
| numeric suffix up to 4. The oldest file is **installnode.log.4**.

- | **/var/log/csm/install.log** Location of the log file on each node containing installation information. Up
| to five copies of this log are maintained. Old logs receive a numeric suffix
| up to 4. The oldest file is **install.log.4**

See Also

- | • The **definnode**, **csmsetupks**, **makenode**, **monitorinstall**, and **csmprereboot** man pages.
- | • The **kscfg.tmpl** File
- | • *IBM CSM for Linux: Software Planning and Installation Guide*.
- | • *IBM CSM for Linux: Hardware Planning and Control Guide*.

Author

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kscfg.tpl File

Name

kscfg.tpl - Linux operating system configuration file template used by **csmssetupks**.

Description

This file is the template that is used by **csmssetupks** to create a Kickstart configuration file for each node. The template can be found at

/opt/csm/install/kscfg.tpl.<InstallDistributionName><InstallDistributionVersion>. The Kickstart configuration file that is generated by **csmssetupks** from this template contains configuration information that is gathered by Kickstart during the installation of the Linux operating system. This file can be used as is, or it can be modified by the user. See an annotated sample template in the Appendix of *IBM CSM for Linux: Software Planning and Installation Guide* for instructions on how to properly modify the template.

To affect the settings of all the nodes in the cluster, modify the Kickstart configuration file template. Do this before running **csmssetupks**.

To change node-specific settings, modify the generated Kickstart configuration file for a specific node. The generated node-specific configuration files are called

/csminstall/csm/<InstallCSMVersion>/kickstart.<InstallDistributionName><InstallDistributionVersion>/<node-ipaddr>-kickstart. Modify the generated node-specific configuration file after running **csmssetupks**.

Note that there are variables in the format **#VARIABLE#** that must not be deleted. These variables are automatically customized with the appropriate values during the process of generating the Kickstart configuration file. For example, the following are some of the variables that are automatically customized:

#MGMTSVR_HOSTNAME#

Replaced with the host name of the management server.

#NODE_HOSTNAME#

Filled in with the hostname of the node. This is the hostname by which the management server knows the node.

#NFS_HOSTNAME#

Replaced with the host name of the management server.

#NFS_DIR#

Replaced with the directory on the management server that contains the Red Hat installation images; for example, **/csminstall/Linux/RedHat7.1/i386**.

#TIMEZONE#

Filled in with the timezone of the management server (in **/etc/sysconfig/clock**).

#TIMEZONE_UTC#

Filled in with the timezone UTC flag of the management server (in **/etc/sysconfig/clock**).

The netmask, gateway, and nameserver values are represented by attributes that can be specified on the **csmssetupks** command line. The default values for these attributes are the same as the values for these attributes on the management server.

If you modify the **kscfg.tpl** file or a generated Kickstart configuration file for a node, be careful not to alter sections that are surrounded by the following text:

```
##### DO NOT ERASE THIS SECTION (begin)#####
##### DO NOT ERASE THIS SECTION (end) #####
```

Files

`/opt/csm/install/kscfg.tpl.RedHat.Version`

Location of the Kickstart configuration file template.

`/csminstall/csm/InstallCSMVersion/kickstart.InstallDistributionNameInstallDistributionVersion/node-
ipaddr-kickstart`

Location of node-specific Kickstart configuration file, for example:
`/csminstall/csm/1.2.0/kickstart.RedHat7.1/9.117.241.32-kickstart`

See Also

- The `definenode`, `rconsole`, `rpower`, `csmsetupks` man pages.
- *IBM CSM for Linux: Software Planning and Installation Guide*.
- *IBM CSM for Linux: Hardware Planning and Control Guide*.
- *The Official Red Hat Customization Guide* for the Kickstart file format.

Author

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Isnode Command

Name

Isnode - Lists the node definitions in the CSM database.

Synopsis

Isnode [-h] [-i | -s | -p | -a *attr,attr...* | -A] [-l | -d *delim* | -D *delim*][-f *file*][-F][-H][-x] [-v | -V] [-S]{*host ...* | -w "*where select string*" | -N *nodegroup*}

Description

The **Isnode** command lists attributes for one or all of the nodes in the CSM cluster. If *host*, **-w** and **-n** are not specified, then **Isnode** will list the attributes of all of the nodes in the cluster. For a complete list of the attributes that the **Isnode** command can display, see the **nodeattributes** man page or "nodeattributes File" on page 72.

If **-w *selectstr*** is specified, **Isnode** uses that string in the "where" part of an SQL select statement against the database of nodes and displays information about the nodes that are matched. If no options are specified, all the nodes known to IBM Cluster Systems Management for Linux are displayed. Most of the options specify the information that is displayed for each node.

The **Isnode** command can retrieve the node information from several different places.

Note: The **-P** and **-B** options are no longer valid for this command.

Options

-a *attr* Displays the specified attribute.

-A Displays all attributes.

-d *delim*

Specifies the delimiter used to separate items within rows and between rows.

-D *delim*

Specifies the delimiter that should be used to separate items within a row. The default is a comma (.).

-f *file* Specifies a file that contains a list of nodes. If the file name is "-", then the list is read from stdin. The file can contain multiple lines and each line can have one or more node names, separated by spaces and/or commas.

-F Display in a format suitable for redirecting into a **nodedef** file that can be used as input to **definnode -f**. This feature can be used to save the definition of one or more nodes so that they can be restored at a later time.

-h Writes the command's usage statement to standard output.

-H Show attributes from the IBM.Host resource class on each node instead of from the IBM.ManagedNode resource class. The attributes from the IBM.Host class represent the actual values currently on the node. In some cases, the corresponding attributes in the IBM.ManagedNode class represent the value requested by the administrator.

-i Displays IP addresses.

-l Displays output in long format. The **-x** option has no effect when this option is specified.

-N *nodegroup*

Displays the nodes that are in the specified node group. The node group is evaluated by the **nodegrp** command.

- p** Displays the status of the nodes.
- s** Displays the short host name.
- S** Sort the output by the first attribute displayed in each row. This option implies **-x** and cannot be used with **-i**, **-s** or **-l**.
- v | -V** Writes the command's verbose messages to standard output.
- w *selectstr*** Displays the nodes that match the "where" part of the select string. It is easiest to put the whole string in double quotation marks, especially if you need to put attribute values in single quotation marks (when they are strings). As a convenience, "*" means all nodes, as if a "where" string were not specified.
- x** Specifies not to display the name of the node at the beginning of each row that is returned. The **-x** option has no effect when the **-l** option is specified.

Exit Status

- 1** A combination of options and arguments has been entered that is not valid.
 - 12** Node or node group not found.
 - 13** The node list file specified could not be opened.
- If an error occurs in the RMC layer, the RMC return code will be returned as the exit status.

Examples

1. To list the names of all nodes, type:
lsnode
2. To list the *Status* of all nodes, type:
lsnode -p
3. To list all of the attributes for node **websvr**, type:
lsnode -l websvr
4. To list all nodes whose host name is in the range between **clsn01** and **clsn09**, type;
lsnode -w "Hostname like 'clsn0%'"

Files

/opt/csm/bin/lsnode Location of the **lsnode** command.

See Also

The **chnode**, **nodeattributes**, **nodegrp**, and **rmnode** man pages.

Author

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mgmtsvr Command

Name

mgmtsvr – Displays the management server entry for this managed node.

Synopsis

mgmtsvr [-h] [-k][-v | -V] [-n *nodename*] [-d | -N | *hostf*]

Description

The **mgmtsvr** command is run on the managed node and displays the management server that will manage this node in the CSM cluster. If this command is run on the management server, the command will acknowledge that.

If *hostname* or *ipaddr* is not specified, the current management server is displayed.

Note: The **-N**, *hostname*, and *ipaddr* arguments should not be issued by the user. Instead, the user should run the **updatenode** command from the management server.

Options

-d Deletes the management server entry.

-h Writes the command's usage statement to standard output.

-k Exchange RSCT public keys, host name, and node identifier between the node and the management server. Only use this option if the host name, node identifier, or public key of either machines has changed. At the time this option is used, you must trust your network to ensure that a rogue machine is not going to insert its public key in place of the public key of the real node.

-n *nodename*

Host name by which the CSM management server knows this node. Normally you do not need to specify this option because it is used internally by **installnode** to ensure correct operation even when the host name value on the node resolves to a different name from that by which the management server knows the node. Defaults to the output of **/bin/hostname**.

-N Displays the value for the local node name along with that of the management server. This argument is only valid when a host name or IP address for the management server is not specified.

-v | -V

Writes the command's verbose messages to standard output.

