PRIMECLUSTER™

Installation and Administration Guide 4.0

(for Linux)

Edition June 2003

Preface

This manual serves as your starting point for using PRIMECLUSTER. It explains the workflow of the series of operations from installation to operation management of the PRIMECLUSTER system. Since the PRIMECLUSTER system comprises multiple features, there are several other manuals beside this one for each feature. However, by reading this manual first, you will be able to perform the series of operations because this manual refers readers to other manuals that contain feature-specific information that is necessary for the operations.
This manual also provides a functional overview of products that are supported by the PRIMECLUSTER system and describes operation procedures.
This manual only covers the basic operation of PRIMECLUSTER. For operations using different hardware and software configurations, see "Related Documentation."

The table below shows the operation flow from PRIMECLUSTER installation to the start of operation management and indicates the reference location in this manual for each operation.

Flow from PRIMECLUSTER system installation to operation management

PRIMECLUSTER system operation flow	Reference location in this manual
1. Understanding the flow of PRIMECLUSTER system building and designing the PRIMECLUSTER system	Part 1 Planning
2. Installing the PRIMECLUSTER system	Part 2 Installation
3. Monitoring the operation status of the PRIMECLUSTER system	Part 3 Operations
4. Changing the PRIMECLUSTER system configuration after system operation has been started	Part 4 System Configuration Modifications
5.Installing products for the PRIMECLUSTER system	Part 5 PRIMECLUSTER Products

For detailed procedural explanations, refer to the reference manuals that are indicated in the target location of each part.

◆ Target Readers

This manual is intended for all users who use PRIMECLUSTER 4.0 and perform cluster system installation and operation management. It is also intended for programmers who develop applications that operate on PRIMECLUSTER.

◆ Configuration of This Documentation

This manual consists of five parts, appendixes, and a glossary. The contents of each part are described below.

Part 1 Planning

Audience: System administrators who build PRIMECLUSTER systems

Contents: This part describes the overall workflow from installation to operation of the PRIMECLUSTER system.

Part 2 Installation

Audience: System administrators who build PRIMECLUSTER systems

Contents: This part describes operations for software installation, cluster building, and application building.

Part 3 Operations

Audience: System administrators who manage system operations.

Contents: This part describes operation methods for operations such as monitoring the PRIMECLUSTER system and investigating failure causes.

Part 4 System Configuration Modifications

Audience: System administrators who build PRIMECLUSTER systems

Contents: This part describes necessary work items for additions, modifications, and deletions to the PRIMECLUSTER system configuration.

Part 5 PRIMECLUSTER Products

Audience: Users who operate PRIMECLUSTER products on PRIMECLUSTER systems

Contents: This part describes the versions and levels of products that are supported by the PRIMECLUSTER system and provides a functional overview of those products.

Appendix A PRIMECLUSTER System Design Worksheets

Audience: Users who design PRIMECLUSTER systems

Contents: This appendix contains the PRIMECLUSTER System Design Worksheet.

Appendix B Manual Pages

Audience: All users who use PRIMECLUSTER systems

Contents: This appendix describes the online manual pages that are used by the individual features of the PRIMECLUSTER system.

Appendix C Troubleshooting

Audience: All users who use PRIMECLUSTER systems

Contents: This appendix describes corrective actions for problems that may occur in the PRIMECLUSTER system. It also explains how to collect data when requesting a problem investigation.

Appendix D Messages

Audience: All users who use PRIMECLUSTER systems

Contents: This appendix describes the contents and actions for messages output by the userApplication Configuration Wizard GUI and messages output by procedure resources in PRIMECLUSTER systems. For other messages, this manual indicates the reference locations in other manuals.

Appendix E Registering, Changing, and Deleting State Transition Procedure Resources for PRIMECLUSTER Compatibility

Audience: All users who use PRIMECLUSTER-compatible resources

Contents: This appendix describes procedures for registering, changing, and deleting procedure resources when the cluster applications use procedure resources.

Appendix F Registering SynfinityCluster-compatible Resources

Audience: All users who use PRIMECLUSTER systems

Contents: This appendix describes the feature supplied with the Supplement CD of the PRIMECLUSTER product.

Glossary

Audience: All users who use PRIMECLUSTER systems

Contents: This section explains terms used to describe the PRIMECLUSTER system.

Abbreviations

Audience: All users who use PRIMECLUSTER systems

Contents: This section explains abbreviations of the PRIMECLUSTER system.

◆ Related Documentation

Refer to the following manuals as necessary when setting up the cluster:

- *PRIMECLUSTER Concepts Guide*
- *PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*
- *PRIMECLUSTER RMS Configuration and Administration Guide*
- *PRIMECLUSTER Global Disk Services Configuration and Administration Guide*
- *PRIMECLUSTER Global File Services Configuration and Administration Guide*

- *PRIMECLUSTER Global Link Services Configuration and Administration Guide: Redundant Line Control Function*
- *PRIMECLUSTER Web-Based Admin View Operation Guide*
- *ServerView User Guide*
- *LKCD Installation Guide*
- *Installation Guide GR Multipath Driver 1.0 for Linux*
- *PRIMECLUSTER Wizard for Oracle Configuration and Administration Guide*

Note

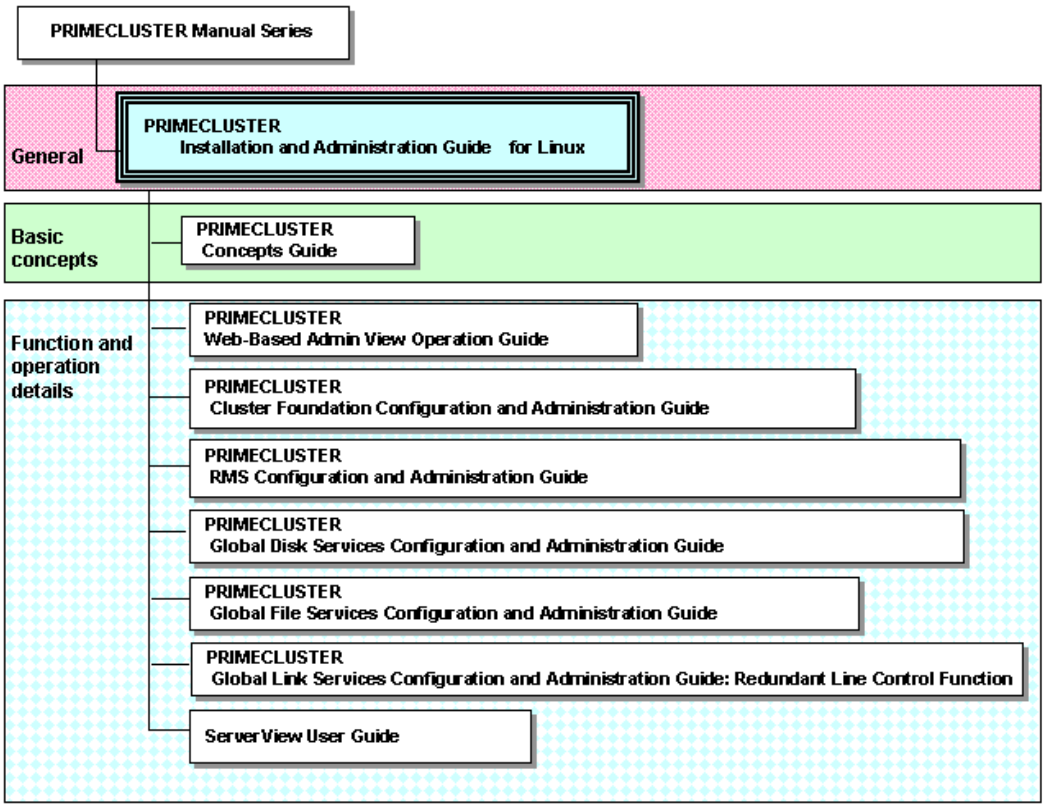
The PRIMECLUSTER documentations include the following documentation in addition to those listed above:

— *PRIMECLUSTER Installation Guide*

This installation guide (text data) is provided with each PRIMECLUSTER product package.

The data is stored on “CD3” of each package. For details on the file names, see the documentation provided with each product.

◆ Manual Series



◆ Manual Printing

If you want to print a manual, use the PDF file found on the CD-ROM for the PRIMECLUSTER product. The correspondences between the PDF file names and manuals are described in the PRIMECLUSTER Installation Guide that comes with the product.

You will need Adobe Acrobat Reader to read and print the PDF file. Use Adobe Acrobat Reader Version 4.0 or higher.

◆ Online Manuals

To allow users to view the online manuals, use the Cluster management server to register each user name to one of the user groups (wvroot, clroot, cladmin, or clmon).
For information on user group registration procedures and user group definitions, see 4.1.1 "Assigning Users to Manage the Cluster."

◆ Conventions

Notation

Prompts

Command line examples that require system administrator (or root) rights to execute are preceded by the system administrator prompt, the hash sign (#). Entries that do not require system administrator rights are preceded by a dollar sign ($).

Manual page section numbers

References to the Linux(R) operating system commands are followed by their manual page section numbers in parentheses – for example, cp(1)

The keyboard

Keystrokes that represent nonprintable characters are displayed as key icons such as [Enter] or [F1]. For example, [Enter] means press the key labeled Enter; [Ctrl-b] means hold down the key labeled Ctrl or Control and then press the [B] key.

Typefaces

The following typefaces highlight specific elements in this manual.

Typeface	Usage
Constant Width	Computer output and program listings; commands, file names, manual page names and other literal programming elements in the main body of text.
Italic	Variables that you must replace with an actual value.
Bold	Items in a command line that you must type exactly as shown.

Example 1

Several entries from an /etc/passwd file are shown below:

```
root:x:0:0:root:/root:/bin/bash
daemon:x:2:2:daemon:/sbin/:/sbin/nologin
```

Example 2

To use the cat(1) command to display the contents of a file, enter the following command line:

$ **cat** *file*

Notation symbols

Material of particular interest is preceded by the following symbols in this manual:

● Contains important information about the subject at hand.

● Describes an item to be noted.

● Describes operation using an example.

● Describes reference information.

- Provides the names of manuals to be referenced.

- Summarizes the contents described in the parts and chapters.

Abbreviations

- Microsoft(R) Windows(R) 98 operating system and Microsoft(R) Windows(R) 98 Second Edition operating system are abbreviated as Windows(R) 98.
- Microsoft(R) Windows NT(R) Server operating system Version 4.0, and Microsoft(R) Windows NT(R) Server Workstation System Version 4.0 are abbreviated as Windows NT(R).
- Microsoft(R) Windows(R) 2000 operating system is abbreviated as Windows(R) 2000.
- Microsoft(R) Windows(R) Millennium Edition is abbreviated as Windows(R) Me.
- Microsoft(R) Windows(R) XP operating system is abbreviated as Windows(R) XP.
- Windows(R) 98, Windows NT(R), Windows(R) 2000, Windows(R) Me, and Windows(R) XP are generically referred to as Microsoft(R) Windows.

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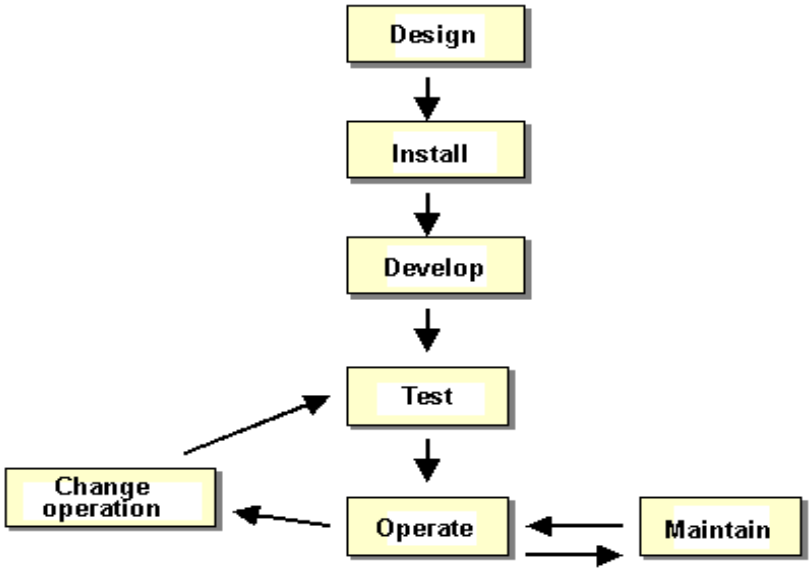
Part 1 Planning

Part 1 describes the workflow from PRIMECLUSTER design to installation and operation management. Users who are installing a PRIMECLUSTER system for the first time need to read this part.

Chapter 1 Build Flow

This chapter describes the workflow for building a PRIMECLUSTER system. To build a PRIMECLUSTER system, follow the procedure described below.

Flow of building a PRIMECLUSTER system



1.1 Planning

Before building a PRIMECLUSTER system, you must first design the system.

■ Designing a PRIMECLUSTER system

1. **Select the PRIMECLUSTER products.**
   Select the PRIMECLUSTER products required for the system you want to build.
   For details, see 2.1 "PRIMECLUSTER Product Selection."
2. **Design the system.**
   Determine the operation environment for building the PRIMECLUSTER system. This includes selecting the applications to be used and determining the required hardware resources, such as the number of hosts, networks, and disk size. Up to two nodes are supported.
   For details, see 2.2 "System Design."
3. **Determine the cluster system operation mode.**
   Determine the number of nodes and the operation mode of the cluster system.
   For details, see 2.3 "Determining the Cluster System Operation Mode."
4. **Determine the operation mode for using Web-Based Admin View.**
   Determine the operation mode for running Web-Based Admin View.
   For details, see 2.4 "Determining the Web-Based Admin View Operation Mode."
5. **Determine the cluster applications.**
   Determine the number of cluster applications. Also determine which nodes are to be used for each application.
6. **Determine the resources required for each cluster application.**
   Determine the resources required for each cluster application.
   - Determine the switchover network type (IP address takeover) and the takeover address.
     Note that when IP address takeover is to be used, PRIMECLUSTER GLS must be installed.
   - Determine whether a user-defined RMS configuration script is to be used. Determine whether there are other items (for example, line switching units) to be used as resources.
   - Determine the cluster interconnect paths and quantity. Two cluster interconnects are recommended.
   - For a disk device, determine which nodes will be sharing the device, whether the device is to be used as a RAW device (database system), whether the device is to be used as a file system (general files), and whether the device is to be grouped.
7. **Determine the failover range of the cluster application.**
   Determine the trigger for cluster application failover.
   For details, see 2.5 "Setting the Failover Range of a Cluster Application."

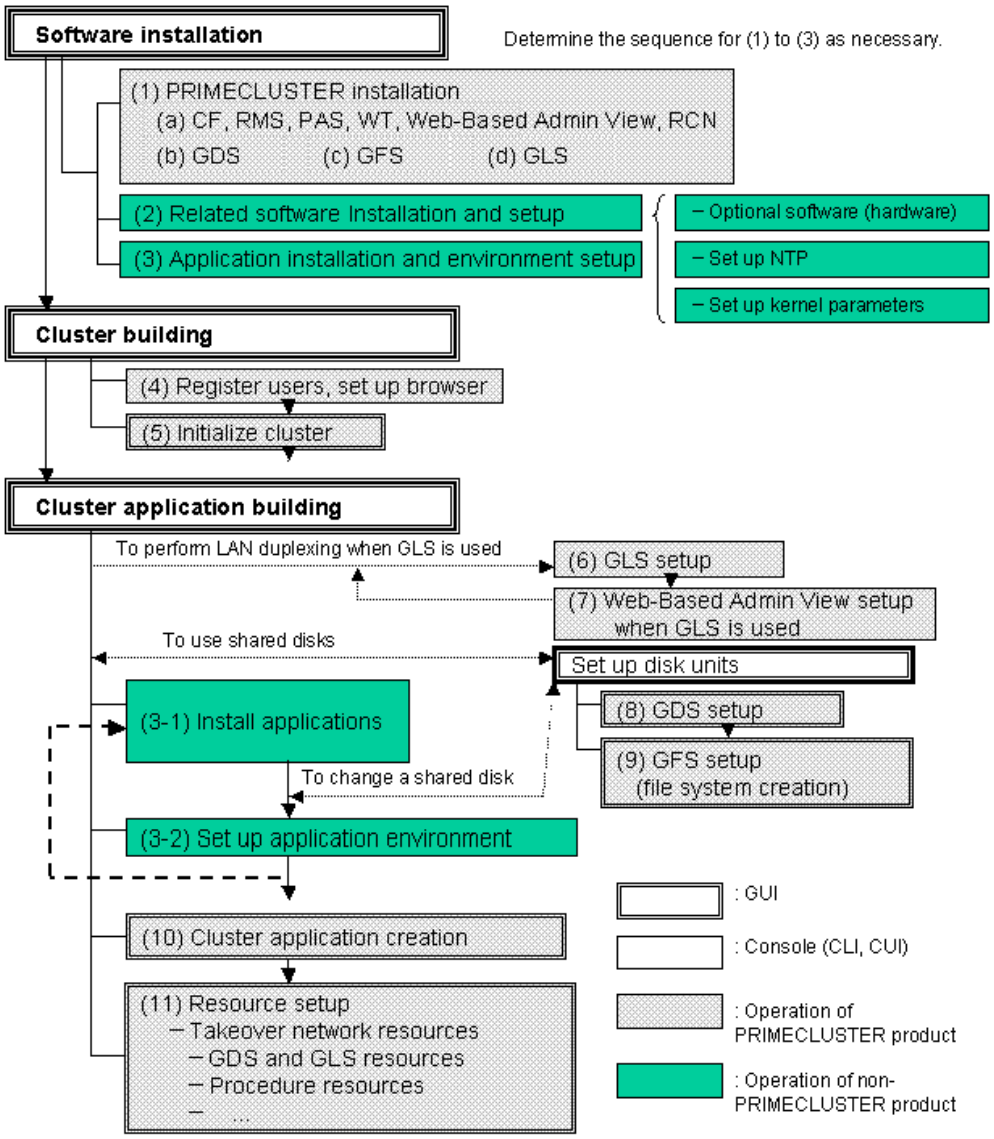
See

For details on designing the system, see Chapter 2 "Site Preparation."

1.2 Installation

After completing the design of the PRIMECLUSTER system and determining the configuration of the PRIMECLUSTER system to be built, install the PRIMECLUSTER system.
Since the work will be performed based on the PRIMECLUSTER system design worksheet that was created, check that all items on the design worksheet have been entered.
Install the PRIMECLUSTER system by performing the following procedure in sequence from (1).
Perform the operations described in the dotted line sections if the system design matches the described conditions.
If you are installing applications after you install the PRIMECLUSTER system, go back to the operations from the Application environment setup to the Application installation.
The screens to be used differ according to the operation. The work procedures to be performed with GUI from Web-Based Admin View and the work procedures to be performed with CLI and CUI from console screens are shown in separate boxes.

Flow of PRIMECLUSTER system installation



The abbreviations in the flowchart for PRIMECLUSTER system installation are explained below.

CF: Cluster Foundation
RMS: Reliant Monitor Services
WT: Wizard Tools
GDS: Global Disk Services
GFS: Global File Services
GLS: Global Link Services

For detailed information on each item, refer as necessary to the corresponding manual reference section mentioned in the table below.

Installation procedure and manual reference sections

Work items	Manual reference section	Required/ optional
System design	Chapter 2 "Site Preparation"	Required
Software installation		
(1) PRIMECLUSTER installation	3.1 "PRIMECLUSTER Installation"	Required
(2) Related software Installation and setup	3.2 "Installation and Setup of Related Software"	Optional
(3) Application installation and environment setup	1.1 "Installation and Environment Setup of Applications"	Optional
Cluster building		
(4) User registration/browser setup	5.1 "Preparations"	Required
(5) Initial cluster setup	5.2 "Initial Cluster Setup"	Required
Cluster application building		
(6) GLS setup	6.2 "Initial GLS Setup"	Optional Note that it is required when IP address takeover and redundant line control are used.
(7) Web-Based Admin View setup when GLS is used		
(8) GDS setup	6.3 "Initial GDS Setup"	Optional (required to use GDS)
(9) GFS setup (file system creation)	6.4 "Initial GFS Setup"	Optional (required to use GFS)
(10) Cluster application creation	6.7 "Setting Up Cluster Applications"	Required
(11) Resource setup	6.7.3 "Setting Up Resources"	Optional

1.3 Development

To configure a user application to be monitored by PRIMECLUSTER, you need to create an RMS configuration script.

- Online script
  This script executes a process that sets the resources to Online or Standby.
- Offline script
  This script executes a process that sets the resources to Offline.

See

For details on the online/offline script settings, see 6.6 "Setting Up Online/Offline Scripts."

1.4 Test

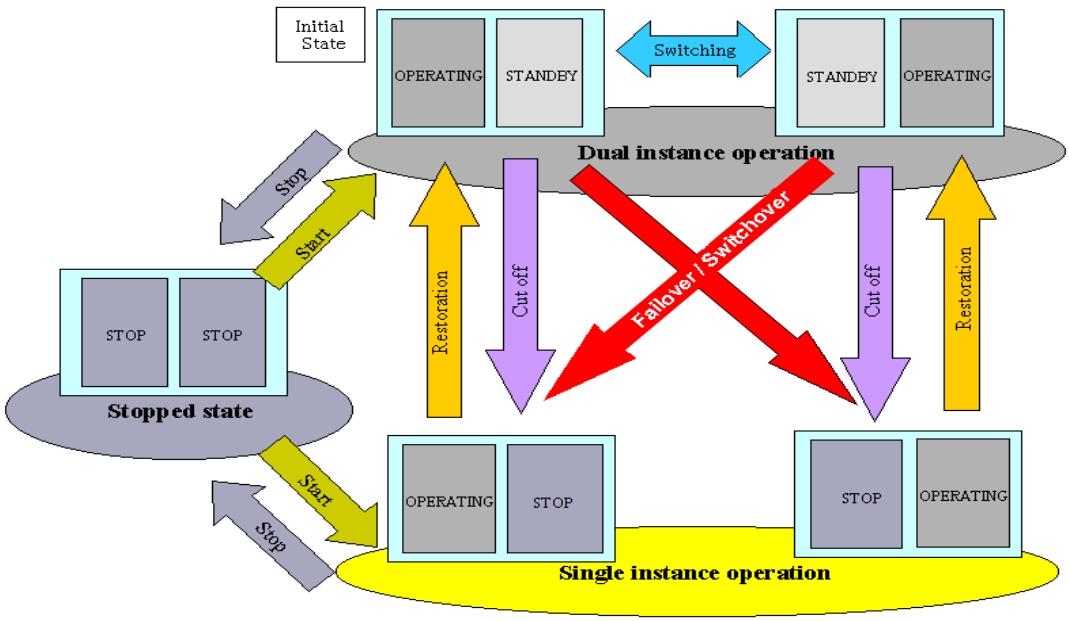
■ Purpose

When you build a cluster system using PRIMECLUSTER, you need to confirm before starting production operations that the entire system will operate normally and cluster applications will continue to run in the event of failures.

For 1:1 standby operation, the PRIMECLUSTER system takes an operation mode like the one shown in the figure below.

The PRIMECLUSTER system switches to different operation modes according to the state transitions shown in the figure below. To check that the system operates normally, you must test all operation modes and each state transition that switches to an operation mode.

State transitions of the PRIMECLUSTER system



◆ PRIMECLUSTER System State

	Description
Dual instance operation	A cluster application is running, and it can switch to the other instance in the event of a failure (failover). Two types of the dual instance operation are OPERATING and STANDBY. Even if an error occurs while the system is operating, the standby system takes over ongoing operations as an operating system. This operation ensures the availability of the cluster application even after failover.
Single instance operation	A cluster application is running, but failover is disabled. Two types of the single instance operation are OPERATING and STOP. Since the standby system is not supported in this operation, a cluster application cannot switch to other instance in the event of a failure. So, ongoing operations are disrupted.
Stopped state	A cluster application is stopped.

The above-mentioned "OPERATING", "STANDBY", and "STOP" are defined by the state of RMS and cluster application as follows;

	RMS state	Cluster application state	Remark
OPERATING	Operating	Online	
STANDBY	Operating	Offline or Standby	
STOP	Stopped	Unknown *	SysNode is Offline

* RMS determines the cluster application state. When RMS is stopped, the cluster application state is unknown.

■ Main tests for PRIMECLUSTER system operation

◆ Startup test

Conduct a startup test and confirm the following:

- View the Cluster Admin screen of Web-Based Admin View, and check that the cluster system starts as designed when the startup operation is executed.
- If an RMS configuration script was created, check that the commands written in the script are executed properly as follows.
  - For a command that outputs a message when it is executed, check that a message indicating that the command was executed properly is displayed on the console.
  - Check that the command has been executed properly by executing the “ps(1)” command.
- A new cluster application is not started automatically during the PRIMECLUSTER system startup. To start the cluster application automatically, you must set "AutoStartUp" for that cluster application. The AutoStartUp setting must be specified as a userApplication attribute when the application is created. For details, see 6.7.2 "Setting Up userApplication."

◆ Clear fault

If a failure occurs in a cluster application, the state of that application changes to Faulted.
To build and run this application in a cluster system again, you need to execute "Clear Fault" and clear the Fault state.
Conduct a clear-fault test and confirm the following:

- View the Cluster Admin screen of Web-Based Admin View, and check that the cluster system starts as designed when the startup operation is executed.
- If an RMS configuration script was created, check that the commands written in the script are executed properly as follows.
  - For a command that outputs a message when it is executed, check that a message indicating that the command was executed properly is displayed on the console.
  - Check that the command has been executed properly by executing the “ps(1)” command.

◆ Switchover

Conduct a failover or switchover test and confirm the following:

- Check that failover is triggered by the following event:
  - When an application failure occurs
- Check that switchover is triggered by the following events:
  - When the OPERATING node is shut down
  - When an application is terminated by the exit operation
  - When an OPERATING cluster application is stopped
- Check that failover or switchover is normally done for the followings:
  - Disk switchover
    Check that the disk can be accessed from the OPERATING node.

For a switchover disk, you need to check whether a file system is mounted on the disk by executing the “df(1M)” command.

- If the Cmdline resources are to be used, check that the commands written in the Start and Stop scripts for the Cmdline resources are executed properly.
  - For a command that outputs a message when it is executed, check that a message indicating that the command was executed properly is displayed on the console.
  - Check that the command has been executed properly by executing the “ps(1)” command.

- If IP address takeover is set, check that the process takes place normally by executing the “ifconfig(1M)” command.
- Check that an application is switched to other node.

You need to know the operation downtime in the event of a failure, so measure the switching time for each failure detection cause and check the recovery time.

- **Replacement test**

Conduct a replacement and confirm the followings:

- Check that the OPERATING and STANDBY instances of the OPERATING business application occurs normally when the cluster application replacement is executed. Check the followings:
  - If disk switchover is to be used, check that the disk can be accessed from the OPERATING node but not from the STANDBY node.
    For a switchover disk, you need to check whether a file system is mounted on the disk by executing the “df(1M)” command.
  - If Cmdline resources are to be used, check that the commands written in the Start and Stop scripts for the Cmdline resources are executed properly.
    - For a command that outputs a message when it is executed, check that a message indicating that the command was executed properly is displayed on the console.
    - Check that the command has been executed properly by executing the “ps(1)” command.
  - If IP address takeover is to be used, check that IP address takeover takes place normally.
    Check that an application is switched to other node.

- **Stop**

Conduct a stop test and confirm the followings:

- Check that an OPERATING work process can be stopped normally by the stop operation.
- Check that work processes can be started by restarting all nodes simultaneously.
- If Cmdline resources are to be used, check that the commands written in the Start and Stop scripts for the Cmdline resources are executed properly.
  - For a command that outputs a message when it is executed, check that a message indicating that the command was executed properly is displayed on the console.
  - Check that the command has been executed properly by executing the “ps(1)” command.

- **Work process continuity**

Conduct work process continuity and confirm the followings:

- Generating some state transitions in a cluster system, check that the application operates normally without triggering inconsistencies in the application data in the event of a failure.
- For systems in which work processes are built as server/client systems, check that while a state transition is generated in the cluster system, work process services can continue to

be used by clients, according to the specifications.

See

- For information on the operation procedures for start, clear fault, failover, switchover, and stop, see 7.2 "Operating the PRIMECLUSTER System."

1.5 Operation and Maintenance

After confirming that work processes can be continued no matter what state the cluster system lapses into, you can begin actual operations.

The cluster system can continue work processes even if a failure occurs. However, work processes cannot be continued if another failure occurs during single node operation before the first failure is corrected. To enhance reliability, you need to eliminate the cause of the failure immediately and recover the dual node operation.

For details for collecting information required for an investigation, see Appendix C "Troubleshooting."

1.6 Operation Mode Change

Change the operation of the PRIMECLUSTER system when it becomes necessary to change the system configuration while the PRIMECLUSTER system is operating. The system configuration must be changed, for example, when a cluster application is added.

For details on changing the operation mode, see Chapter 8 "Changing the Operation Configuration."

Chapter 2 Site Preparation

You must plan the items listed below before building the PRIMECLUSTER system.

Planning items

- PRIMECLUSTER product selection
- System design
- Cluster system operation mode
- Operation mode for using Web-Based Admin View
- Cluster applications and resources to be used by the cluster applications

An overview of each PRIMECLUSTER product is described in the *"PRIMECLUSTER Concepts Guide."* Be sure to read the guide before designing the PRIMECLUSTER system.

2.1 PRIMECLUSTER Product Selection

The sequence for selecting PRIMECLUSTER products is as follows:

1. Select the products to be used.
   For details, see 2.1.1 "PRIMECLUSTER Product Selection."
2. Select the functions to be used.
   For details, see 2.1.2 "PRIMECLUSTER Function Selection."

2.1.1 PRIMECLUSTER Product Selection

The product sets described below have been prepared for PRIMECLUSTER. Select the necessary products according to how the system will be used.

- **PRIMECLUSTER HA Server (HA)**
  Switchover-type cluster system that features HA (switchover) cluster functions, volume management functions, system functions, and network multiplexing functions.
- **PRIMECLUSTER Clustering Base (CB)**
  Cluster foundation software that realizes a switchover-type cluster system.