Exit Status

0 Command has run successfully.

1 You have entered a combination of options that is not valid.

11 The management server is not set for this node.

21 This node is the management server for itself.

22 This node is also a management server for other nodes.

23 This machine is a CSM management server and a node, but the node does not currently have a management server set for it.

31 This machine is a CSM management server.

101 This machine is neither a CSM management server or node.

Examples

1. To query the current CSM management server for this node, type:

```
mgmtsvr
```

2. To set the management server for this node to **csmsvr.com**:

```
mgmtsvr csmsvr.com
```

Files

/opt/csm/bin/mgmtsvr Location of **mgmtsvr** command.

/var/log/csm/makenode.log Location of the log output by the **makenode** command.

See Also

- The **lsnode**, **nodegrp** man pages.
- *IBM CSM for Linux: Administration Guide* for information on editing the RMC ACL file.

Author

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monitorinstall Command

Name

monitorinstall - Displays the status of the CSM installation on each of the nodes.

Synopsis

monitorinstall [-h] [-v | -V] [-e] [-i] [-l] [-u]

Description

The **monitorinstall** command displays the status of the CSM installation on each of the nodes. A filtering scheme can be used to display only nodes of interest. By default, all of the PreManagedNodes and ManagedNodes that are defined in the cluster are displayed in the installation monitor. You can choose to display all nodes, only the installed nodes, only the not-installed nodes, or only the nodes that failed to install. By default, if an option is not specified, all nodes are displayed. To run the **monitorinstall** command at specified intervals, use the **watch** command.

Options

- e** Shows only the nodes that had an error during the installation process. Can be used with the **-i** or **-u** option to display different types of nodes. Note that some errors are undetectable by **monitorinstall**. If none of the options are specified, then all of the nodes are displayed.
- h** Writes the command's usage statement to standard output.
- i** Shows only the nodes that are installed. Can be used with the **-e** or **-u** option to display different types of nodes. Note that some errors are undetectable by **monitorinstall**. If none of the options are specified, then all of the nodes are displayed.
- l** Displays output in long format.
- u** Shows only the nodes that are not installed and nodes that are in the process of installing. Can be used with the **-e** or **-i** option to display different types of nodes. Note that some errors are undetectable by **monitorinstall**. If none of the options are specified, then all of the nodes are displayed.
- v | -V** Writes the command's verbose messages to standard output.

Examples

1. To display the progress of the installation, type:

```
monitorinstall
```

Output similar to the following is displayed:

Node	Status
-----	-----
clsn02.ppd.pok.ibm.com	Installed
clsn03.ppd.pok.ibm.com	Rebooting to Install Node
clsn04.ppd.pok.ibm.com	Starting Kickstart Post-Install
clsn05.ppd.pok.ibm.com	Installed
clsn06.ppd.pok.ibm.com	Installed
clsn07.ppd.pok.ibm.com	Starting Firstboot
clsn08.ppd.pok.ibm.com	Not Installed

2. To display expanded details on the progress of the installation, type:

```
monitorinstall -l
```

Output similar to the following is displayed:

```
Node clsn02.ppd.pok.ibm.com
```

```
-----  
No status file.
```

```
Node clsn03.ppd.pok.ibm.com
```

```
-----  
Thu Oct 18 15:45:19 EDT 2001: Full Install Initiated  
Thu Oct 18 15:45:21 EDT 2001: Rebooting to Install Node
```

```
Node clsn04.ppd.pok.ibm.com
```

```
-----  
Mon Oct 22 12:40:41 EDT 2001: Full Install Initiated  
Mon Oct 22 12:40:42 EDT 2001: Rebooting to Install Node  
Mon Oct 22 08:55:24 EDT 2001: Kickstart RPM Installation Complete.  
Mon Oct 22 08:55:24 EDT 2001: Starting Kickstart Post-Install.
```

```
Node clsn05.ppd.pok.ibm.com
```

```
-----  
Mon Oct 22 12:40:41 EDT 2001: Full Install Initiated  
Mon Oct 22 12:40:42 EDT 2001: Rebooting to Install Node  
Mon Oct 22 08:55:24 EDT 2001: Kickstart RPM Installation Complete.  
Mon Oct 22 08:55:24 EDT 2001: Starting Kickstart Post-Install.  
Mon Oct 22 08:55:25 EDT 2001: Kickstart Post-Install Complete.  
Mon Oct 22 08:55:25 EDT 2001: Rebooting to hard disk.  
Mon Oct 22 08:57:41 EDT 2001: Starting Firstboot  
Mon Oct 22 08:57:41 EDT 2001: Starting makenode to install CSM RPMs  
Mon Oct 22 08:59:51 EDT 2001: makenode complete: status=0  
Mon Oct 22 08:59:52 EDT 2001: Firstboot complete.: status=0  
Mon Oct 22 08:59:52 EDT 2001: Installed
```

3. To continuously display the output of **monitorinstall**, type:

```
watch monitorinstall
```

Files

/opt/csm/bin/monitorinstall Location of **monitorinstall** command.

/csminstall/csm/status/<node_hostname>
Location of the node's install status file.

See Also

- The **installnode**, and **watch** man pages.
- *IBM CSM for Linux: Software Planning and Installation Guide* for more information on the installation processes.

Author

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nodeattributes File

Name

nodeattributes - Provides a list of all the attributes available for nodes in the CSM Database.
nodeattributes is not a command — it is for reference only.

Description

The following describes all the available node attributes:

AllowManageRequest

Allow a request to manage the node. The valid values are:

- 0** (do not allow manage request from the node)
- 1** (allow manage request from the node)

This attribute is editable (Read/Write). It is optional when defining a resource.

ConsoleMethod

Console method used to open node console. Valid values are: **esp**, **els**, **conserver**, **computone** and **cps**.

This attribute is editable (Read/Write). It is optional when defining a resource.

ConsolePortNum

The number associated with the console port for this node. The console port numbers are **0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c, d, e, and f**.

This attribute is editable (Read/Write). It is optional when defining a resource.

ConsoleServerName

Hostname of the network adapter for the console server. This attribute is editable (Read/Write). It is optional when defining a resource.

ConsoleServerNumber

Number associated with the ESP console server. This attribute is editable (Read/Write). It is optional when defining a resource.

CSMVersion

The version of the CSM client software currently installed on this node. You should not update this attribute.

HWControlNodeId

Identifier associated with the node power control. The value is dependent on the *PowerMethod* in use:

- Text ID of the Service Processor for netfinity.

This attribute is editable (Read/Write). It is optional when defining a resource. This attribute must be defined to enable hardware control.

HWControlPoint

Hostname of the network adapter for the hardware control point. This attribute is editable (Read/Write). It is optional when defining a resource. This attribute must be defined to enable hardware control.

HWType

Hardware type. You should not update this attribute.

HWModel

Hardware model number. You should not update this attribute.

HWSerialNum

Hardware serial number. You should not update this attribute.

Hostname

The hostname associated with the node's network interface as known by the management server. This is the network interface used to install and manage the node.

This attribute is editable (Read/Write). It is required when defining a resource.

InstallAdapterDuplex

The duplex value of the adapter which will be used during the network installation of the node.

This attribute is editable (Read/Write). It is optional when defining a resource.

InstallAdapterMacaddr

The machine address of the network adapter used for installation. This attribute is editable (Read/Write). It is optional when defining a resource.

InstallAdapterSpeed

The speed of the adapter that will be used during the network installation of the node. This attribute is editable (Read/Write). It is optional when defining a resource.

InstallAdapterType

The type of the adapter that will be used during the network installation of the node. This attribute is editable (Read/Write). It is optional when defining a resource.

InstallCSMVersion

The CSM version to be installed on the node. This is specified as: *version.release.modification* for example:

1.2.0 or **1.3.0**

The expected value is **1.2.0**. The default is to use the same version of CSM as that of the management server.

This attribute is editable (Read/Write). It is optional when defining a resource.

InstallDisk

Disk to be used for node installation. **The *InstallDisk* attribute is currently not being used — it is reserved for future use.**

This attribute is editable (Read/Write). It is optional when defining a resource.

InstallDiskType

The type of disk to be used for node installation. **The *InstallDiskType* attribute is currently not being used — it is reserved for future use.**

This attribute is editable (Read/Write). It is optional when defining a resource.

InstallDistributionName

Distribution name to be installed. The expected value is **RedHat**. The default is to use the same distribution as that of the management server.

This attribute is editable (Read/Write). It is optional when defining a resource.

InstallDistributionVersion

Distribution version to be installed. The format for the values is *version.release*. For example, **7.1**

This attribute is editable (Read/Write). It is optional when defining a resource.

InstallKernelVersion

Kernel version to be installed. **The *InstallKernelVersion* attribute is currently not being used, it is reserved for future use.**

This attribute is editable (Read/Write). It is optional when defining a resource.

InstallMethod

Installation method. The valid values are:

nodeattributes

kickstart

This attribute is editable (Read/Write). It is optional when defining a resource.

InstallOSName

Operating system to be installed. The expected value is **Linux**. The default is to use the same operating system as that of the management server.

This attribute is editable (Read/Write). It is optional when defining a resource.

InstallPkgArchitecture

The machine architecture of the node. This attribute is used to determine the package to be installed on the node. The expected value is **i386**. The default is to use the same architecture as that of the management server. The value **i386** represents any machine whose architecture is **i386**, **i486**, **i586** or **i686**.

This attribute is editable (Read/Write). It is optional when defining a resource.

LastCFMUpdateTime

Time at which CFM updated the managed node (in seconds, since the epoch). This attribute is editable (Read/Write). It is optional when defining a resource.

LParID

Logical partition identifier. You should not update this attribute. This attribute is optional when defining a resource.

ManagementServer

Hostname of the management server machine as known by the managed node. This attribute is editable (Read/Write). It is optional when defining a resource.

Mode Mode. It will be set by the installation tools to one of: **PreManaged**, **Installing** or **Managed**, depending on the current installation state of the node. The user should not update this attribute.

This attribute is editable (Read/Write). It is optional when defining a resource.

Name Same as hostname of the node. This attribute is not editable (Read Only). It is not valid when defining a resource.

PowerMethod

Power method used to perform hardware control. The only valid value is **netfinity**.

This attribute is editable (Read/Write). It is optional when defining a resource. This attribute must be defined to enable hardware control.

UniversalId

Unique node identifier. The user should not update this attribute.

This attribute is editable (Read/Write). It is optional when defining a resource.

UpdatenodeFailed

Status of the last execution of the **updatenode** command on this node. This attribute will be set to **0** if **updatenode** was successful. Any other value means that a failure occurred. The user should not update this attribute.

This attribute is editable (Read/Write). It is optional when defining a resource.

The following describes the dynamic **class** attributes that can be monitored for the IBM.ManagedNode class:

ResourceDefined

Indicates that a new ManagedNode resource was created. This is a dynamic class attribute.

ResourceUndefined

Indicates that a ManagedNode resource was deleted.

The following describes the dynamic **resource** attributes that can be monitored for the IBM.ManagedNode class:

PowerStatus

Represents the current power status of the node. The valid states are ON (1), OFF (0), and UNKNOWN (127).

Status

Represents the current accessibility status of the node. *Accessibility* is defined as the ability to successfully communicate with the RMC subsystem on the node. The valid states are ALIVE (1), UNREACHABLE (0), UNKNOWN (127), and HARDWARE CONTROL NOT CONFIGURED (128).

See Also

- The **chnode**, **definenode**, and **lsnode** man pages.
- *IBM CSM for Linux: Hardware Planning and Control Guide*, *IBM CSM for Linux: Software Planning and Installation Guide*

Author

Keshav Ranganathan- cluster@us.ibm.com

nodedef File

Name

nodedef - CSM node definition file.

Description

The **nodedef** (node definition) file is a text file that contains node attributes that may be used to create CSM node definitions. It is used as input to the **definenode** command.

The **nodedef** file is structured in stanza format, where each stanza contains information for a unique node. The following rules must be followed when creating a **nodedef** file:

- A stanza header consists of the node name followed by a colon (:).
- Attribute lines must take the form of *Attribute=Value*.
- A warning message is issued for attributes that are not valid, but the code continues.
- Each line of the file may have only one header or attribute definition.
- Only one stanza may exist for each node.
- If the header keyword is **default**, the attribute values in the stanza are considered default values for subsequent node definitions.
- Default stanzas may be specified multiple times and at any point in a definition file. The values apply to all definitions following the default stanzas in a file. The default values are cumulative. In other words, a default attribute value will stay set until it is explicitly unset or changed.
- To turn off a default value, set the attribute to nothing (blank).
- When a specific value for an attribute is provided in the node stanza, it takes priority over any default value that had been set.
- Comments beginning with the pound sign (#) may be added to the file. A comment must be on a separate line.
- When parsing the file, tab characters and spaces are ignored.
- By default, some attribute values will be set by the **definenode** command when the **nodedef** file is used as input.

For information about the node definition attributes, see the “nodeattributes File” on page 72.

Examples

1. A sample node definition file is available in: **/opt/csm/install/nodedef.sample**.
2. A sample filled-in node-attribute table is available in *IBM CSM for Linux: Hardware Planning and Control Guide*.

Files

/opt/csm/install/nodedef.sample

Location of a sample node definition file.

See Also

- The **definenode**, **rconsole**, and **rpower** man pages.
- *IBM CSM for Linux: Hardware Planning and Control Guide*.
- *IBM CSM for Linux: Software Planning and Installation Guide*.

Author

Sean Safron - cluster@us.ibm.com

nodegrp Command

Name

nodegrp - Manages node group definitions in the IBM Cluster Systems Management for Linux (CSM) database.

Synopsis

nodegrp **{**-h | -f *file* | -g | -L | -p | -a *nodelist* | -x *nodelist* | -D | -I | -w *selectstr* | -W | -s *node***}**

nodegrp [-v | -V] [-I] [-S*group1 group2*] [-d *delim*] [*group*]

Description

The **nodegrp** command can be run on any node, including the management server. It lists and updates the node groups that are defined to IBM Cluster Systems Management for Linux (CSM). Node groups can be either explicit lists of node host names created with the **-a** option or a dynamic group that uses a select string specified with the **-w** option. When **-w *selectstr*** is specified, the **nodegrp** command uses that string to apply against the node database each time the **nodegrp** command is invoked to display the members of the group.

Options can also be used to list all node groups, delete a node group, or remove nodes from a node group. The group specified as the input to the command is the group that is to be acted on for all options specified.

The *host* parameter can be specified by either a host name or an IP address.

The *group* parameter is the name of the node group to be acted on. You can only specify multiple groups with the **-p** option or no option.

Note: The **-P** and **-B** options are no longer valid for this command.

Options

-a *nodelist*

Adds host names to a group, creating a group if necessary. A node list consists of one or more comma-separated host names.

-d *delim*

Specifies the delimiter used to separate the items returned.

-D

Deletes a group.

-f *file* Specifies a file that contains a list of groups to be defined. If the file name is "-", then the list is read from stdin. Each line of the file should contain the group name followed by a colon, then the following three fields separated by commas: type (**static** or **dynamic**), the validation setting (**validated** or **not validated**), and the definition of the group contents (either a select string or the unexpanded member list). This is same format that is output by the **-L** option.

-g The names in the group just represent generic names, they do not have to be actual node names in the CSM cluster. This option can only be used with **-a** when creating a group.

-h Writes the command's usage statement to standard output.

-I Take the intersection of the two groups specified and display the results. Neither group is modified. Type as an uppercase i.

-I Lists all defined node groups.

-L List the definition of all groups. Each line of output will represent one group and will display its

nodegrp

- | name, the type (**static** or **dynamic**), the validation setting (**-g**), and the definition of the group contents (either a select string or the unexpanded member list).
- | **-p** Prints a group. If no option is specified, this is the default.
- | **-s** *host*
| Displays all the group names (static and dynamic) that contain the node represented by this host name or IP address.
- | **-S** Subtract the membership of the second group from the first group and display the members that are left. Neither group is modified.
- | **-v** | **V** Writes the command's verbose messages to standard output.
- | **-w** *selectstr*
| Specifies the "where" clause of a select string to be used to search the nodes table in the database to dynamically determine the list of nodes in the group. The group is created if it does not already exist.
- | **-W** Displays the "where" clause of the select string set for this node group.
- | **-x** *nodelist*
| Removes nodes from a group.

Exit Status

- | **1** A combination of options and arguments has been entered that is not valid.
- | **12** Group not found.
- | **13** Did not specify two groups required for the operation.
- | **14** "where" string set in attempt to add nodes to group.
- | **15** "where" string set in attempt to remove nodes from group.
- | **16** Member list set in attempt to set the "where" string.
- | **17** "where" string not set in attempt to display the "where" string.
- | **18** Error opening file to read group definitions.
- | **19** Improper format in group file.