The following table shows the components (modules) that are included in each product.

Components		Products	
Names	**Features**	**HA**	**CB**
pdksh	Ksh package	Y	Y
PCLsnap	Troubleshooting information collection tool	Y	Y
Web-Based Admin View	GUI common framework and cluster administration GUI	Y	Y
Cluster Foundation (CF)	Base cluster foundation	Y	Y
Reliant Monitor Services (RMS)	The application is switched to other node.	Y	Y
Wizard Tools	Configuration definition tools for RMS	Y	Y
RAO	RMS-Add on	Y	Y
RSB	RSB control package	Y	Y
SA_LKCD	LKCD shutdown agent	Y	Y
Global Link Services (GLS)	Provides highly reliable transmission routes by setting up redundant network	Y	-
Global File Services (GFS)	Cluster file system functions	Y	-
Global Disk Services (GDS)	Cluster volume management functions	Y	-

2.1.2 PRIMECLUSTER Function Selection

Check that the functions to be used for the selected product are included, using the following manuals:

- PRIMECLUSTER basic functions
  For information on the basic functions, see "3.3 PRIMECLUSTER modules" in the *"PRIMECLUSTER Concepts Guide."*

2.2 System Design

Use the "PRIMECLUSTER System Design Worksheet" to design the system.

The installation of the PRIMECLUSTER system is based on the completed Appendix A "PRIMECLUSTER System Design Worksheets."

For details on the operation environment, see "3. Operating Environment" in the *"PRIMECLUSTER Installation Guide."*

When designing the system it may be helpful to see A.11 "System Design Examples."

2.3 Determining the Cluster System Operation Mode

PRIMECLUSTER supports 1:1 standby operation. Install an application on each node.

Classification	Operation mode	Number of cluster applications	Number of nodes
Standby operation	1:1 standby	1	2

Note

If an operating node is powered off, a failover might not occur. Take corrective action as follows.

* Connect UPS
* Connect the node and RSB to different power sources to prevent simultaneous power-off.

2.3.1 Standby Operation

■ 1:1 standby

◆ Definition

- It is an operation mode in which a cluster system consists of 2 nodes. One is operating, and the other is standby. When a failure occurs in the operating node, a cluster application switches to the standby node. This does not disrupt ongoing operation.

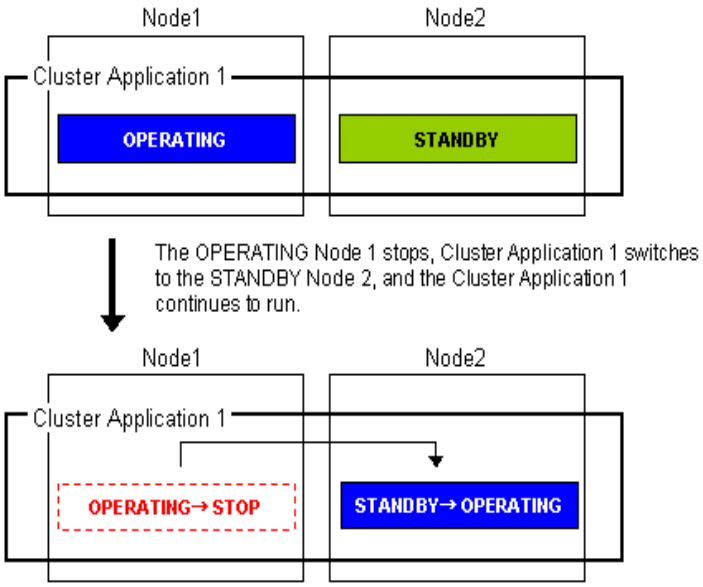
Advantage

- This operation mode ensures the availability of the cluster application even after failover.

Disadvantage

- Nodes cannot be used efficiently because of a redundant configuration.

◆ Failover image



2.4 Determining the Web-Based Admin View Operation Mode

Determine the operation mode of Web-Based Admin View according to your PRIMECLUSTER configuration.
This section describes operation modes and typical models of PRIMECLUSTER systems that run Web-Based Admin View, and provides a guideline for adopting models.

- For information on the operation modes of Web-Based Admin View, see "1.2 Web-Based Admin View topology" in the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

■ Roles of individual nodes

Web-Based Admin View adopts a logical 3-tier architecture, which consists of clients, a cluster management server, and cluster nodes.

◆ Clients

A client is a computer with which a user manages operations. Basically, the computer is a personal computer that uses a Web browser or Linux(R) Workstation (with Intel CPU).

◆ Management server

The cluster management server manages cluster operation and features web server functions. The server can be as a cluster node. The cluster management server can be duplexed. In this case the system will have a two-server configuration, consisting of a primary management server and a secondary management server.
Set up both primary and secondary management servers for redundancy.
You can dynamically move the secondary management server depending on the operation mode.
The cluster management servers run Linux (R).

◆ Cluster nodes

Cluster nodes construct the PRIMECLUSTER system.

■ Logical 3-tier architecture and operation models

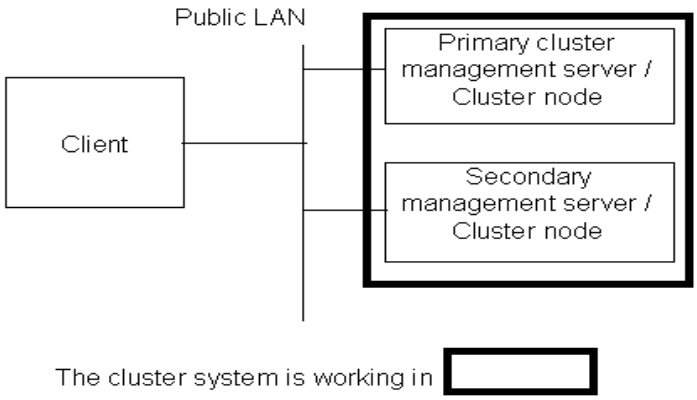
Web-Based Admin View adopts a logical 3-tier architecture consisting of clients, management servers, and monitored nodes. Physically, the system can adopt a 2-tier architecture.
Typical operation modes that run Web-Based Admin View are introduced below.

◆ 2-tier model

In the 2-tier model, the cluster management server and the cluster node are used together on the same machine, and the client is on a machine other than the nodes and the management servers.
This model supports configurations where the number of nodes is relatively small and which does not require a specific cluster management server.
This model supports 2 types of topology, which are described below.

● Topology where a network is shared

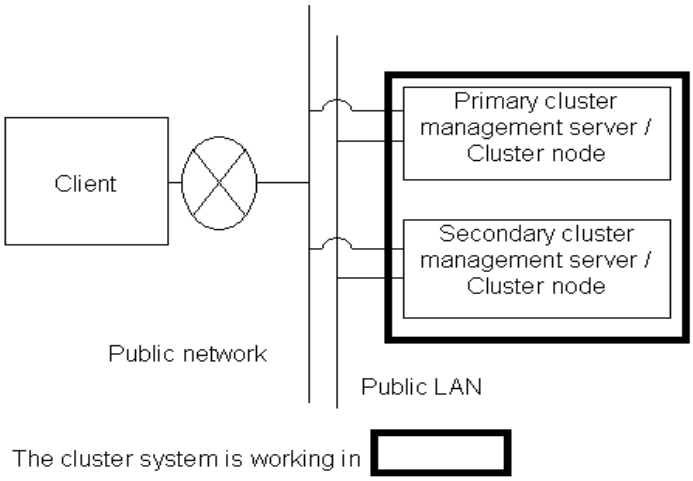
In this topology, the public LAN and the LAN that is connected to the management client are used together. You can adopt this topology if the network users and network range are limited for security. This is the default Web-Based Admin View configuration after PRIMECLUSTER installation.



- **Topology where separate LANs are used**

  In this topology, the public LAN and the LAN that is connected to the management client are separate. When using a management client from a public network, this topology is recommended for security. After the PRIMECLUSTER installation is done, you will need to modify the Web-Based Admin View configuration.

  Specify IP addresses used for a cluster node and a client respectively. For details, see 5.2.1 "Setting Up CF and CIP."



◆ 3-tier model

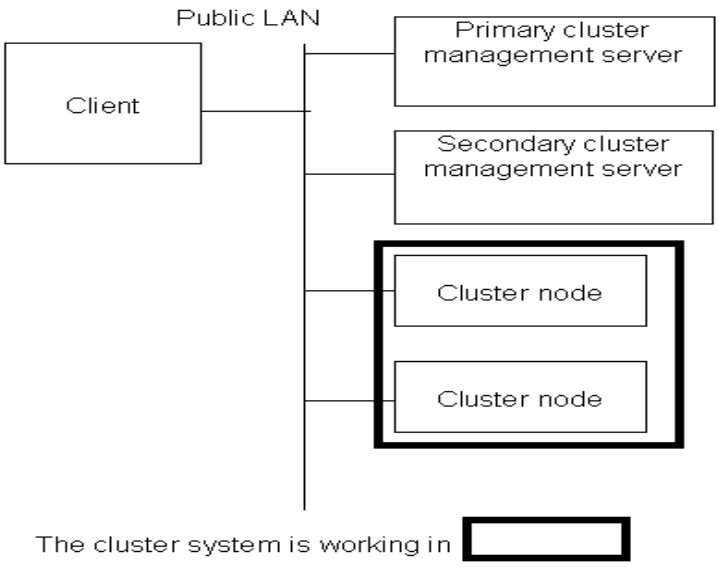
In the 3-tier model, clients, cluster management servers, and cluster nodes are set up separately. This model is adopted for configurations where the number of nodes is relatively large.

Normally, this model is used for integrated management of the PRIMECLUSTER system. You can also use this mode when you do not want to impose the load of running the management server on the cluster node or when you want to perform the integrated management of the PRIMECLUSTER system.

This model supports 2 types of topology, which are described below.

- **Topology where a network is shared**

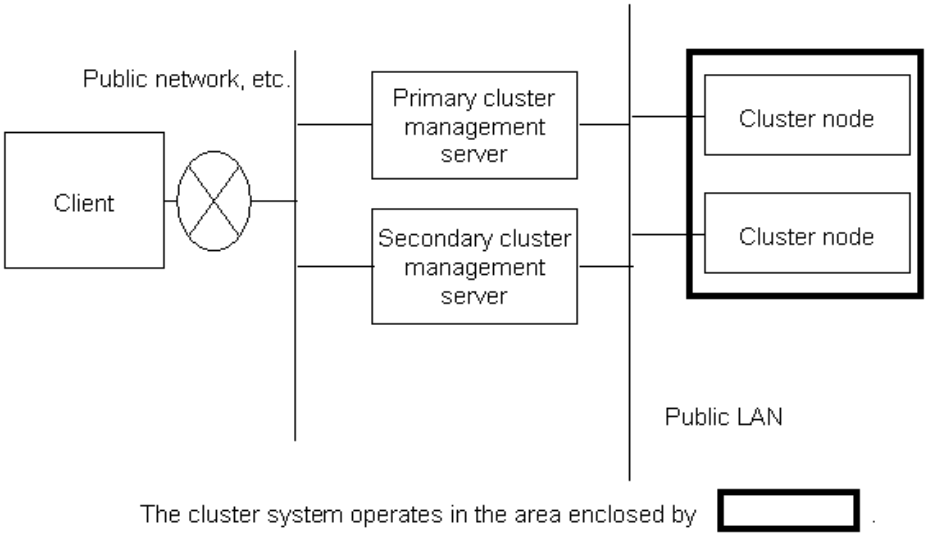
  In this topology, the public LAN and the LAN that is connected to the management client are the same. You can adopt this topology if the network users and network range are limited for security. This is the default Web-Based Admin View configuration after PRIMECLUSTER installation.



- **Topology where separate LANs are used**

  In this topology, the public LAN and the LAN that is connected to the management client are separate. When using a management client from a public network, this topology is recommended for security. After PRIMECLUSTER installation is done, you will need to modify the Web-Based Admin View configuration.

  Specify IP addresses used for a cluster node and a client respectively. For details, see 5.2.1 "Setting Up CF and CIP."



2.5 Determining the Failover Range of a Cluster Application

Determine the trigger for cluster application failover. You can choose from the followings:

1. The cluster application does not automatically switch to other host.
2. The cluster application switches to other host in the event of a node failure or a resource failure.
3. The cluster application switches to other host in the event of a node failure, a resource failure, or RMS shutdown.

Part 2 Installation

This part describes procedures for installing the PRIMECLUSTER system and running Web-Based Admin View.
The work operations include the procedures up to installing a new PRIMECLUSTER system.
For procedures on changing the PRIMECLUSTER system configuration after the system is installed, see Chapter 8 "Changing the Operation Configuration."

Chapter 3 Software Installation

Install software products related to PRIMECLUSTER on each node.

For the security, set “No Firewall” when a Red Hat Advance Server is installed or when the setup command is executed. If Firewall has already been set for the security, change the setting to “No Firewall.” If the “Firewall” setting is left as is, the clsetup (setting of the resource database) command will operate abnormally.

This chapter describes the following topics:

- PRIMECLUSTER installation (overview)
- Installation and configuration of related software
- Application installation and environment configuration

3.1 PRIMECLUSTER Installation

You can install PRIMECLUSTER using an installation script.

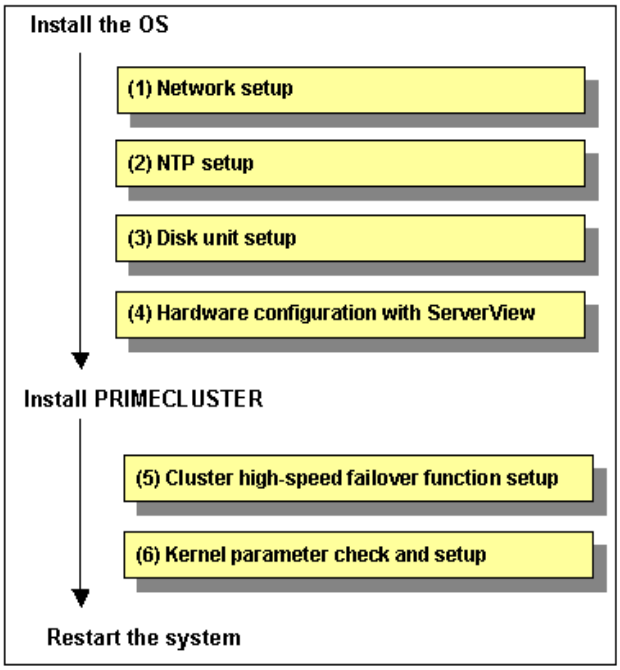
- Installation script

  The installation script is also called the CLI Installer. It is used to install PRIMECLUSTER on a system in which Linux(R) software and related Fujitsu software have been installed. This method is also used for installation on the cluster management server.

For details on the installation procedures, see the *"PRIMECLUSTER Installation Guide."*

3.2 Installation and Setup of Related Software

After installation of the software products related to PRIMECLUSTER is done, you need to set up the OS and hardware for installing and operating PRIMECLUSTER.
Set up the followings if necessary.