Examples

1. To list all of the node groups, type:
nodegrp
2. To create a node group called g1 that contains webserv1 and webserv2, type:
nodegrp -a webserv1,webserv2 g1
3. To list the members of g1, type:
nodegrp g1
4. To add a node (webserv3) to g1, type:
nodegrp -a webserv3 g1
5. To remove webserv2 from g1, type:
nodegrp -x webserv2 g1
6. To create a node group called ws that contains all the nodes that start with webserv, type:
nodegrp -w "Hostname like 'webserv%'" ws

Files

/opt/csm/bin/nodegrp Location of the **nodegrp** command.

See Also

| The **chnode**, **lsnode**, and **rmnode** man pages.

Author

Bruce Potter - cluster@us.ibm.com

predefined-condresp Command

Name

predefined-condresp – Defines default conditions and responses for monitoring.

Synopsis

`predefined-condresp [-h] [[-r] [-d] | [-m]] [-v | -V]`

Description

The **predefined-condresp** command defines some conditions and responses that are useful to many administrators for monitoring. These conditions and responses are used by the Event Response resource manager (ERRM) to monitor the cluster for conditions of interest. When the conditions occur, ERRM runs the corresponding responses. The **predefined-condresp** command is run automatically when **csm.server** is installed. This command can also be run again to restore the conditions and responses to their initial definitions. If run with no arguments, **predefined-condresp** removes the conditions and responses first and then defines them again. The options can be used only to define or only to remove the conditions and responses.

For the predefined conditions and predefined responses for the Managed Node Resource Class, the Node Group resource class, the Hardware Control resource class, and the Hardware Control Point resource class, see “Domain Management Server Resource Manager” on page 13 (if you are viewing this as a man page, refer to the *IBM CSM for Linux: Administration Guide*).

Options

-d Defines conditions and responses.

-h Writes command’s usage statement to standard output.

-m Migration mode - define only the conditions and responses that are not defined already. This is the default. This option can not be used with **-d** or **-r**.

-r Removes the conditions and responses.

-v | -V

Writes the command’s verbose messages to standard output.

Exit Status

0 Command has run successfully.

1 You have entered a combination of options and arguments that are not valid.

n The highest exit code that was returned by any of the ERRM commands.

Examples

1. To remove the current predefined conditions and responses and create them again, type:

```
predefined-condresp
```

2. To define the predefined conditions and responses, type:

```
predefined-condresp -d
```

Files

/opt/csm/bin/predefined-condresp

Location of **predefined-condresp** command.

See Also

- The **mkcondition**, **mkcondresp**, and **mkresponse** man pages.
- *IBM CSM for Linux: Administration Guide* for information on ERRM and on the predefined conditions and responses that are available for monitoring.

Author

Bruce Potter - cluster@us.ibm.com

predefined-nodegroups Command

Name

predefined-nodegroups – Restores predefined node groups to their initial states.

Synopsis

`predefined-nodegroups [-h] [[-r] [-d] | [-m] [-v | -V]`

Description

The **predefined-nodegroups** command is run during installation by CSM, but can be run again by the administrator to restore the predefined node groups to their initial state. If run with no arguments, removes the nodegroups first and then defines them again.

Options

- d** Defines node groups.
- h** Writes command's usage statement to standard output.
- m** Migration mode - define only the conditions and responses that are not defined already. This is the default. This option can not be used with **-d** or **-r**.
- r** Removes the node groups.
- v | -V** Writes the command's verbose messages to standard output.

Exit Status

- 0** Command has run successfully.
- 1** You have entered a combination of options and arguments that are not valid.
- n** The highest exit code that was returned by any of the ERRM commands.

Examples

1. To remove the current predefined node groups and create them again, type:
`predefined-nodegroups`
2. To define the predefined node groups, type:
`predefined-nodegroups -d`

Files

/opt/csm/bin/predefined-nodegroups
Location of **predefined-nodegroups** command.

See Also

- The **nodegrp** man page.
- *IBM CSM for Linux: Administration Guide* for information on ERRM and on the predefined conditions and responses that are available for monitoring.

Author

Bruce Potter - cluster@us.ibm.com

rconsole Command

Name

rconsole – provides remote console support for Cluster Systems Management (CSM) nodes.

Synopsis

```
rconsole [-a] [ [-h] [-t] [-n host[,host...]] [-N Node_group[,Node_group...]]
```

Description

The **rconsole** command provides remote console support for the nodes in a cluster. The command uses the CSM database to determine the nodes and their service processor information. The **-a** option causes the **rconsole** command to display a console for each node defined in the cluster. The **-n** and **-N** options cause the command to display a console for each node defined by these options. You can also define an environment variable **RCONSOLE_LIST**, which is the name of a file that contains a list of nodes to manage. The host names used must be the names specified when the nodes are defined in the CSM database.

Note: The **-P** and **-B** options are no longer valid for this command.

The **rconsole** command provides an **xterm** window for each node specified unless **-t** is specified. The font used depends on the number of nodes specified:

1	fixed
2 to 4	5x8
greater than 4	nil2

Note: The nil2 font that is the default font when more than five systems are specified is not intended to be readable. Rather, it is intended to give a general idea of whether the node is up. Use **RCONSOLE_FONT** to override this default if you intend to read the information provided on these consoles.

Options

-a Runs the command on all of the nodes in the cluster.

-h Writes usage information to standard output.

-n *Host[,Host...]*
Specifies a list of nodes on which to run the command.

-N *Node_group[,Node_group...]*
Specifies one or more node groups on which to run the command.

-t Specifies text mode. Shows the contents of the remote console in the current **xterm** session. This option is allowed only when one node is specified.

Environment

RCONSOLE_FONT

Specifies the font to use for the remote console. This overrides the default.

RCONSOLE_LIST

Specifies a file that contains a list of nodes, one host name per line.

rconsole

Exit Status

- 0** Command has run successfully.
- 1** Error occurred with one or more of the remote console commands.

Examples

1. To open a remote console to one system, type:
`rconsole -n c1sn02`
2. To open a remote console to a group of nodes defined in the CSM database as the node group **clients**, type:
`rconsole -N clients`
3. To open consoles for a group of nodes with a specific font, type:
`export RCONSOLE_FONT=fixed10; rconsole -n c1sn02,c1sn03`

Files

| `/opt/csm/bin/rconsole` Location of the **rconsole** command.

See Also

- | • The **espcfg**, **espdiag**, **esptty**, and **lnode** man pages.
- | • *IBM CSM for Linux: Hardware Planning and Control Guide*.

Author

| John Simpson – cluster@us.ibm.com

rmnode Command

Name

rmnode - Removes a node definition from the CSM database.

Synopsis

rmnode [-h] [-f *file*] [-N *group*] [-v | -V [*host* [*host* ...]]

Description

The **rmnode** command is run on the management server and deletes a managed node definition from the CSM database. The managed node is represented by the *host* parameter, which can be specified by either host name or IP address. Removing a node from a cluster does not uninstall CSM and its prerequisites from the node. Rather, it disassociates the node from its management server. It removes the node from the database of the management server, and it informs the node that it is no longer attached to the management server.

Note: The **-P** option is no longer valid for this command.

Options

-h Writes the command's usage statement to standard output.

-f *file* Specifies a file that contains a list of nodes names. If the file name is "-", then the list is read from stdin. The file can contain multiple lines and each line can have one or more node names, separated by spaces and/or commas.

-v | -V Writes the command's verbose messages to standard output.

-N *group* Remove the nodes that are in the node groups specified. The node group is evaluated by the **nodegrp** command. Multiple node groups can be separated by commas or spaces (if the list is quoted).

Exit Status

1 A combination of options and arguments has been entered that is not valid.

12 Node not found.

13 No nodes were specified.

If an error occurs in the RMC layer, the RMC return code will be returned as the exit status.

Examples

1. To remove the node named **websvr** from the CSM database, type:

```
rmnode websvr
```

2. To remove the node with the IP address 9.117.10.51 from the database, type:

```
rmnode 9.117.10.51
```

Files

/opt/cms/bin/rmnode Location of **rmnode** command.

rmnode

See Also

- The **chnode**, **lsnode**, and **nodegrp** man pages.
- The **rmcli** man page.

Author

Bruce Potter - cluster@us.ibm.com

rpower Command

Name

rpower – Controls remote power for Cluster Systems Management (CSM) nodes.

Synopsis

```
| rpower [-a] [-h] [-n host[,host...]] [-N Node_group[,Node_group...]] [-v | -V] on | off | reboot | query |
| resetsp_hcp | resetsp_host
```

Description

The **rpower** command allows remote power control for the nodes in a cluster. The command uses the CSM database to determine the nodes and their service processor information. The **-a** option causes the **rpower** command to run on all of the nodes defined in the cluster. The **-n** and **-N** options cause the command to run on the set of nodes defined by these options. In addition to these options, you can define an environment variable, **RPOWER_LIST**, which is the name of a file that contains a list of nodes to manage. The host names used must be the names specified when defining the nodes in the CSM database.