- Network setup
  If a network adapter for a public LAN has been installed, you need to configure the IP addresses after installing the OS.
  Perform this setup after installing the operating system.
  For details, see3.2.1 "Setting Up the Network."
- NTP setup
  This setup synchronizes the time in all of the nodes of the cluster system. This NTP setup needs to be done before installing PRIMECLUSTER.
- Disk unit setup
  When using a shared disk unit, you need to install and set up the software product. This disk unit setup should be done after installing the OS.
  For details, see 3.2.2 “Setting Up Disk Units.”
- Hardware configuration with ServerView
  You need to configure software that monitors hardware after installing the OS.
  For details, see 3.2.3 "Setting Up Hardware Monitoring with ServerView."
- Cluster high-speed failover function setup
  You need to configure software and hardware that enables cluster high-speed failover after installing the OS and PRIMECLUSTER.
  For details, see 3.2.4 "Setting Up the Cluster High-Speed Failover Function."
- Kernel parameter check and setup
  When operating the software products related to PRIMECLUSTER, you need to adjust kernel parameters according to the hardware configuration and applications. This kernel parameter setup should be done before operating PRIMECLUSTER.
  For details, see 3.2.5 ”Checking the Kernel Parameters.”

3.2.1 Setting Up the Network

If a network adapter for a public LAN has been installed, the IP address setup is required.

For information on changing the public LAN that the PRIMECLUSTER system uses, see 8.2 "Changing an IP Address on the Public LAN."

Web-Based Admin View automatically sets up an interface that was assigned the IP address of the host name corresponding to the node on which PRIMECLUSTER was installed. This interface will be used as a transmission path between cluster nodes and cluster management server, and between cluster management servers and clients.

3.2.2 Setting Up Disk Units

■ Installation and Setup of Related Software

Install and set up the software products(GRMPD) required for using shared disk units. For details on the installation and setup procedure, see the "*Installation Guide for GR Multipath Driver*."

3.2.3 Setting Up Hardware Monitoring with ServerView

■ Overview

ServerView supports monitoring of the fan, temperature sensor, and power supply in addition to watchdog monitoring of the OS. In the ServerView, you can set up the behavior of each monitored target in the event of a failure. For example, if “Shut down the server immediately” is selected and an error is detected, the failed node will be shut down. The ongoing operations on the failed node are then quickly moved to the standby node.

■ Behavior setup of recovery function

When setting the behavior of the monitored targets in the event of a failure, you need to consider the operating environment in which a failover is generated. The recommended behaviors are as follows:

Monitored item			Recommended behavior
Fan			
	Fan check time		00:00 AM/PM *
	When a fan failure occurs.		Continues ongoing operations.
Temperature sensor			
	When abnormally raised temperature is detected.		Shuts down the node immediately.
Restart settings			
	Wait time until power-on (minutes)		2 **
	Restart retry count		3 **
	When the restart retry count is exceeded.		Abandons attempts to restart and power off the node.
	Watchdog timer monitoring		Not supported
	Monitoring time	Wait time until monitoring timeout (minutes)	3 **
		Behavior	Continues ongoing operations. **
	Startup monitoring		Not supported
	Monitoring time	Wait time until monitoring timeout (minutes)	6 **
		Behavior	Restart. **

* The default value is 00:00 midnight. You need to change the value according to the operating environment.

** The default value is recommended. Note that the default value might vary depending on the machine model.

Since the hardware products that are not listed above only supports monitoring, the behavior setup for the recovery function is not available.

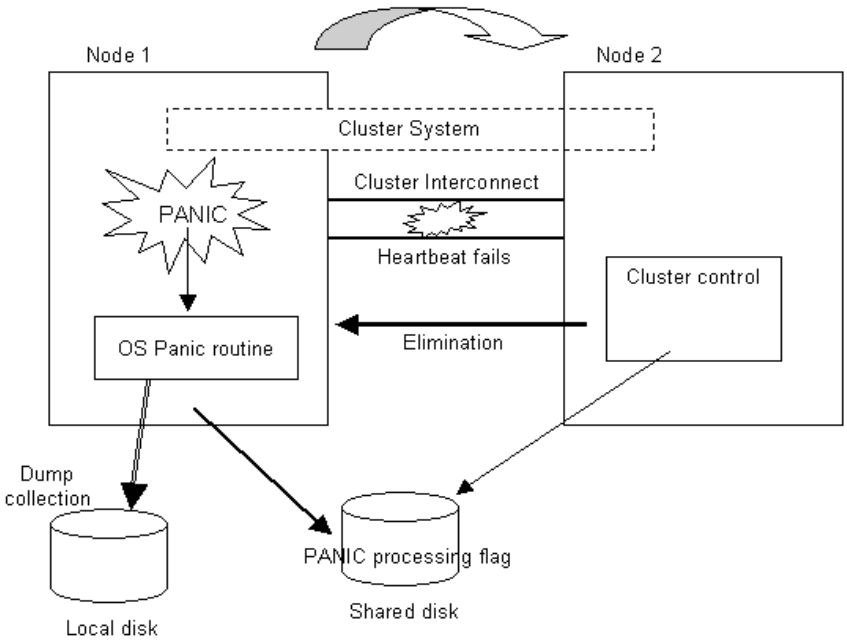
For information about behavior setup, see the "*ServerView User Guide*."

3.2.4 Setting Up the Cluster High-Speed Failover Function

■ Overview

If heartbeat monitoring fails because of a node failure, PRIMECLUSTER shutdown facility removes the failed node. If this occurs during crash dump collection, you might not be able to acquire information for troubleshooting.

The cluster high-speed failover function prevents node elimination during crash dump collection, and at the same time, enables the ongoing operations on the failed node to be quickly moved to the another node.



If a failure occurs in one node, the cluster high-speed failover function notifies other nodes of the failure by using a dedicated shared disk area. The node that detected a heartbeat error assumes that the failed node enters the Offline mode.

Note

When the crash dump collection of the failed node is done, the operations such as reboot, power-off, and stop are initiated according to the LKCD settings.
For details, see the "*LKCD Installation Guide*."

■ Setting up the cluster high-speed failover function

Set up LKCD shutdown agent and RSB shutdown agent. The PRIMECLUSTER Shutdown Facility consists of these two agents.

◆ Prerequisites for LKCD shutdown agent

- Enable acquisition of Linux kernel crash dump.
  For details, see the "*LKCD Installation Guide*."
- Reserve sufficient area (1LU) for failure notification when you configure the shared disk.
  The required capacity of the LU is as follows:
  Required capacity (bytes) = 4096 + 512 x (number of cluster nodes)
- Install the GR multipath driver.
  For details, see the "*Installation Guide GR Multipath Driver*."

◆ Prerequisites for RSB shutdown agent

- The following user settings are required for the remote service board:
  - User ID
  - Password
  - IP address

  For details, see the operation manual provided with the remote service board and the "*ServerView User Guide*."

3.2.5 Checking the Kernel Parameter

You need to edit the values for the kernel parameters according to the environment.

Target node:

All nodes in which PRIMECLUSTER is to be installed

The kernel parameters differ according to the products and components to be used.

Check the Kernel Parameter Worksheet, and edit the value if necessary.

For information on the kernel parameters, see the A.6 "Kernel Parameter Worksheet."

To enable modifications, you need to restart the system after installation.

3.3 Installation and Environment Setup of Applications

Install software products to be operated on the PRIMECLUSTER system and configure the environment as necessary.
To bring about application switchover in the event of a failure, you need to register the resources of software application to RMS. RMS will monitor these resources. For details, see Chapter 6 "Building Cluster Applications."

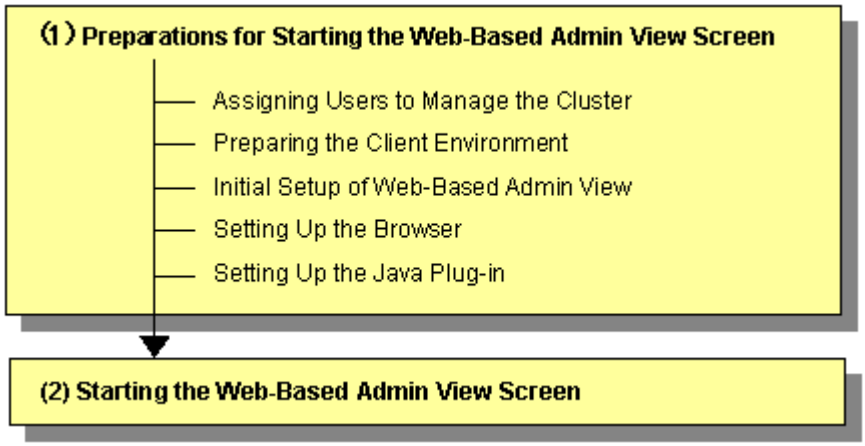
See

- For information on products supported by the PRIMECLUSTER system, see Table 9-1 "PRIMECLUSTER Product List."
- For details on installing applications, see the manuals and installation guides for the individual applications.

Chapter 4 Starting the Web-Based Admin View Screen

This chapter explains how to start and exit the Web-Based Admin View screen.
It also describes the windows that are displayed from the Web-Based Admin View screen.

The procedure for starting the Web-Based Admin View screen is shown below.



Operation procedure and manual reference location for starting the Web-Based Admin View screen

	Work item	Execution Node	Required/ Optional	Manual reference location*
(1)	4.1.1 Assigning Users to Manage the Cluster	Cluster node	Required	
	4.1.2 Preparing the Client Environment	Client	Required	**WEB** "3.1.2 Prerequisite client environment"
	4.1.3 Initial Setup of Web-Based Admin View	Cluster node	Required	
	4.1.4 Setting Up the Browser	Client	Required	**WEB** "3.1.3.1 Preparing the Web browser"
	4.1.5 Setting Up the Java Plug-in	Client	Required	**WEB** "3.1.3.2 Required for the Web Browser Environment"
(2)	4.2 Starting the Web-Based Admin View Screen	Client	Required	**WEB** "3.2 Screen startup"

***** The PRIMECLUSTER manual name is abbreviated as follows:

- **WEB:** PRIMECLUSTER Web-Based Admin View Operation Guide

4.1 Preparations for Starting the Web-Based Admin View Screen

Take the following steps for starting the GUI screen of Web-Based Admin View:

1. Environment setup
   You can set up the following in no special order:
   - 4.1.1 Assigning Users to Manage the Cluster
   - 4.1.2 Preparing the Client Environment
   - 4.1.3 Initial setup of Web-Based Admin View
2. Web environment preparation
   You need to set up the browser first.
   - 4.1.4 Setting Up the Browser
   - 4.1.5 Setting Up the Java Plug-in

4.1.1 Assigning Users to Manage the Cluster

Web-Based Admin View restricts access to specific operation management GUIs by using user groups in the management server.
The table below shows the groups used for operation management GUIs of PRIMECLUSTER.

Operation management GUIs of Web-Based Admin View and authorized user groups

GUI name	user group name	Privileges
All GUIs	wvroot	Root authority. This group can execute all operations.
Cluster Admin	clroot	Root authority. This group can specify settings, execute management commands, and display information.
	cladmin	Administrator authority. This group cannot specify settings. It can execute management commands and display information.
	clmon	User authority. This group cannot specify settings and cannot execute management commands. It can only display information.
GDS (Global Disk Services)	sdxroot	Root authority. This group can use the GDS management view.

The groups for the operation management GUIs are defined as shown in the above table.
wvroot is a special user group, and is used for Web-Based Admin View and GUIs. Users belonging to this group are granted the highest access privileges for Web-Based Admin View and all kinds of operation management GUIs.
The system administrator can grant different access privileges to users according to the products that the users need to use.
For example, a user who belongs to the "clroot" group but not to "sdxroot" is granted all access privileges when opening the Cluster Admin screen but no access privileges when opening the Global Disk Services (GDS) GUIs.
You need to create the above Linux(R) groups for both the primary and secondary management servers as necessary, and assign users to these groups. The Web-Based Admin View group membership should maintain consistency among all management servers associated with a specific cluster system. To set a user group, execute the “useradd(1M)” command as follows:

 # useradd -g wvroot *username*

The root user is granted the highest access privilege regardless of which group the root user

belongs to.
For details about user groups, see "3.1.1 User group determination" in the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

4.1.2 Preparing the Client Environment

Prepare hardware, operating systems, and Web browsers of the clients supported by Web-Based Admin View.

See

For details, see “3.1.2 Preparing the Client Environment” in the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

Note

If Windows(R) is used for a client that is supported with Web-Based Admin View, the following color pallet problem may occur:

When the GUI screen of Web-Based Admin View is displayed with Windows(R), the 16-bit or 32-bit color mode must be used. The 24-bit color mode does not properly support an alpha component (transparency) that is required for RMS graphs. If 24-bit color is used, RMS graphs may not be displayed properly.
Whether problems will occur in 24-bit color mode depends on the graphics card and video driver being used.

4.1.3 Initial Setup of Web-Based Admin View

4.1.3.1 Initial setup of the operation management server

When using Web-Based Admin View for the first time, you need to initialize the management server on each node. Take the following steps in the order listed below.

◆ **Operation Procedure:**

1. Set the IP addresses of the primary management server and secondary management server.

```
# /etc/opt/FJSVwvbs/etc/bin/wvSetparam primary-server
<primary-management-server-IP-address>
# /etc/opt/FJSVwvbs/etc/bin/wvSetparam secondary-server
<secondary-management-server-IP-address>
```

Example: Set the "primary cluster management server IP" and "secondary cluster management server IP" of the "operation management mode" found on the cluster building worksheet.

```
# /etc/opt/FJSVwvbs/etc/bin/wvSetparam primary-server 10.20.30.40
# /etc/opt/FJSVwvbs/etc/bin/wvSetparam secondary-server 10.20.30.41
```

2. Start Web-Based Admin View.

```
# /etc/opt/FJSVwvbs/etc/bin/wvCntl start
# /etc/init.d/fjsvwvcnf start
```

See

Web-Based Admin View has some different operation management modes. For further details, see "1.2.2 System topology" and "Chapter 7 Web-Based Admin View setup modification" in the "*PRIMECLUSTER Web-Based Admin View Operation Guide*."

4.1.3.2 Confirming Web-Based Admin View Startup

This section describes the procedure for confirming whether Web-Based Admin View has been started

◆ **Confirmation Procedure**

Check that all node information is output by executing the “wvstat(1M)” command on the connected management server.

[Example]

In a two-node configuration consisting of node1(10.20.30.40) and node2(10.20.30.41), node1 is the primary management server and node2 is the secondary management server.

```
# /etc/opt/FJSVwvbs/etc/bin/wvstat
primaryServer   10.20.30.40 node1  http=10.20.30.40     Run  3m41s
primaryServer   Sessions: 0
primaryServer   Nodes: 2
       10.20.30.40 node1      Linux-2.4.9-e.8enterprise      3m36s
       10.20.30.41 node2      Linux-2.4.9-e.8enterprise      2m58s
secondaryServer 10.20.30.41 node2  http=10.20.30.41     Run  2m46s
secondaryServer Sessions: 0
secondaryServer Nodes: 2
       10.20.30.40 node1      Linux-2.4.9-e.8enterprise      2m41s
       10.20.30.41 node2      Linux-2.4.9-e.8enterprise      2m23s
#
```

If the information is not displayed, Web-Based Admin View has not been started or there may be an error in the Web-Based Admin View settings. Restart Web-Based Admin View and execute the operation again. If node information is still not displayed, refer to the *"PRIMECLUSTER Web-Based Admin View Operation Guide"* and check the parameter settings.

For details on the wvstat(1M) command, see the manual page.

4.1.4 Setting Up the Browser

Set up a Web browser on the clients.

See

See "3.1.3.1 Preparing the Web browser" in the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

4.1.5 Setting Up the Java Plug-in

Install the Java Plug-in on the clients.

For details on the supported Java Plug-in versions, see 4.1.2 "Preparing the Client Environment." For instructions on setting up the Java Plug-in, see "3.1.3.2 Required for the Web Browser Environment" in the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

4.2 Starting the Web-Based Admin View Screen

After completing the all preparations, start the Web-Based Admin View GUI screen.

◆ Operation Procedure:

1. Start the Web browser in the client.
2. Specify the URL in the following format, and access the cluster management server:
   http://<*host-name*>:<*port-number*>/Plugin.cgi

   <*host-name*>

   IP address or host name (**httpip**) that clients use to access the primary or secondary cluster management server.

   The default value of **httpip** is the IP address that is assigned to the node name that is output when "uname -n" is executed.

   <*port-number*>

   Specify "8081."

   If the port number has been changed, specify the up-to-date number.

   For instructions on changing the http port number, see "7.2.1 http port number" in the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

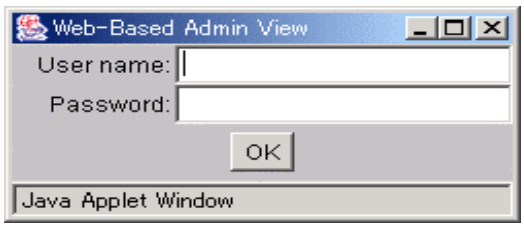
   Note

   — If the Web-Based Admin View screen cannot be started when the host name is specified in <***host-name***>, specify the IP address directly that corresponds to the host name.

   — Note that the access method may be different depending on the operation management product. To use operation management products that have different access methods at the same time, see "3.3.4 Concurrent use of operation management products with different access methods" in the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

   — For information on the IP address or host name (httpip) used by clients, see the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

   — When a URL is to be registered for the bookmark of a browser, register "Plugin.cgi."
3. When the Web-Based Admin View is started, the following window appears.
   Enter a user name and password that have been registered to the cluster management server, and click *OK*.



   Note

   You cannot close this window by clicking “x” at the top right corner.
4. When authentication ends, you can use Web-Based Admin View.

- After starting the Web-Based Admin View screen, do not change the page by pressing the *Forward/Next*, *Back*, or *Reread/Refresh* buttons.
- The screen of some browsers may hang.
  - If the browser is terminated, restart the browser and display Web-Based Admin View.
  - Reread the URL or restart the browser if the browser does not work (no response).
  - The operation can be continued after the Web-Based Admin View is started by moving the mouse on the browser if the page switches to a black screen.
- If the URL of the Java Plug-in is read with Netscape Communicator or Netscape Navigator, a message stating “Click here to get the plugin” may appear. In this case, the Java Plug-in may not be installed or an older Java Plug-in version that is not supported may be installed. See the *"PRIMECLUSTER Web-Based Admin View Operation Guide"* and install the Java Plug-in. Note that if you click the "Click here to get the plugin" icon, a dialog box indicating “Plug-in is not read” appears. Select *Cancel*.
- If “Welcome to Web-Based Admin View” does not appear after you read the URL of the Java Plug-in with Internet Explorer, an appropriate Java Plug-in may not be installed. Confirm that an appropriate Java Plug-in is installed by using “Add/Remove Programs” in the control panel. If the Java Plug-in is not be installed or if an older Java Plug-in version that is not supported is installed, see the *"PRIMECLUSTER Web-Based Admin View Operation Guide"* and install the Java Plug-in. Also, if the “security warning” dialog box appears, and prompts you to specify whether the “Java Plug-in” is to be installed and executed, select *No*.
- If the secondary cluster management server is set to operate dynamically, there is a function that connects automatically to the primary or secondary cluster management server that is operating at that time even if the URL of a specific monitoring node is specified. For details, see "7.4 Secondary management server automatic migration" in the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*
- If repeated errors occur during the authentication of Step 3, the message 0016 may be displayed and you may not be able to log in. For the action to take if this happens, see "Symptom 17" in "Appendix B Troubleshooting" of the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*
- If Netscape 6.X is used, URL input may become disabled. This condition is a Netscape problem and Netscape is currently working to correct the problem.
  If this condition occurs, minimize the Netscape window and then return it to its original size, or restart the Netscape Web browser.
- If some problems occur while you are using Web-Based Admin View, see "Appendix A Message" and "Appendix B Troubleshooting" of the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

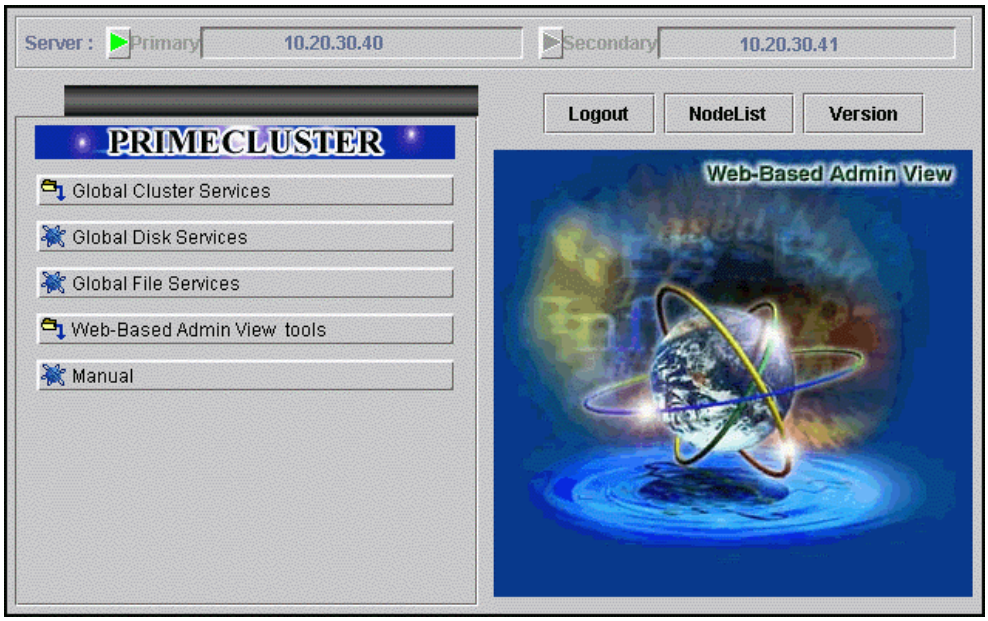
4.3 Web-Based Admin View Screen

When you start Web-Based Admin View, the Web-Based Admin View screen is displayed.
The left area of the Web-Based Admin View screen displays the currently supported functions as **operation menus**.

4.3.1 Operation Menu Functions

Web-Based Admin View screen supports the functions shown below.
See "Menu Outline."

Web-Based Admin View screen



■ Menu Outline

The operation menus are divided into the following two categories:

1. **PRIMECLUSTER category**
   Management screens and manuals of operation management products that are presented by PRIMECLUSTER
2. **MISC category**
   Management screens and manuals of operation management products that are provided by non-PRIMECLUSTER products.

The following operations are enabled for each category:

- **PRIMECLUSTER**
  - **Operation management product name**
    You can operate the screen of the operation management product.
    For details, see the manual provided with each operation management product.
    - Global Cluster Services (CF, RMS, SIS)
    - Global Disk Services (PRIMECLUSTER GDS)
    - Global File Services (PRIMECLUSTER GFS)

SIS is restricted to PRIMECLSUTER 4.0A20.

— **Web-Based Admin View tools**

These tools display the Web-Based Admin View log and allow you to set the operation environment. For details, see "Part 3 Web-Based Admin View tools menu" in the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

— **Manual**

The PRIMECLUSTER online manual is displayed.

● **MISC**

Buttons for starting the management screens of installed operation management products other than the PRIMECLUSTER products are displayed. For example, in an environment in which Symfoware is installed, this menu category will be displayed.
For details, see the manual provided with each operation management product.

— **Operation management product name**

You can operate the management screens of installed operation management products other than the PRIMECLUSTER products.

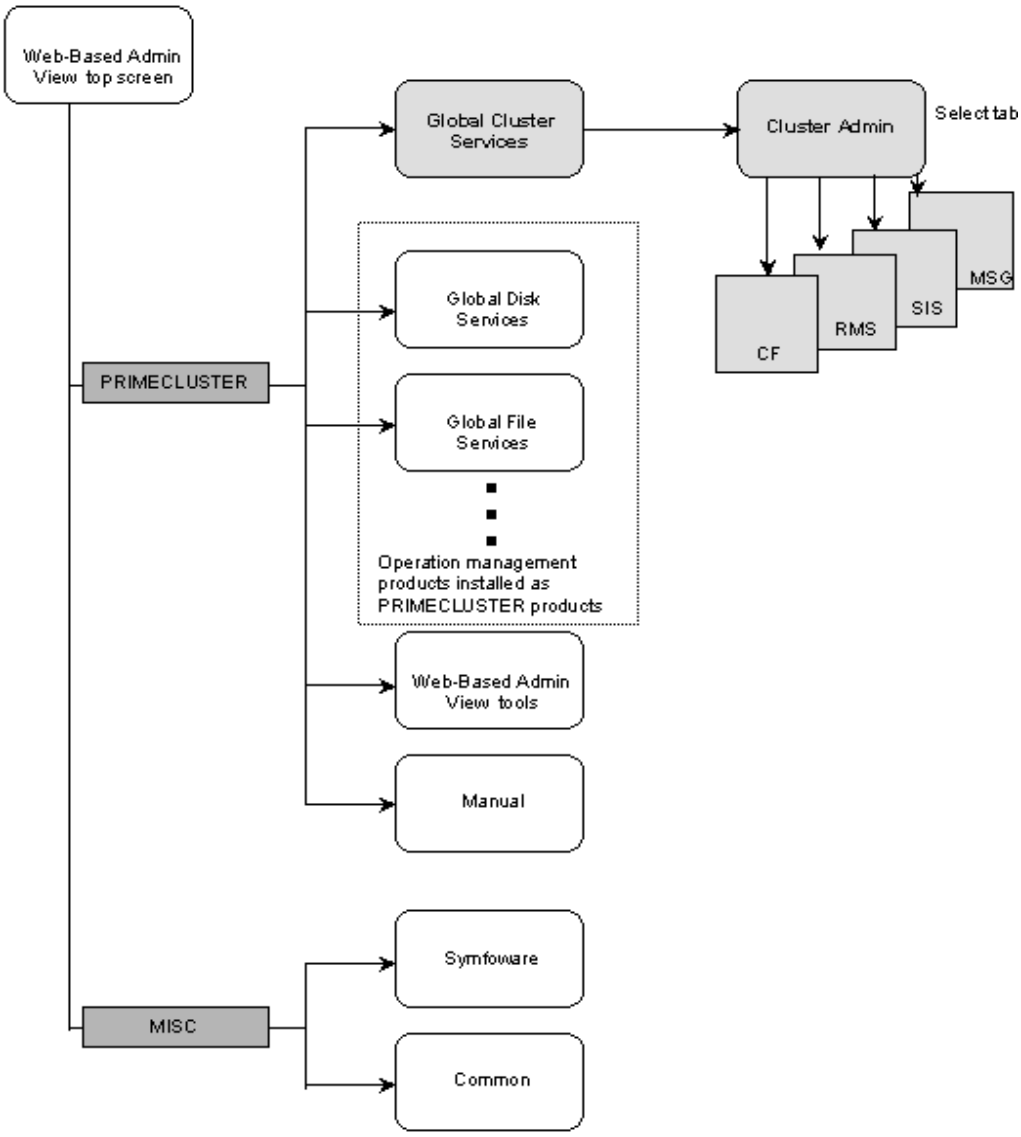
- Symfoware

— **Common**

You can refer to manuals that are available as online manuals. For details, see the *"PRIMECLUSTER Web-Based Admin View Operation Guide."*

■ Operation menu transition diagram

Shown below are the transitions from the top screen of Web-Based Admin View to the other screens.



At the Cluster Admin screen, you can switch the window by clicking the following tabs:

- CF: Cluster Foundation
- RMS: Reliant Monitor Services
- SIS: Scalable Internet Services
- MSG: Message

The following sections describe the screens found after the Global Cluster Services menu.

4.3.2 Global Cluster Services Menu Functions

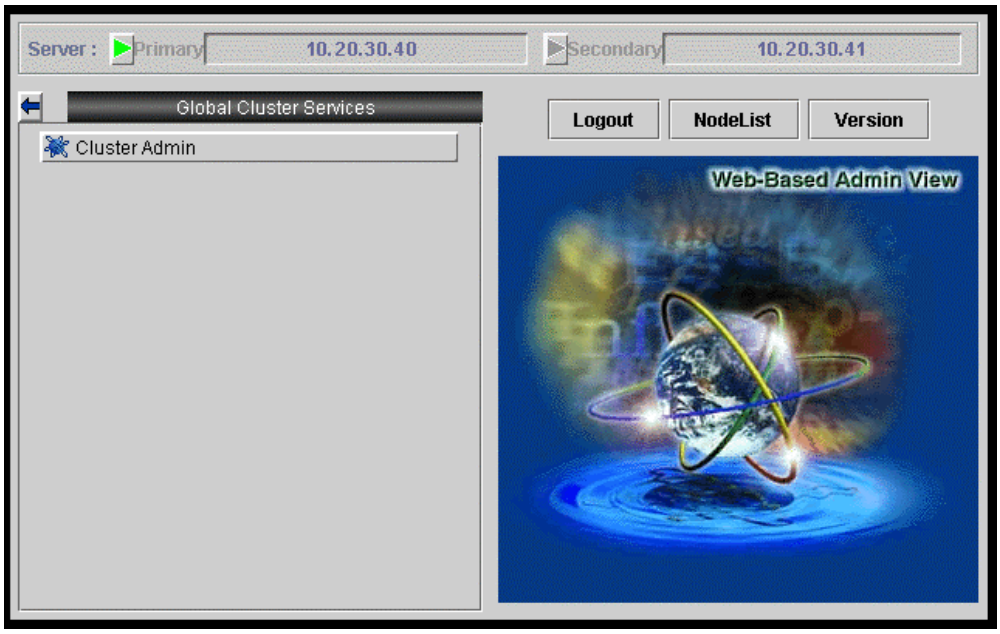
Display procedure

Web-Based Admin View screen -> *Global Cluster Services*

Exit procedure

To return to the Web-Based Admin View screen, click the arrow next to *the Global Cluster Services*.

Web-Based Admin View screen (Global Cluster Services menu)



Overview of the Global Cluster Services menu

- **Cluster Admin**

  This function allows you to monitor the status of the PRIMECLUSTER system and operate the system.

4.3.3 Cluster Admin Functions

Display procedure

Web-Based Admin View screen -> Select *Global Cluster Services*. -> Select *Cluster Admin*. -> Node selection screen -> Select the node.