The **query** option prints an **on** or **off** status response for each of the nodes specified. The **on**, **off**, **reboot**, and **resetsp** options print the node name with the command specified and the return code of the command.

| **Note:** The **-P** and **-B** options are no longer valid for this command.

Options

-a	Runs the command on all of the nodes in the cluster.
-h	Writes usage information to standard output.
-n <i>host[,host...]</i>	Specifies a list of nodes on which to run the command.
-N <i>Node_group[,Node_group...]</i>	Specifies one or more node groups on which to run the command.
-v -V	Specifies to turn tracing on. Note that when you specify this option, tracing is turned on for the duration of the command only. After the command is run, tracing is restored to the state it was in before the command was executed.
on	Powers the node or nodes on.
off	Requests a shutdown and schedules a power off based on the ISP timer.
reboot	Reboots the power on the node or nodes.
query	Reports the power status of the node or nodes.
resetsp_hcp	Resets the service processor for the hcp or hcps.
resetsp_host	Resets the service processor for the node or nodes.

Environment

RPOWER_LIST

Specifies a file that contains definitions of the set of hosts, one per line, that comprise the node list.

rpower

Exit Status

- 0 Command has run successfully.
- 1 Error occurred with one or more of the remote power commands.

Security

While the **rpower** command currently only supports the Netfinity hardware, the architecture is designed to allow future enhancements for other hardware support. For Netfinity hardware, the **rpower** command requires that the **systemid** command be run first, in order to establish the user ID and password that is necessary to access the remote hardware.

Note: If you change the ID and password on the service processor, then you must run the **systemid** command and specify the new ID and password. For information on using the **systemid** command, see the man page.

Examples

1. To query one node, type:

```
rpower -n clsn04 query
```

The output is:

```
clsn04 on
```

2. To query all nodes, type:

```
rpower -a query
```

The output is similar to:

```
clsn05.ppd.pok.ibm.com on  
clsn04.ppd.pok.ibm.com on  
clsn03.ppd.pok.ibm.com on  
clsn02.ppd.pok.ibm.com on  
clsn01.ppd.pok.ibm.com on
```

3. To power off a node, type:

```
rpower -n clsn04 off
```

The output is:

```
clsn04 off complete rc=0
```

4. To power on a node, enter:

```
rpower -n clsn04 on
```

5. To display a list of the nodes in a node group, type:

```
nodegrp -p test
```

The output is similar to:

```
clsn01.ppd.pok.ibm.com  
clsn02.ppd.pok.ibm.com  
clsn05.ppd.pok.ibm.com
```

6. To query the power status of the nodes in a node group, type:

```
rpower -N test query
```

The output is similar to:

cls01.ppd.pok.ibm.com on
cls02.ppd.pok.ibm.com on
cls05.ppd.pok.ibm.com on

Files

- | **/etc/opt/csm/system_config/<node ID>** The file containing the id and encrypted password.
- | **/opt/csm/bin/rpower** Location of the **rpower** command.

See Also

- | • The **lsnode** and **systemid** man pages.
- | • *IBM CSM for Linux: Hardware Planning and Control Guide*.

Author

John Simpson – cluster@us.ibm.com

savenodedata1.1 Command

Name

The **savenodedata1.1** command is used to dump the CSM Version 1.1 ManagedNode table to a file that can be used later as input to the **definenode** command. This will ease the transfer of some of the node data to the new release.

Synopsis

savenodedata1.1

Description

The **savenodedata1.1** command will print out all the ManagedNode and PreManagedNode objects in a format compatible with the **nodedef** file format of CSM Version 1.2. Any attributes that have changed names or been deleted between CSM Version 1.1 and 1.2 will be correctly output in the format needed for CSM Version 1.2. Attributes that were not present in CSM Version 1.1 will not be displayed. When the resulting **nodedef** file is run with the CSM Version 1.2 **definenode**, these missing attributes will be filled in with defaults from the management server or left blank as needed. See the **definenode** man page for which attributes will get defaults. Follow these instructions to use **savenodedata1.1**:

Step 1

Mount the CSM 1.2 CD-ROM and run the **savenodedata1.1** command, as follows:

```
mount /dev/cdrom /mnt/cdrom
/mnt/cdrom/savenodedata1.1 > /tmp/nodedef.migrate
```

The **savenodedata1.1** command generates the definitions for the nodes that are currently in your cluster and redirects them to a file called **nodedef.migrate**. Later in this procedure, you will use the **nodedef.migrate** file to provide your current node definitions to the new level of CSM.

Step 2

Remove all CSM 1.1 RPMs from the nodes as follows:

```
rpm -e csm.client csm.core rsct.core rsct.core.utils src
```

Step 3

Uninstall all of the CSM 1.1 and RSCT code as follows:

```
rpm -e csm.gui.dcem csm.dsh csm.server csm.core rsct.core rsct.core.utils src
```

Note: cfengine was used by CSM 1.1, but its function is replaced in CSM 1.2 with rdist. Note that because you might be using cfengine for other things, cfengine was not removed when you uninstalled CSM. However, you can manually remove cfengine if you don't plan on using it.

Step 4

Create a partition called **/csminstall**. See *IBM CSM for Linux: Software Planning and Installation Guide* for information on how to do this.

Step 5

Install the new version of the **csm.core** package from the CSM 1.2 CD-ROM. See *IBM CSM for Linux: Software Planning and Installation Guide* for information on how to do this.

Step 6

Install the remainder of CSM 1.2 and RSCT by running the **installms** command. See *IBM CSM for Linux: Software Planning and Installation Guide* for information on how to do this.

Step 7

Redefine the nodes of your cluster for CSM 1.2, using the **definenode** command and the **nodedef.migrate** file, as follows:

```
definenode -f /tmp/nodedef.migrate
```

| Note that some of the node attributes that are used in CSM 1.2 were not present in CSM 1.1.
| When you run the **definenode** command, above, the missing attributes are filled in with defaults
| from the management server or left blank, as needed.

Step 8

| For CSM-only installations, upgrade to the latest level of CSM and RSCT, using the **updatenode**
| command, as follows:

```
| updatenode -P
```

Author

| Sean Safron - cluster@us.ibm.com

systemid

systemid Command

Name

systemid - This command is used to store the user ID and password for internal programs to access the remote hardware.

Synopsis

systemid [-h] [*host_name* | *ip_address* [*user_id*]]

Description

This command is used to store the user ID and password for remote hardware. The system is identified by its IP address or by its host name. If the host name is resolveable, the password file is stored as an IP address. If the host name is not resolveable, the password file is stored as the host name that was entered.

When running the **savenodedata1.1** command, you will be prompted for the password to be stored with the specified user ID. If the command is run with no user ID, the command will return the IP address and user ID for the specified IP address, if one has been stored. If the command is run with no IP address, it will return all IP addresses and user IDs that have been previously saved. To change an existing saved user ID or password value, run the command again with new values.

Options

-h Writes the command's usage statement to standard output.

host_name

Specifies the hostname of the system where the ID resides.

ip_address

Specifies the IP address of the system where the ID resides.

user_id

Specifies the user name which will be defined.

Examples

1. To store a system ID for user **admin** on host **cls04.pok.ibm.com**:

```
systemid cls04.pok.ibm.com admin
```

Author

John Simpson- cluster@us.ibm.com

updatenode Command

Name

updatenode - Updates or installs CSM packages and CFM configuration files across the cluster.

Synopsis

```
updatenode [-h ] [-v | -V] [-a | -P | -M] [-f ][-k] [-t | --test] [-I | --installcsm] [-F | --cfm]
[--cfmoptions "Options to pass to CFM"] [-N Node_group [, Node_group ...]] [ host [host...]]
```

Description

The **updatenode** command runs on the management server and updates/installs all CSM software and files on the target nodes. Currently, the **updatenode** command updates/installs CSM packages and user-defined CFM configuration files.

The **updatenode** command can be used to install CSM on a premanaged node. During this process the premanaged node is added to the CSM cluster (and converted to a ManagedNode). For convenience, **updatenode** may also be initiated through the `definenode -U` command. This will call **updatenode** when **definenode** has completed.

The **updatenode** command can also be used to update existing CSM nodes. It will only install/update CSM packages and CFM configuration files that are outdated or nonexistent on the target machines.

Since the **updatenode** command calls both the **dsh** and **cfmupdatenode** commands, it utilizes their respective default scaling fanouts. The **dsh** fanout can be set with the `DSH_FANOUT` environment variable. The `--cfmoptions -M max_child_process` flag should be specified on the **updatenode** command line to specify the **cfmupdatenode** fanout.