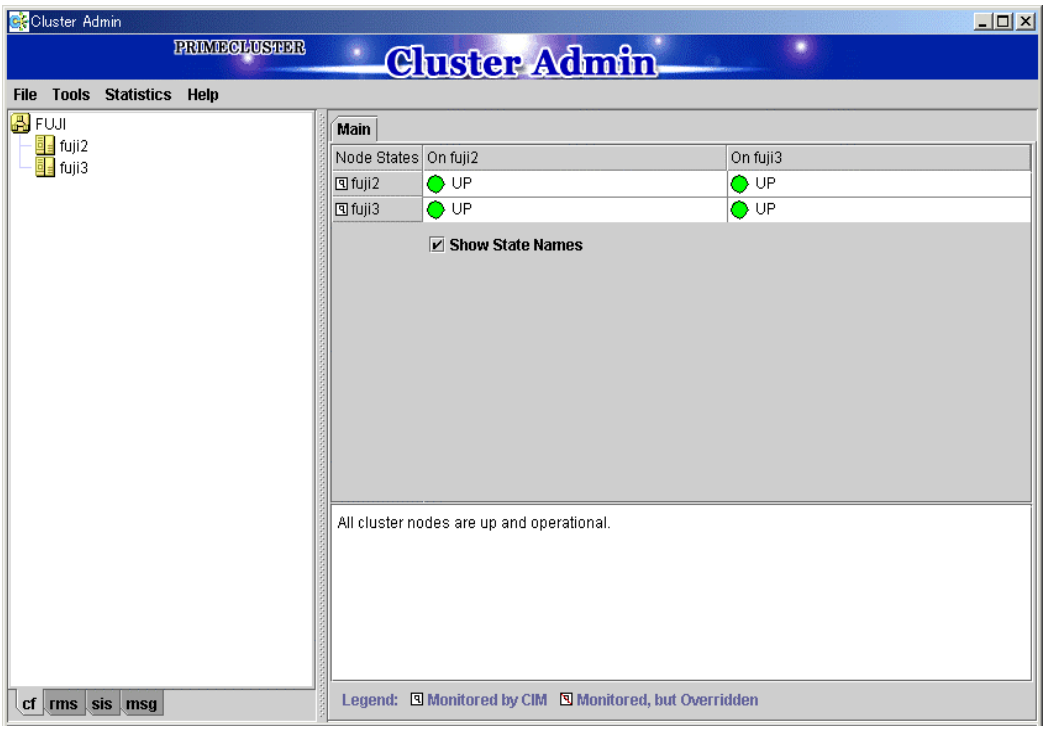
Exit procedure

Select the *Exit* in the *File* menu. -> Confirmation screen -> Select the *Yes*. -> *Global Cluster Services* menu

Cluster Admin supports the functions described below.

The manual reference locations are indicated in "Overview of Cluster Admin."

Web-Based Admin View screen (Cluster Admin)



Overview of Cluster Admin

- **cf (CF: Cluster Foundation)**
  This function allows you to manage, build, monitor, and diagnose the cluster.
  Reference location: 5.2 "Initial Cluster Setup", Chapter 7 "Operations"
- **rms(RMS: Reliant Monitor Services)**
  This function monitors the status of the cluster system and manages applications and resources.
  Reference location: Chapter 7 "Operations"
- **sis (SIS: Scalable Internet Services)**
  This function is not supported for PRIMECLUSTER 4.0A20.
- **msg(Message)**
  Cluster control messages are displayed.
  Reference location: Chapter 7 "Operations"

4.4 Exiting the Screen

To exit the Web-Based Admin View screen, follow the procedure below.

◆ Logging out of the screen

To log out of the Web-Based Admin View screen, follow the procedure below.

1. Close all screens if the management screen of the operation management product is displayed.
2. When only the Web-Based Admin View screen is displayed, select *the Logout*.

◆ Exiting the screen

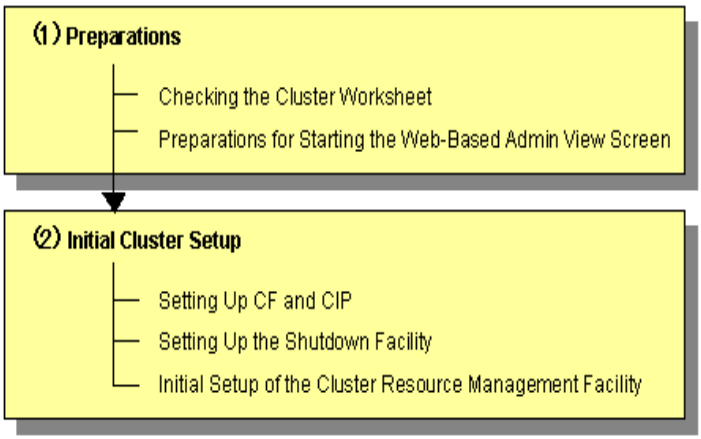
To exit the Web-Based Admin View screen, follow the procedure below.

1. Log out from the Web-Based Admin View screen according to "Logging out of the screen" described above.
2. The login screen will be displayed. To exit the Web-Based Admin View screen, execute one of the following operations while the login screen is still displayed:
   - Terminate the Web browser.
   - Specify another URL in the Web browser to switch the screen. (Enter a new URL or specify a bookmark.)
   - Select the *Back* button of the browser.

- To terminate the Web browser, select the *Close* in the *File* menu, or click the “x” at the top right corner of the screen.
  Note that if you are using Netscape, selecting the *Exit* in the *File* menu will terminate all browser screens.
- At the login screen, clicking the “x” at the top right corner of the screen will not terminate the screen.
- The login screen will remain temporarily after exiting the browser.

Chapter 5 Building a Cluster

The procedure for building a PRIMECLUSTER cluster is shown below



Cluster building procedure and manual reference locations

	Work item	Execution Node	Required/ Optional	Manual reference location*
(1)	5.1 Preparations	All nodes	Required	**ING** "3 Operating Environment"
	5.1.1 Checking the cluster worksheet	-	Required	This manual: Appendix A
	5.1.2 Preparations for starting the Web-Based Admin View screen	All nodes	Required	**This manual:** "4.1 Preparations for Starting the Web-Based Admin View Screen"
(2)	5.2 Initial Cluster Setup			
	5.2.1 Setting up CF and CIP	All nodes	Required	**CF**
	5.2.2 Setting Up the Shutdown Facility	All nodes	Required	**CF** "8 Shutdown Facility "
	5.2.3 Initial Setup of the Cluster Resource Management Facility	All nodes	Required	**CF** "4.3 Resource Database configuration"

* The PRIMECLUSTER manual names are abbreviated as follows:

- **ING:** PRIMECLUSTER Installation Guide
- **CF:** PRIMECLUSTER Cluster Foundation Configuration and Administration Guide

5.1 Preparations

As preparation for building the cluster, check the operation environment. See "3 Operating Environment" in the "*PRIMECLUSTER Installation Guide*."

5.1.1 Checking the Cluster Worksheet

Make certain of filling the worksheet. If there is missing information, you should specify values and complete the sheet.

See

For information on the worksheet, see Appendix A "PRIMECLUSTER System Design Worksheets"

5.1.2 Preparations for Starting the Web-Based Admin View Screen

For information on the preparations before starting the Web-Based Admin View screen, see 4.1 "Preparations for Starting the Web-Based Admin View Screen"

5.1.3 Activating the Cluster Interconnect

As preparation for setting up CF, execute the following operation:

1. Edit the /etc/sysconfig-scripts/ifcfg-ethX file.
   Edit “ONBOOT” of the /etc/sysconfig-scripts/ifcfg-ethX file as follows:
   ```
   ONBOOT=yes
   ```

   Note

   ethX indicates a network interface that is used for the cluster interconnect.
   X indicates a number.
2. Confirming the cluster interconnect.
   Confirm the state of the interface for interconnect with the following command.
   ```
   # ifconfig <relevant interface> <Return>
   ```
3. If the beginning of the second row output with the above command is not “UP,” execute the following command to confirm if “UP” is output.
   ```
   # ifconfig <relevant interface> up <Return>
   ```

5.2 Initial Cluster Setup

This section describes the initial setup of the PRIMECLUSTER cluster.
For details on the setup methods, see the reference locations indicated in the table below.

	Contents	Manual reference location*
1	5.2.1 Setting up CF and CIP (setting up cluster configuration information and IP addresses)	**CF** "2.1 CF configuration"
2	5.2.2 Setting up the shutdown facility	**CF** "8 Shutdown Facility "
3	5.2.3 Initial Setup of the Cluster Resource Management Facility	**CF** "4.3 Resource Database configuration"

***** The PRIMECLUSTER manual names are abbreviated as follows:

- **CF:** PRIMECLUSTER Cluster Foundation Configuration and Administration Guide

5.2.1 Setting Up CF and CIP

Set up Cluster Foundation (CF) and CIP using the CF Wizard of Cluster Admin. Enter the information described in the table below. The worksheet for the CF and CIP setup is the A.7 "Cluster Configuration Worksheet."

Setup item	Description	Described in worksheet
Cluster name	Define the name of the cluster systems. Use up to 31 printable ASCII characters (except space, line feed, and tab characters) for each name. Cluster names are always processed as uppercase characters.	"Cluster name"
Cluster nodes	Select the nodes that will construct a cluster system.	"Node name (uname-n)" for "Node 1" and "Node 2"
CF node names	Set the names of the nodes that construct the cluster. Use up to 31 printable ASCII characters (except space, line feed, and tab characters) for each node name. CF node names are always processed as lowercase characters. In the setup screen, the same names as the "Cluster nodes" above are displayed by default.	"CF node name" for "Node 1" and "Node 2"
Cluster interconnects	In each node of the cluster, determine the network interface to be used in CF inter-node communication. A representative network interface is the Ethernet device. Set the network interfaces to be used for CF inter-node communication so that they are activated when the system is started. However, IP addresses must not be assigned to the interfaces.	"Path 0 NIC name" and "Path 1 NIC name" for "Node 1" and "Node 2"
IP interconnects	Optional. This setup allows you to operate CF over IP.	"IP interconnect setup"

Setup item	Description	Described in worksheet
CIP subnets	Set the following items, and set the IP address used by CF: ● CIP subnet count ● Host suffix ● Subnet number ● Subnet mask	"Number of subnets," "Subnet IP," and "Net mask" for "CIP"
Cluster Integrity Monitor (CIM) configuration	After starting the CF, configure CIM using the “rcqconfig” command.	"Node in the CF quorum set" for "Node 1" and "Node 2"

- If you enable any one of the CF remote services, do not connect the following systems in the same cluster interconnect:
  - Systems that have a security problem
  - Systems in which cluster interconnects are not secured
- Hereinafter, the CF remote services (CFCP and CFSH) must be enabled. To enable the CFCP and CFSH, add the following definition to the “/etc/default/cluster.config” file before configuring the CF.

```
CFCP    "cfcp"
CFSH    "cfsh"
```

- If the CF and CIP configuration fails, check the following:
  - The cluster interconnect is connected.
  - The network interface that is used for the cluster interconnect is activated.
  - An IP address is configured for the network interface.

5.2.2 Setting Up the Shutdown Facility

The procedure for setting up the shutdown facility is given below:

For details on the shutdown facility, see the following manuals:

- "3.3.1.6 PRIMECLUSTER SF" in the "*PRIMECLUSTER Concept Guide*"
- "8. Shutdown Facility" in the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*"

Live priority

If cluster partitioning occurs as a result of a cluster interconnect failure, all nodes can still access the user resources. For information on the cluster partition, see the “*PRIMECLUSTER Concept Guide*.”

To ensure the data consistency, you must determine which node groups are to be left alive and which node groups are to be eliminated (forcibly shut down).

In PRIMECLUSTER, the weight assigned to each node group is called the "live priority."

If the weight of a node is large, the live priority is high. Conversely, if the weight becomes smaller, the live priority becomes lower.

The live priority is determined by the ShutdownPriority of userApplication. For information

how to set the Shutdown Priority, see “6 Appendix -Object types” in the “*PRIMECLUSTER RMS Configuration and Administration Guide*.”
Specify this setting in the attribute setup when userApplication is created. For instructions on how to change the setting value, see 8.4 "Changing the Operation Attributes of a userApplication."

◆ Setting up the shutdown facility

● Setting up the shutdown daemon

Create /etc/opt/SMAW/SMAWsf/rcsd.cfg on all nodes as shown below:

```
CFName1:agent=SA_rsb,timeout=20

CFName2:agent=SA_rsb,timeout=20
```

CFNameX : CF node name of the cluster host

Example:

```
node1:agent=SA_rsb,timeout=20
node2:agent=SA_rsb,timeout=20
```

When the "/etc/opt/SMAW/SMAWsf/rcsd.cfg" file is to be created, the "/etc/opt/SMAW/SMAWsf/rcsd.cfg.template" file can be used as a prototype.

● Setting up the RSB shutdown agent

Create /etc/opt/SMAW/SMAWsf/SA_rsb.cfg on all nodes as shown below:

```
CFName1 ip-address:[port]:[user]:[passwd] [cycle | leave-off]

CFName2 ip-address:[port]:[user]:[passwd] [cycle | leave-off]
```

CFNameX: CF node name of the cluster host
ip-address: IP address of the remote service board
port: Unused
user: User name defined when remote service board is set up
passwd: Password defined when remote service board is set up
cycle: Reboot the node after forcibly stopping the node.
leave-off: Power-off the node after forcibly stopping the node.

Example:

```
node1 10.20.30.50::root:rsbpwd cycle
node2 10.20.30.51::root:rsbpwd cycle
```

When the "/etc/opt/SMAW/SMAWsf/SA_rsb.cfg" file is to be created, the "/etc/opt/SMAW/SMAWsf/SA_rsb.cfg.template" file can be used as a prototype.

You need to set the node behavior after collecting the crash dump in the failed node to [reboot | power-off] according to the [cycle | leave-off] settings in the above

file. The behavior is defined by modifying the DUMP_ACTION variables in /etc/sysconfig/dump. For details, see the "*LKCD Installation Guide*."

- **Setting up the LKCD shutdown agent**
  - Specify the disk that notifies the panic status.
    Add the following row to /etc/sysconfig/dump on all the nodes:

```
NOTIFY_DEV=/dev/sdX
```

    sdX: Device name of the disk that notifies the panic status.
    Example: NOTIFY_DEV=/dev/sdc

  - Change the reboot wait time after collecting the crash dump.
    Change PANIC_TIMEOUT of /etc/sysconfig/dump to 30 on all the nodes.
    Example: PANIC_TIMEOUT=30

  - Initialize the panic status notification function
    Execute the following command on any one of the nodes of the cluster system.

```
# /etc/opt/FJSVcllkcd/bin/panicinfo_setup
```

    — To use this command, CF and CF services (CFSH and CFCP) must be running. For details on the setting, see the notes in 5.2.1 "Setting Up CF and CIP."
    — If the command ends abnormally, see D.5.1 "Notes on setting up the shutdown facility."

  - Enable the panic status notification function.
    Execute the following command on all the nodes:

```
# /sbin/lkcd config
```

- **Starting up the shutdown daemon**

  Start or restart the shutdown daemon (rcsd) on all the nodes.
  If rcsd has not yet been started, execute sdtool –b. If rcsd is active, stop rcsd by using sdtool –e and then execute sdtool –b. Use sdtool –s to confirm whether rcsd is activated.

```
# sdtool -b
```

  Or,

```
# sdtool -e

# sdtool -b
```

5.2.3 Initial Setup of the Cluster Resource Management Facility

This section explains how to set up the resource database that the cluster resource management facility (CRM) manages.

Set up the CRM resource database according to the following procedure:

- Set up the resource database that is managed with the CRM.
- Register the hardware (shared disk, network interface card) in the resource database that is managed by the CRM.

The network interface card must be active. Confirm the state of the network interface card using the “ifconfig(8)” command.

5.2.3.1 Initial Configuration Setup

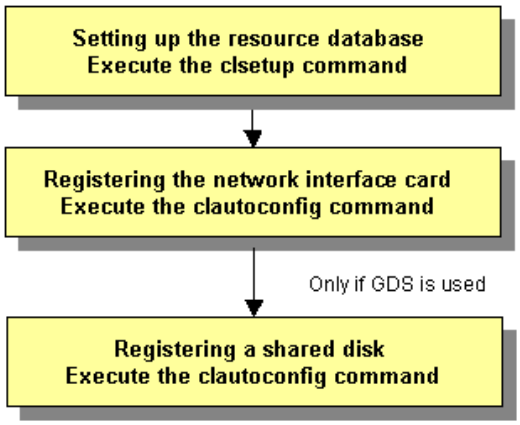
Set up the resource database that CRM manages.

When setting up the initial configuration, make sure that all nodes in the cluster have been started and that CF configuration is completed.

◆ Operation procedure

- **CRM setup flow**

The flow for setting up CRM is shown below:



- **CRM setup procedure**

1. Setting up the resource database

Take the following steps:

1) Log in to the node using system administrator access privileges.
2) The resource database acquires the CIP information from the CIP configuration information that is stored in /etc/cip.cf. If multiple CIPs are defined for a single node, use the CIP that is defined first.
   Confirm that CIP of the node is properly connected by executing the “ping(8)” command. For details on this command, see the manual pages of ping(8).
   If CIP is not properly connected, the CIP might contain incorrect settings. Confirm that the CIP settings are correct, and then set up the resource database again.
3) Execute clsetup(1M) to set up the resource database. For details on this command, see the manual pages of clsetup(1M).

```
#/etc/opt/FJSVcluster/bin/clsetup [RETURN]
```

4) To confirm that the resource database has been correctly set, execute the “clgettree(1)” command. For details on this command, see the manual pages of clgettree(1).

```
#/etc/opt/FJSVcluster/bin/clgettree [RETURN]
```

Using the clgettree(1) command, confirm that all the nodes constituting the cluster system are displayed and that the content displayed on all the nodes, to which the resource database is set, is the same.
If all the nodes that constitute the cluster system cannot be displayed with the clgettree(1) command, or if the display content is different on all the nodes to which the resource database is set, the CIP setting may contain an error. Set up the resource database again after examining the CIP settings and performing the following operations on all the nodes that constitute the cluster system:

1- Reset the resource database by executing the clinitreset(1M) command. For details on this command, see the manual pages of clinitreset(1M).
2- Reboot the node.

2. Registering the network interface card

1) Confirm that all nodes have been started in multi-user mode.
2) Log in to the node using system administrator access privileges and execute the “clautoconfig(8)” command. Then, the network interface is automatically recognized and registered in the resource database.

```
#/etc/opt/FJSVcluster/bin/clautoconfig -r -n [RETURN]
```

For details on this command, see the manual pages of clautoconfig(8).

— Do not execute the clautoconfig(8) command on the node in which the clautoconfig(8) command is being executed or on any other node while the clautoconfig(8) command is being executed. If you execute it, a shared disk device cannot be registered correctly. If you have executed it, execute the following operation on all the nodes that constitute the cluster system to re-execute “Initial Setup of the Cluster Resource Management” described in this chapter:

1- Reset the resource database using the “clinitreset(8)” command. For details on this command, see the manual pages of clinitreset(1M).
2- Reboot the node.

— Only an active network interface card is automatically detected. Confirm the state of the network interface card using the “ifconfig(8)” command.

3. Registering a shared disk

When you use GDS, register a shared disk in the resource database using the following steps on any one of the nodes of the cluster system. For details on the procedure, see “Appendix H” in the “*PRIMECLUSTER Global Disk Services Guide*."

1) Log in any one of the nodes of the cluster system using system administrator access privileges.
2) Create a shared disk configuration file in the following format. The configuration file defines settings of a shared disk connected to all the nodes of the cluster system.

```
Resource key name device name node identifier
Resource key name device name node identifier
                  :
```

- Define “resource key name device name node identifier” for each shared disk in one row.
- “resource key name”, “device name”, and “node identifier” are delimited by a single space.

Set up resource key name, device name and node identifier as follows;

Resource key name

Specify a resource key name that indicates the sharing relationship for each shared disk. You need to specify the same name for each disk shared between nodes. The resource key name should be specified in the “shd number” format. “shd” is a fixed string. For “number”, you can specify any four-digit numbers. If multiple shared disks are used, specify unique numbers for each shared disk.

[Example] When /dev/sdb and /dev/sdc are shared between nodes

```
Resource key name of /dev/sdb: shd0001
Resource key name of /dev/sdc: shd0002
```

Device name

Specify a device name of the shared disk in the “/dev/device" format.

[Example] In the case of /dev/sdb

```
/dev/sdb
```

Node identifier

Specify a node identifier for which a shared disk device is available. Confirm the node identifier by executing the clgettree(1) command. For details on this command, see the manual pages of clgettree(1).

[Example] node1 and node2 are node identifiers in the following case:

```
# /etc/opt/FJSVcluster/bin/clgettree
Cluster 1 cluster
    Domain 2 PRIME
        Shared 7 SHD_PRIME
        Node 3 node1 ON
        Node 5 node2 ON
```

The following example shows the configuration file of the shared disk when shared disks /dev/sdb and /dev/sdc are shared between node1 and node2.

```
shd0001 /dev/sdb node1
shd0001 /dev/sdb node2
shd0002 /dev/sdc node1
shd0002 /dev/sdc node2
```

3) Execute the “clautoconfig(8)” command to register the settings of the shared disk device that is stored in the configuration file in the resource database.
Specify the “clautoconfig(8)” command in the following format:
[Format]
`/etc/opt/FJSVcluster/bin/clautoconfig -f [full path of the shared disk definition file]`
[Example]

```
# /etc/opt/FJSVcluster/bin/clautoconfig -f /var/tmp/diskfile
```

If the “clautoconfig(8)” command ends abnormally, take corrective action according to the error message. For details on the messages of this command, see the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*." This command does not check whether the shared disk defined in the configuration file is physically connected. If you found an error in the shared disk configuration file after executing the “clautoconfig(8)” command, reset the resource database by executing the “clinitreset(8)” command and reboot the node.

4) Confirm that the settings of the shared disk has been correctly registered in the resource database using the “clgettree(1)” command.
Confirm the information on the shared disk device that is registered in the resource database.
Use the clgettree(1) command to confirm the registered information.
[Example] The following example shows that shared disk devices /dev/sdb and /dev/sdc are shared by node1 and node2.
The "DISK" class resource indicates a resource of the shared disk device.
The "SHD_DISK" class resource indicates the sharing relationship of the shared disk device.

```
# /etc/opt/FJSVcluster/bin/clgettree
    Cluster 1 cluster
      Domain 2 PRIME
              Shared 7 SHD_PRIME
                       SHD_DISK 14 SHD_Disk14 UNKNOWN
                                DISK 15 sdb UNKNOWN node1
                                DISK 16 sdb UNKNOWN node2
                       SHD_DISK 17 SHD_Disk17 UNKNOWN
                                DISK 18 sdc UNKNOWN node1
                                DISK 19 sdc UNKNOWN node2
              Node 3 node1 ON
                       DISK 15 sdb UNKNOWN
                       DISK 18 sdc UNKNOWN
              Node 5 node2 ON
                       DISK 16 sdb UNKNOWN
                       DISK 19 sdc UNKNOWN
```

5.2.4 Preparing to Display the Operator Intervention Messages

This section explains how to output operator intervention request messages on the console.
If userApplication does not start up along with node startup, you can start it by responding to the operator intervention request message displayed on the console. For details on the operator intervention messages, see D.4.1 "Operator Intervention Messages."

The operator intervention request messages are displayed using the “syslogd(8)” function. daemon.err indicates priority (facility.level) of the message. For details on the priority, see the manual pages of syslog.conf(5).

The procedure for displaying the operator intervention request message is explained below. Take the following steps on all the nodes;

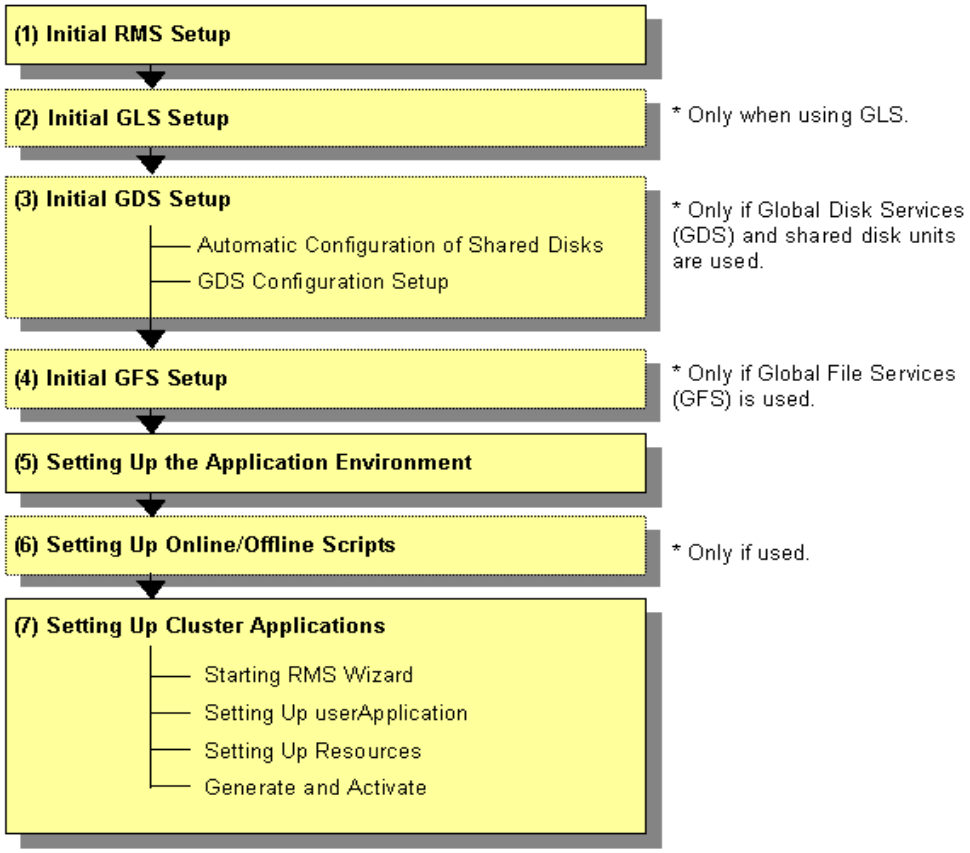
◆ Procedure

1. Log in the node using system administrator access privileges.
2. Confirm that the setting of syslogd is /etc/syslog.conf, and that daemon.err is set to be displayed on the console. For further details on /etc/syslog.conf, see the manual pages of syslog.conf(5).
   [Example] How daemon.err is set to be displayed on the console.
   ```
   daemon.err        /dev/console
   ```
   If you do not need to display daemon.err on the console, change syslogd by modifying /etc/syslog.conf. To enable this change, send the SIGHUP signal to syslogd. For details on how to re-read the configuration file in syslogd, see the manual pages of syslogd(8).
3. Starting the console.
   Start the console.
   [Example]
   ```
   # kterm -C
   ```

If a Japanese-language system is being used, use a console that supports Japanese.
By setting the operator intervention request messages, messages other than the operator intervention request messages will be displayed on the console. If a console that does not support Japanese is used, Japanese messages will not be displayed.

Chapter 6 Building Cluster Applications

The procedure for building a cluster application is shown below.



Application building procedure and manual reference locations

Work item		Execution Nodes	Required/ optional	Manual reference location*
(1)	6.1 Initial RMS Setup	All nodes	Required	
(2)	6.2 Initial GLS Setup	All nodes	Optional (Required when the GLS redundant line control function is used)	**GLSR**
(3)	6.3 Initial GDS Setup	All nodes	Optional (required when GDS is used)	
	6.3.1 Automatic Configuration of Shared Disks	All nodes	Optional	**GDSG** "Appendix H Preparations"
	6.3.2 GDS Configuration Setup	All nodes	Optional	**GDSG** "Chapter 5 Operations"
(4)	6.4 Initial GFS Setup	All nodes	Optional (required when GFS is used)	**GFSG**
(5)	6.5 Setting Up the Application Environment	All nodes	Required	Manuals for each application
(6)	6.6 Setting up Online/Offline Scripts	All nodes	Optional	**RMS** "2.8 Environment Setup", "8 Appendix – Environment Variables"
(7)	6.7 Setting Up Cluster Applications	All nodes	Required	
	6.7.1 Starting RMS Wizard			
	6.7.2 Setting Up userApplication			
	6.7.3 Setting Up Resources			
	6.7.4 Generate and Activate			

***** The names of the reference PRIMECLUSTER manuals are abbreviated as follows:

- **RMS:** PRIMECLUSTER RMS Configuration and Administration Guide
- **GDSG:** PRIMECLUSTER Global Disk Services Configuration and Administration Guide
- **GFSG:** PRIMECLUSTER Global File Services Configuration and Administration Guide
- **GLSR:** PRIMECLUSTER Global Link Services Configuration and Administration Guide: Redundant Line Control Function

6.1 Initial RMS Setup

When RMS is to be used, you must first check the A.8.1 "RMS Setup Worksheet" and change the following environment variable as required:

- Automatic startup of RMS (HV_RCSTART)

In this version, “Does not start up automatically” is set as default.
If you want to set RMS to be started automatically along with node startup, select “Start up automatically.”
When RMS is to be used, we recommend that you set “Start up automatically.”

For information on how to check and change the environment variables of RMS automatic startup, see 8.4.3 "Changing Environment Variables."