By default, **updatenode** performs both CSM installation and configuration file distribution (through CFM). However, **updatenode** can be instructed to only perform some of these tasks with command line options. If called with only the `[-I | --installcsm]` flags, **updatenode** will only perform installation/updates of CSM packages. If called with either the `[-F | --cfm]` or `[--cfmoptions]` flags, **updatenode** will only distribute configuration files. Calling **updatenode** with both the `[-I | --installcsm]` and `[-F | --cfm]` flags results in the default behavior: **updatenode** performs both CSM installation and CFM file distribution.

The `UpdatenodeFailed` node attribute is set for each target node at the conclusion of the **updatenode** command. If **updatenode** was successful, the `UpdatenodeFailed` value is set to zero. Any other value means that **updatenode** encountered significant errors during execution to the given node.

Options

-h Shows usage information.

-v | -V
Verbose Mode.

-a Performs updates on all nodes.

-P Performs updates on all nodes whose *Mode* is **PreManaged**.

-M Performs updates on all nodes whose *Mode* is **Managed**.

-f Forces the updates of CSM packages. Performs a binary check on configuration files (this is the equivalent of running `cfmupdatenode -c`).

-k Exchanges RSCT public keys, host name, and node identifier between the node and the management server. Only use this option if the host name, node identifier, or public key of either

updatenode

machines has changed. At the time this option is used, you must trust your network to ensure that a rogue machine is not going to insert its public key in place of the public key of the real node.

-t | --test

Only reports what would be done by the command. Does not perform any updates.

-I | --installcsm

Installs/updates the CSM code sets. If neither **-I** nor **-F** are specified, both operations are performed. When individual command line options are used, **updatenode** only performs the actions specified by the given options. Note that the **-I** option is typed as an uppercase i.

-F | --cfm

Updates the configuration files from /cfmroot. If neither **-I** nor **-F** are specified, both operations are performed. When individual command line options are used, **updatenode** only performs the actions specified by the given options through the use of the **cfmupdatenode** command.

--cfmoptions "*options to pass to CFM*"

Forwards options to the **cfmupdatenode** command. This flag implies the **[--F | --cfm]** flag. All options following the **--cfmoptions** operand must be enclosed within double quotes. These options are allowed: **[-b]**, **[[-y] |[-c]]**, **[-r 'remote_shell_path']**, **[-t timeout]**, **[-M 'max_child_process']**, **[-d 'distfile_location']**, **[-F filename]**.

-N Node_group [, Node_group ...].

Specifies one or more node groups on which to run the command. This flag may not be used with either of the **-a**, **-P**, or **-M** options.

host ...

Specifies a list of node hostnames (or IP addresses) on which to run the command. Hostnames may not be specified with either of the **-a**, **-P**, or **-M** options.

Examples

1. To install all premanaged nodes, enter:

```
updatenode -P
```

2. To update all managed nodes automatically every weekday morning at 0800, add this line to your **crontab** file:

```
0 8 * * * /opt/csm/bin/updatenode -M
```

3. To test what **updatenode** will do on the **FTP_server** node group, type:

```
updatenode -t -N FTP_server
```

Files

/cfmroot	The directory on the Management server that contains the cluster's configuration files.
/opt/csm/bin/cfmupdatenode	Location of the cfmupdatenode command.
/opt/csm/bin/updatenode	Location of the updatenode command.
/var/log/csm/updatenode.log	Location of the log file on the management server for the updatenode command. Up to five copies of this log are maintained. Old logs receive a numeric suffix up to 4. The oldest file is updatenode.log.4 .
/var/log/csm/install.log	Location of the log file on each node containing installation information. Up to five copies of this log are maintained. Old logs receive a numeric suffix up to 4. The oldest file is install.log.4 .

See Also

The **definnode**, **dsh**, and **cfmupdatenode** man pages.

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updatenode

Chapter 5. CSM messages and diagnostics

This chapter contains the following message identifiers for CSM messages. It is organized in numerical order by message identifier.

2651–nnn: Hardware control, node commands, and Configuration File Manager messages issued from the management server

2652–nnn: Configuration File Manager messages issued from a node

2653–nnn: Installation messages

2655–nnn: Domain Management Server messages

Node command messages

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

Explanation: None.

User Response: None.

2651-004 Could not find one or more of the specified nodes in the database. Run `lsnode` 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: None.

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.

2651-018 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.

2651-021 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 IBM support.

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.

2651-035 Bad value given for the `-u` option. The value must be yes or no or 1 or 0.

Explanation: None.

User Response: None.

Hardware control messages

2651-601 No command-line flags specified.

Explanation: No command-line flags were specified. At least one flag is required.

User Response: Specify a flag.

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

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

User Response: Either specify a valid flag argument, or remove the flag. See the man page for the command or Chapter 4, "CSM Commands" on page 33 for the valid flag arguments.

2651-603 Unrecognized flag: *unrecognized flag*.

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

User Response: Specify a valid flag.

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 flag was specified multiple times.

User Response: Specify the flag 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 IBM support.

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 returned by `fopen()` is also provided.

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

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 SP 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 an SP 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 of 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.

2651-736 **Entry not found.**

Explanation: The entry specified does not exist.

User Response: Reissue the command 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 flag was not recognized by **systemid**.

User Response: Specify a valid flag.

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.

2651-792 **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.

2651-796 **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** flag is not specified. If the **-f** flag is specified, check the input file for errors. If the problem cannot be resolved, record the above information and contact the IBM Support Center.

2651-799 **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 **errpt** for errors. If the problem cannot be resolved, record the above information and contact the IBM Support Center.

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.

2651-851 **Incorrect argument on** *flag name* **flag:** *flag argument.*

Explanation: You specified an invalid argument for the specified flag.

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 System 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 **nglist** 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 System Management (csm.core) **Isnodes command not installed.**

Explanation: The **Isnodes** command, used to acquire node attribute information, is not installed.

User Response: **Isnodes** is a program in the **csm.core** package. Contact your system administrator to resolve this problem.

2651-859 Cluster System Management *command name* command error.

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

User Response: Resolve the **Isnodes** 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 *hostname*.

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 **-l** flags.

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.

2651-871 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 System 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 System 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 System 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 **nglist** 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 *-a*, *-f* and *-n* or *-N* flag.

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* flag.

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 hostnames are specified with the *-n* flag.

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.

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 non-zero code.

User Response: Refer to the error messages produced by the command to determine the cause of problem before running the command again.

Configuration File Manager 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).

User Response: None.

2652-517 Error: Cannot open directory: *directory*.

Explanation: None.

User Response: None.

2652-512 Error: Unable to make destination directory *directory*.

Explanation: None.

User Response: Check the permissions on the parent directory.

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.

2652-513 Error: Cannot close 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.

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.

2652-515 This command *command name* reported this exit status: *exit code*, and this error: *error message*.

Explanation: Command failed.

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.

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: 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*. *errorerror*. 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 System 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:** *errorerror*. **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*. **CFM 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 `cfmupdatenode` 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 `cfmupdatenode` 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 `cfmupdatenode -f filename` 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.

2651-556 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).

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.

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 Node install — Failed.

Explanation: None.

User Response: None.

2653-025 An error occurred while installing CSM packages.

Explanation: The install command failed.

User Response: Check previous error messages. Try installing packages manually.

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

Explanation: None.

User Response: None.

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 Cannot provide *-n* and *-M* together.

Explanation: None.

User Response: None.

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* 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 **dsh**.

2653-038 **Could not process command arguments.**

Explanation: None.

User Response: None.

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.

2653-048 **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: runtime (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 a flag might have been mistaken for an attribute. All flags 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 flags provided on the command line cannot be used together. If a `nodedef` file name is provided via the `-f` flag, then the flags 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 flags provided on the command line cannot be used together. If the `-M` flag is provided, the flags 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` flag 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` flag and the `PowerMethod=attribute`.

2653-059 ConsoleMethod attribute must be provided when using -C flag.

Explanation: The `-C` flag 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` flag and the `ConsoleMethod=value` attribute.

2653-060 There is no group with name node group name.

Explanation: None.

User Response: None.

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.**

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.**

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 **Cannot execute RMC command: *RMC command*. Error message from RMC: *error message*.**

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 **definenode** 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 **definenode** 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 **Cannot assign install method to nodes.**

Explanation: None.

User Response: None.

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: Since the **-U** flag was provided, the **definenode** 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** flags with the **updatenode** command.

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, `createdhcp` was never run.

User Response: Run the `csmsetupks` command (which runs `createdhcp` and `updatedhcp`).

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 requisite 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 Could not get required information from *file name*.

Explanation: Could not find `/etc/niminfo` file.

User Response: Determine why `/etc/niminfo` was not created by NIM.

2653-103 Could not get management server and node hostname.

Explanation: The command could not find the information it needed.

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.

2653-104 Could not get node attribute values from `config_info` file.

Explanation: The command could not get the required information from the node's configuration information file (`/csminstall/csm/config/hostname.configinfo`).

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.

2653-105 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.

2653-108 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` flag.

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 in `installnode`.

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 `csmsetupks` was run that prevents `installnode` 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 `csmsetupks` has run successfully, run the `installnode` command again.

2653-117 Error setting up `/fttboot/pxelinux/pxe` files.

Explanation: The `/fttboot/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 **csmsetupks** (*/var/log/csm/csmsetupks.log*) and then, when the **csmsetupks** 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 **csmsetupks** runs successfully, rerun the **installnode** command.

2653-123 *filename* was not copied to */csminstall* by **installms** or **copycsmpkgs**.

Explanation: **installms** or **copycsmpkgs** should have copied this file into the */csminstall* tree.

User Response: Rerun **installms** or **copycsmpkgs** 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 flag to **--cfmoptions**.

User Response: Pass only flags 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 **Error: */install* exists and is not a directory or an NFS mount point. Please remove the */install* file. It is needed as a mount point for *smsupdatenode*.**

Explanation: None.

User Response: None.

2653-139 **Error: The directory */install* exists, is not a mount point, and contains files. Please remove this directory. It is needed as a mount point for *smsupdatenode*.**

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 the *updatenode* 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.

2653-146 **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 *updatenode* to open the file.

2653-147 **Another execution of *updatenode* may be running. Cannot place lock on file *file name*:*return code***

Explanation: Could not get lock on file. Another process of *updatenode* may be running.

User Response: Wait until the other *updatenode* process has completed, and then run the *updatenode* command.

2653-148 **Error: CFM 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** flag and **-p** flag should not be used together. The **-x** flag specifies not to copy packages, while the **-p** flag 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 flags: 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: **csmsetupks** 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 RPMs 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 then 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 you have enough disk space to hold all the images. You need about 1.5GB to hold the contents of both 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 **csmsetupks** 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 flag, 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 flag, 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 flag contains a full copy of the Red Hat CD-ROMs. Ensure the kickstart template file exists and is in the correct format. Rerun the **csmsetupks** 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 **csmsetupks** 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` to

kickstart manually using the **chnode** command. If this works, there is no need to rerun the **csmsetupks** 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.

2653-174 **Could not find attribute values in *file name* file.**

Explanation: The required attribute values were not found in the file.

User Response: If CSM failed to install properly during a full install, try issuing the **updatenode** command to install CSM.

2653-175 **No nodes provided.**

Explanation: No nodes were provided to the **definenode** command.

User Response: Rerun the command with the **-n** flag.

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** flag sets the node's **ConsolePortNum**, **ConsoleServerNumber** and **ConsoleServerName** attributes automatically, so these attributes should not be provided with the **-C** flag.

User Response: Run the command again and do not provide the listed attributes with the **-C** flag.

2653-179 **Cannot provide **HWControlPoint** attribute with **-H**.**

Explanation: The **-H** flag sets the node's **HWControlPoint** attribute automatically, so **HWControlPoint** should not be provided with the **-H** flag.

User Response: Rerun the command and do not provide both the **HWControlPoint** attribute and the **-H** flag 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 Cannot extract the *file name* from *rpm* or *package name*.

Explanation: None.

User Response: None.

2653-187 The */etc/dhcpd.conf* file can no longer be modified by *createdhcp*. You should manually go fix the changes you want to make with the *Netmask*, the *Gateway*, or the *Name servers*.

Explanation: The */etc/dhcpd.conf* file can no longer be parsed, because of the way the program has been set up. This probably means that you modified the lines in the */etc/dhcpd.conf* file where they shouldn't have been modified. It could also mean that you have simply changed the file too extensively for our script to recognize.

User Response: Save the */etc/dhcpd.conf* file to a temporary directory and then erase */etc/dhcpd.conf*. Next, run the program again. It will create a new */etc/dhcpd.conf* file, which you can modify with your own settings.

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 *definnode* 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 The *Management Server* attribute on the node is different from the *Management Server* attribute from the management server.

Explanation: None.

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* indicates all groups and the *-N* is used to specify a list of group names.

User Response: Chose either the *-a* flag or the *-N* flag, and then rerun the command.

2653-195 Either the *-a* or *-N* flag must be specified.

Explanation: This command requires that either the *-a* or *-N* flag 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.

2653-198 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.

2653-202 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 Chapter 4, “CSM Commands” on page 33, 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.

2653-205 There are no devices associated with subnet *subnet (ip address)*. This implies that either the network is not configured — or — The incorrect netmask *netmask (ip address)* value was passed in.

Explanation: None.

User Response: Check the network configuration.

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.

2653-206 dsh cannot connect to nodes: *node names through protocol remote shell protocol*.

Explanation: None.

User Response: None.

2653-207 *directory name that need to 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: None.

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 datatype of input elements is not correct.

User Response: Provide input elements with the correct datatype.

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:

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:

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:

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 non-zero 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 PreManagedNode node whose host name matches the host name of the node that is making the request.
- The AddUnrecognizedNode attribute must be set.
- If a ManagedNode exists with the same host name as the node that is making the request, then 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 the node.**

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 PreManagedNode node with the hostname matching the hostname of the node making the request.
- The AddUnrecognizedNode attribute must be set.
- If a ManagedNode exists with the same hostname as the node making the request, then 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 **Unable to retrieve the hostname of the node or the management server name as known to the node.**

Explanation: None.

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.

2655-209 Hostname attribute value specified for the node is not valid.

Explanation: The Hostname attribute value must be a non-zero length string.

User Response: Provide a valid value for the Hostname attribute.

Chapter 6. Diagnosing problems

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 “Providing security” on page 7.	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 remote shell is rsh .	The CSM csmsetupks and updatenode commands
syslinux	Enables network booting during installation.	The CSM csmsetupks , getmacs , and installnode commands
atftp	Advanced tftp. Handles file transfers during installation.	The CSM csmsetupks , getmacs , 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, type:

```
lsnode -l
```

- To list the status of the RMC daemons, type:

```
lssrc -a
```

- To review the audit log for monitoring events, type:

```
lsaudrec
```

- If you have modified the RMC access control list (ACL) file, make sure 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 *IBM RSCT for Linux: Guide and Reference* for detailed information on authorization and the ACL file. See the ACL File FAQ at <http://www.ibm.com/servers/eserver/clusters/library> for information on troubleshooting the RMC ACL file.

- If you are using **rsh** as the remote shell for **dsh**, make sure that the **/root.rhosts** file on each node contains the hostname of the management server.

- To test **dsh** access on all nodes, type:

```
dsh -a date
```

Recovering from security problems

The CSM system administrator has control over the public and private keys for the nodes in the cluster. By default, the keys are installed to 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)

Diagnosing problems with RMC

If RMC isn't working properly, first check to see if the RMC daemon (`ctrmc`) and the resource managers are running by running the `lssrc` command, as follows:

```
lssrc -a
```

At least `ctrmc`, `IBM.ERRM`, and `IBM.DMSRM` should be running. (Some of the other resource managers are not started until they are needed.) If you need to restart RMC, run the `rmcctrl` command with the `-z` option, as follows,

```
rmcctrl -z
```

and then again with the `-s` option:

```
rmcctrl -s
```

After you are sure that RMC is running, run the `lsrsrc` command to see if the RMC daemon is responding and what resource classes it knows about. Some of the important classes are: `IBM.ManagedNode`, `IBM.NodeGroup`, `IBM.Condition`, `IBM.EventResponse`, and `IBM.Association`. You can list the contents of any of these classes by using the `lsrsrc` command.

Diagnosing problems with Distributed Command Execution Manager

DCEM uses IBM Cluster Systems Management (CSM), which, in turn, uses several other tools. Understanding this relationship can be helpful in diagnosing problems.

Problems due to insufficient setup of underlying subsystems

The underlying 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 and 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. In order for the `dsh` command to work, security needs to be set up on each node in such a way 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`, and 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 `/.rhosts` file on the nodes that will be managed nodes. For example, if you want to run commands as `root` on `machine2` from `machine1`, to the `/.rhosts` file on `machine2`, you would have to add the line `machine1 root`.

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 information, see *IBM CSM for Linux: Software Planning and Installation Guide*.

Interactive commands and GUI applications

The CSM `dsh` command does not support the execution of interactive commands. Therefore, attempting to run an interactive command (one that requires input from standard in) from DCEM will not work.

To run an XWindows GUI application from DCEM, make sure that the `DISPLAY` variable is first set to your system's `DISPLAY` address, so that the GUI will display on your system. (For example, in the General panel, command area, you could first export the `DISPLAY` variable to your display's address prior to issuing your command name.) If you run a GUI application correctly from DCEM, the application will remain in the "Working" state until you choose to exit the GUI.

Security considerations and remote shells

DCEM takes in 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: Software Planning and Installation Guide*.

Diagnostic information

All DCEM command activity of failures and successes are saved in log files to use later if you have to diagnose problems. These log files are stored in the following directory:

home/dcem/log/log file name

To see more detail on the actual underlying CSM command execution string specified as a result of running your created command specification, run the Perl script (outside of DCEM) in debug mode and directly from your AIX command line, as follows:

```
<commandSpecificationName>.pl -debug
```


Appendix. Example of a saved command script

The following example of a saved 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.

```
#!/usr/bin/perl -w
#####
#
# Licensed Materials - Property of IBM
#
# (C) COPYRIGHT International Business Machines Corp. 1994,2001
# All Rights Reserved
#
# US Government Users Restricted Rights - Use, duplication or
# disclosure restricted by GSA ADP Schedule Contract with IBM Corp.
#
#####

#####
#
# Example perl file -
# Run via:
# perl <this-perl-script.pl> [-debug] [-non_interactive]
# E.g.
# perl listusers.pl
# perl listusers.pl -debug
# perl listusers.pl -non_interactive
#
# 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)     = ('b905em17.austin.ibm.com');
my (@GROUPS)    = ('Group1','Group2');

# -----
# Command Specification
# -----
```

```

my ($CMD_SPECIFICATION)=<<<'END_CMD_SPECIFICATION'
ls -l; whoami; pwd; ls -l
END_CMD_SPECIFICATION
;

# -----
# 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";
my ($DISTRIB_DEFAULT_REMOTE_SHELL) = "rsh";

# -----
# 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 ($DISTRIB_REMOTE_SHELL_OPTIONS_OPTION) = "-o";
my ($DISTRIB_REMOTE_SHELL_PATH_OPTION) = "-r";

# -----
# Additional Csm Command Environment Variables
# -----

my ($FANOUT)                = 64;
my ($STREAMING)             = $TRUE;
my ($VERIFY_HOSTS)         = $FALSE;
my ($USER)                  = "root";
my ($REMOTE_SHELL_OPTIONS) = "";
my ($REMOTE_SHELL)         = "rsh";
my ($COMMAND_PATH)         = '$PATH';

# -----
#####
# 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 ("Enter sub-function run_distributed_command()...\n");

    my (@execution_string);
    my ($line) = "";

    # Get the arguments

    # construct the execution string based on the parameters
    @execution_string = build_execution_string();

    # run the command
    debug_message ("Running the command: @execution_string \n\n");

    my (@output);
    my ($current_pid) = fork();
    if ($current_pid == 0) {
        @output = exec (@execution_string);
    }
    elsif ($current_pid) {
        debug_message("In parent process, before wait.\n");
        my ($child_pid) = wait;
        debug_message("In parent process, after wait. Child pid was $child_pid.\n");
    }
    else {
        die "fork error: $!\n";
    }

    foreach $line (@output)
    {
        display_message ($line);
    }
}

```

```

    debug_message ("\nLeave sub-function run_distributed_command().\n");
    return (@output);
}

#####
# 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;
    $cmd_name =~ s/\.\.p1$//;
    debug_message( "Command name to load is $cmd_name\n");

    `~/opt/csm/dcem/bin/dcem -command $cmd_name`;

    debug_message ("Leave sub-function run_distributed_command_gui().\n");
}

#####
# This sub-function gets the path to the selected remote shell.
#
#-- This is generated by the printBuildCommandLineFunction() method
#####

sub get_remote_shell_path ()
{
    debug_message ("Enter sub-function get_remote_shell_path()...");

    my ($execution_string) = "ksh -c \"which $REMOTE_SHELL\"";
    my ($line);

    # run the command
    debug_message ("Running the which $REMOTE_SHELL command: $execution_string \n\n");

    my (@output) = `$execution_string`;

    $line = $output[0];
    my (@splitLine) = split(' ', $line);
    my ($path) = $splitLine[0];

    if ($line =~ /$REMOTE_SHELL$/)
    {
        debug_message ("Found remote shell path $path\n");
        return $path;
    }
    else
    {
        display_message ("The remote shell $REMOTE_SHELL was not found. Dsh will use the
        default $DISTRIB_DEFAULT_REMOTE_SHELL remote shell when executing this command.\n");
        return "";
    }
}

#####
# 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 (($STREAMING eq $TRUE) && ($FORMAT_OUTPUT eq $FALSE))
{
    $execution_string[++$i] = $DISTRIB_STREAMING_OPTION;
    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");

if ($REMOTE_SHELL ne $DISTRIB_DEFAULT_REMOTE_SHELL)
{
    my ($remote_shell_path) = get_remote_shell_path();
    if ($remote_shell_path ne "")
    {
        $execution_string[++$i] = $DISTRIB_REMOTE_SHELL_PATH_OPTION;
        $execution_string[++$i] = $remote_shell_path;
        debug_message ("Execution string is: @execution_string\n");

        $execution_string[++$i] = $DISTRIB_REMOTE_SHELL_OPTIONS_OPTION;
        $execution_string[++$i] = $REMOTE_SHELL_OPTIONS;
        debug_message ("Execution string is: @execution_string\n");
    }
}
elseif ($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 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_SPECIFICATION);

```

```

debug_message ("Execution string is: @execution_string\n");

if ($FORMAT_OUTPUT eq $TRUE)
{
    $execution_string[++$i] = join(" ", " | ", $DISTRIB_POST_PROCESSING_COMMAND);
    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
    {
        return ($FALSE);
    }
}

#####
# This sub-function exits the program with an appropriate
# exit code.
#
# @param
#
#####

sub exit_program ($$)
{
    debug_message ("Enter sub-function exit_program()...\n");

    my ($msg, $exit_code) = @_;

    display_message ($msg);

    debug_message ("Leave sub-function exit_program().\n");
    debug_message ("Exiting program with exit_code: $exit_code\n");
    exit ($exit_code);
}

#####
# This sub-function display the usage message for this command
#
# @param
#
#####

sub usage ($)
{
    debug_message ("Enter sub-function usage()...\n");

    my ($bad_option) = @_;
    display_message ($bad_option);

    display_message ("Usage: perl $0 [$DEBUG_FLAG] [$PROMPT_USER_FLAG]\n\n");

    display_message (" $DEBUG_FLAG\t\t\t\t- displays debug messages\n");
    display_message (" $PROMPT_USER_FLAG\t\t- does not prompt user for input\n");

    exit_program("", 1);

    debug_message ("Leave sub-function usage().\n");
}

```

```

#####
# This function logs entries into a file whose name is
# provided as the input argument.
#
# @param - log file name
#
#####

sub generate_log_entries
{
    debug_message ("Enter sub-function generate_log_entries()...\n");
    ~/opt/csm/dcem/bin/dLogMgr -s \@_\`;

    debug_message ("Leave sub-function generate_log_entries()...\n");
}

#####
# This function mails status reports after the command is
# executed
#
# @param - email addresses
#
#####

sub mail_report ($)
{
    debug_message ("Enter sub-function mail_report()...\n");

    debug_message ("Leave sub-function mail_report()...\n");
}

#####
# 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 = $FALSE;
    }
    elseif ($TMP_CMD_OPTION eq $LAUNCH_GUI_FLAG)
    {
        debug_message ("Setting LAUNCH_GUI to TRUE.\n");
        $LAUNCH_GUI = $TRUE;
    }
    elseif ($TMP_CMD_OPTION eq $FORMAT_OUTPUT_FLAG)
    {
        debug_message ("Setting FORMAT_OUTPUT to TRUE.\n");
        $FORMAT_OUTPUT = $TRUE;
    }
    elseif ($TMP_CMD_OPTION eq $DEBUG_FLAG)
    {
        $DEBUG = $TRUE;
        debug_message ("Setting DEBUG to TRUE.\n");
    }
    elseif ($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_SPECIFICATION,
            \@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
    my (@results) = run_distributed_command_line ();
    if (-e "/opt/csm/dcem/bin/dLogMgr")
    {
        generate_log_entries(@results);
    }

    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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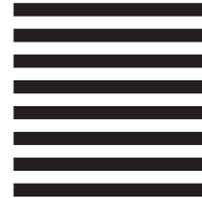
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