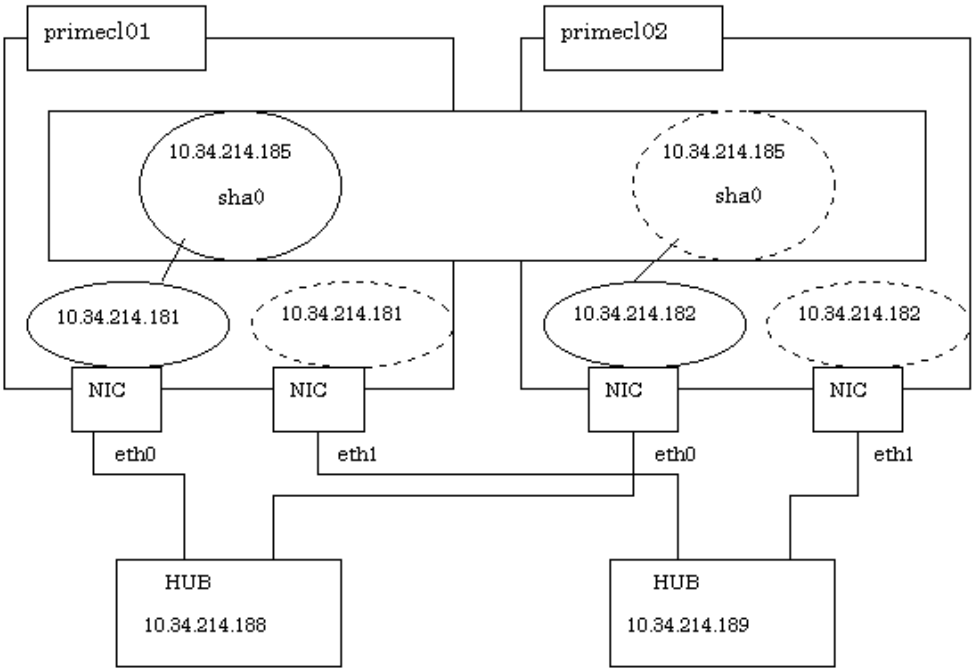
6.2 Initial GLS Setup

This section outlines the steps for configuring Global Link Services (GLS).

6.2.1 GLS Setup

For information on the initial GLS setup, see "Chapter 5 Operation on Cluster System" in the "*PRIMECLUSTER Global Link Services Configuration and Administration Guide: Redundant Line Control Function*."
This section describes how to set up "logical IP takeover of the NIC switching mode" that GLS (redundant line control function) provides. This procedure is described based in the example below.

The setup values correspond to those on the A.8.3 "GLS Setup Worksheet."



◆ **Operation Procedure:**

- **If the OPERATING node is [HOST-primecl01]**

1. Set up the virtual interface.
   In the underlined parameter, specify the physical IP address of the node.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i
10.34.214.185 -e 10.34.214.181 -t eth0,eth1
```

   Check that the virtual interface has been set up correctly.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig print
```

2. Set up the subnet mask.
   For the underlined parameter, specify the network address and the subnet mask of the virutal interface.

```
# /opt/FJSVhanet/usr/sbin/hanetmask create -i 10.0.0.0 -m
255.255.255.0
```

Check that the facility has been set up correctly.

```
# /opt/FJSVhanet/usr/sbin/hanetmask print
```

For details on the subnet mask value, see “hanetmask command” in the “*PRIMECLUSTER Global Link Services Configuration and Administration Guide*.”

3. Set up the inter-hub monitoring facility.
   In the underlined parameter, specify the IP addresses of the hubs to be monitored.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p
10.34.214.188,10.34.214.189 -b off
```

   Check that the facility has been set up correctly.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll print
```

4. Register the node to the cluster resources.

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc create –n sha0
```

   Check that the registration has been set up correctly.

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc print
```

- **If the STANDBY node is [HOST-primecl02]**

1. Set up the virtual interface.
   In the underlined parameter, specify the physical IP address of the node.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig create -n sha0 -m d -i
10.34.214.185 –e 10.34.214.182 -t eth0,eth1
```

   Check that the virtual interface has been set up correctly.

```
# /opt/FJSVhanet/usr/sbin/hanetconfig print
```

2. Set up the subnet mask.
   For the underlined parameter, specify the network address and the subnet mask of the virutal interface.

```
# /opt/FJSVhanet/usr/sbin/hanetmask create -i 10.0.0.0 -m
255.255.255.0
```

   Check that the facility has been set up correctly.

```
# /opt/FJSVhanet/usr/sbin/hanetmask print
```

For details on the subnet mask value, see “hanetmask command” in the “*PRIMECLUSTER Global Link Services Configuration and Administration Guide*.”

3. Set up the inter-hub monitoring facility.
   In the underlined parameter, specify the IP addresses of the hubs to be monitored.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll create -n sha0 -p
10.34.214.188,10.34.214.189 -b off
```

   Check that the facility has been set up correctly.

```
# /opt/FJSVhanet/usr/sbin/hanetpoll print
```

4. Register the cluster resources.

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc create -n sha0
```

Check that the resources have been set up correctly.

```
# /opt/FJSVhanet/usr/sbin/hanethvrsc print
```

◆ **Post-setup processing**

After the OPERATING and STANDBY node setup is done, create the Gls resources, and register them to the cluster application.

For details, see 6.7.3.4 "Setting Up Gls Resources" and 6.7 "Setting Up Cluster Applications."

You also need to reboot the system after registering the cluster application. Then, start RMS and check the RMS tree to confirm whether the GLS resources are displayed correctly. For details, see “RMS Tree."

The GLS resource name is displayed as GlsX (X is integer).

For information on GLS (redundant line control function) and other operation modes, see "Appendix B Examples of Setting Up" in the "*PRIMECLUSTER Global Link Services Configuration and Administration Guide: Redundant Line Control Function*."

6.2.2 Setting Up Web-Based Admin View When GLS Is Used

To use Web-Based Admin View in a network that was made redundant with GLS, you must set up Web-Based Admin View after setting up the NIC switching mode.

For setup details, see "2.3 Setup with GLS" in the "*PRIMECLUSTER Web-Based Admin View Operation Guide*."

6.3 Initial GDS Setup

Take the following steps to configure Global Disk Services (GDS). If shared disk units are to be used, you are recommended to use GDS to manage the shared disk units.

6.3.1 Automatic Configuration of Shared Disks

Before setting up GDS, you must have configured the shared disks using automatic configuration. If the disk units were already configured with automatic configuration in "Initial Configuration Setup" skip this operation.

If disk units are not set up for automatic configuration during the initial setup or if a shared disk unit was added after the initial configuration setup, execute automatic configuration of disk units before the GDS setup.

6.3.2 GDS Configuration Setup

The GDS setup operations are described below.

— 6.3.2.1 "Setting Up Shared Disks"
Set up the shared disk volumes.

6.3.2.1 Setting Up Shared Disks

Set up the shared disks according to the following procedures:

- Volume setup
- File system setup

■ Volume setup

There are four types of volumes:

a. Single volume
b. Mirror volume
c. Striped volume
d. Volume created in a concatenation group

This section separately describes the volume setup procedures for a single volume (a) and for other volumes (b, c, d). For details, see "Chapter 5 Operations" in the "*PRIMECLUSTER Global Disk Services Configuration and Administration Guide*."

The values to be set for the individual items correspond to the values in the "GDS Configuration Worksheet."

If you plan to add, delete, or rename a disk cluster from the GDS window, close the ClusterAdmin screen before starting the operation

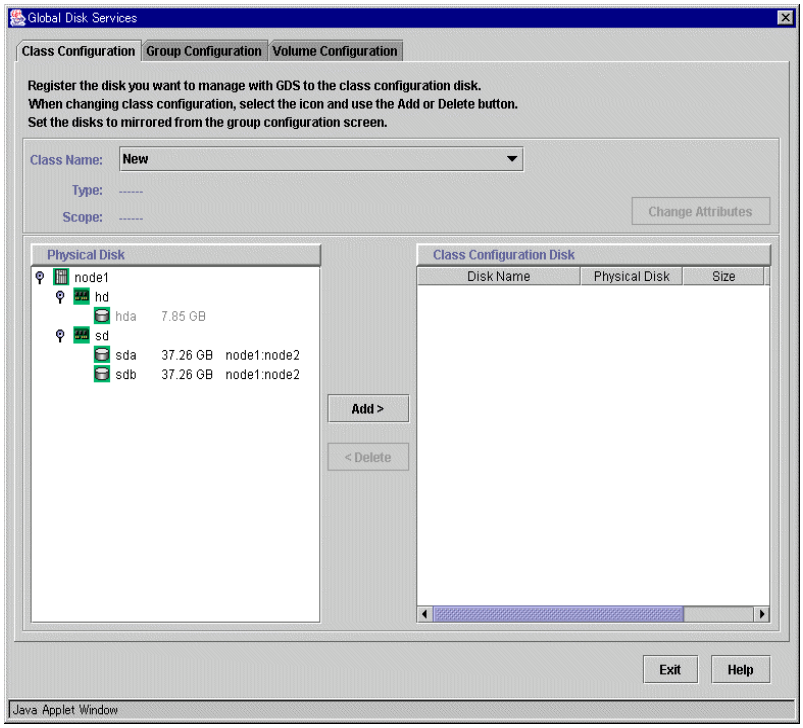
◆ Single volume setup

If you are not using a single volume, this setup is unnecessary.

◆ Operation Procedure:

1. Disk class creation and physical disk registration

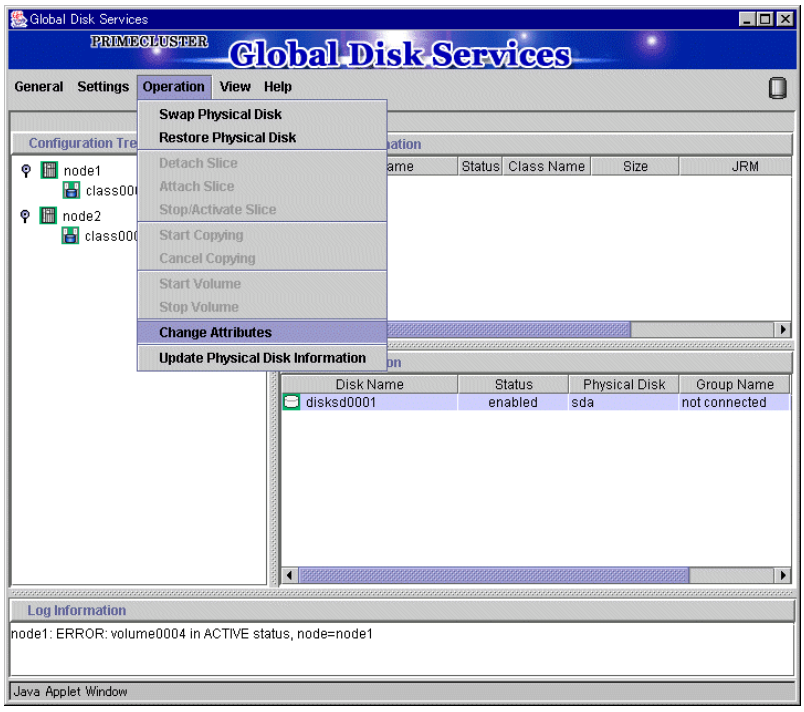
At the GDS window, select *Class Configuration* from the *Settings* menu.



At the above screen, select the physical disk to be registered from the "*Physical Disk*" list, and then click *Add*. When *Add* is clicked, the class attribute definition screen opens. Enter the *Class name* but do not change the *Type* value (leave the value as "shared").

2. Disk type attribute setup

   At the GDS window, select the disk that was registered in Step 1 from the disk information field, and select *Operation -> Change Attributes* from the menu bar.



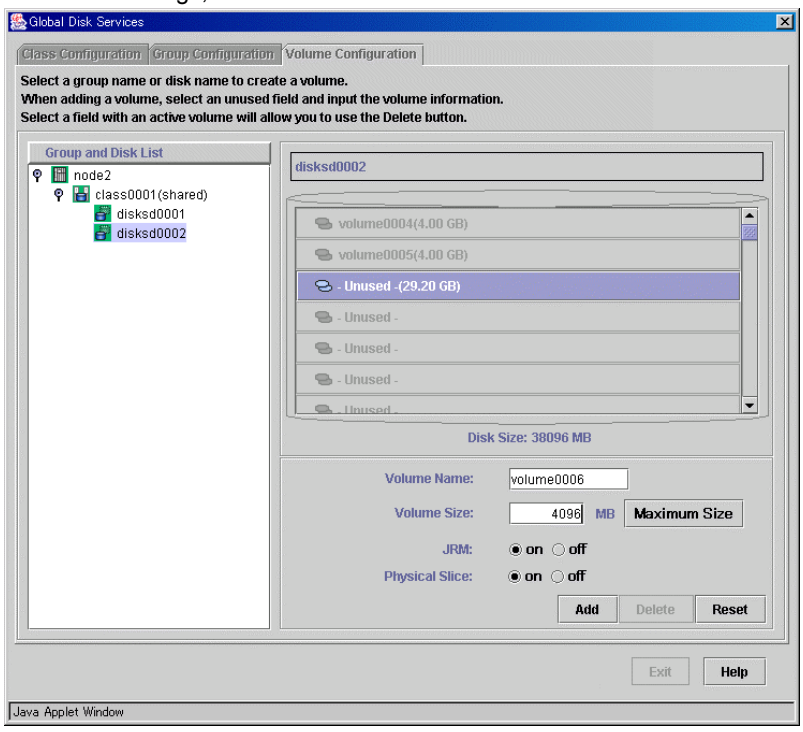
Set *Disk Type* to "single," and then click *OK*.

3. Volume creation

   Select *Settings* -> *Volume Configuration*, and then select the disk that was registered in Step 1 from the *Group and Disk List*. Select "*Unused*" in the volume diagram, and enter the "Volume Name," the "Volume Size," and the volume attributes.

   Click *Add* to enable the settings.

   Check the settings, and then click *Exit*.



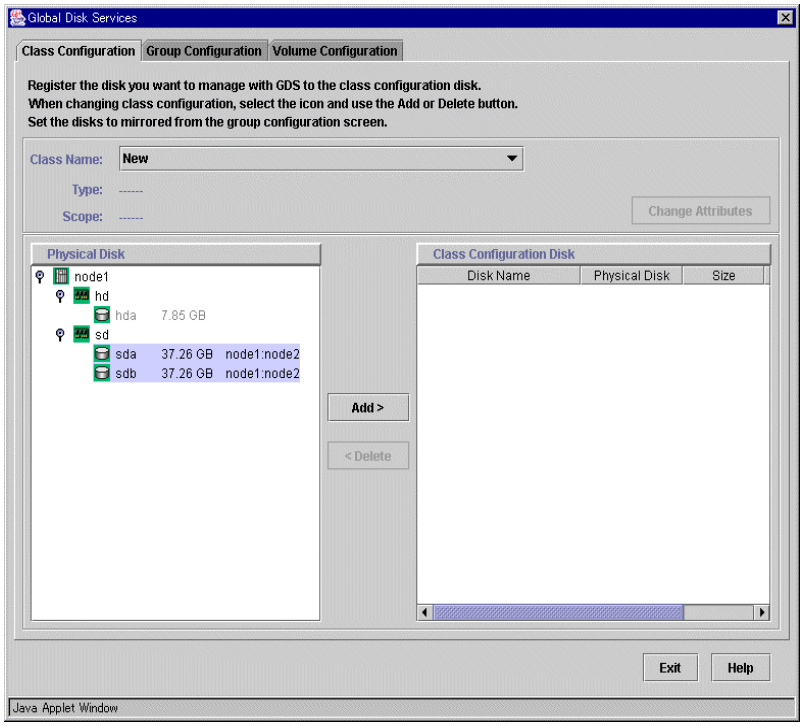
◆ Setup for other volumes

If you are using only a single volume, this setup is unnecessary.

● Operation Procedure:

1. Creating disk classes and registering physical disks

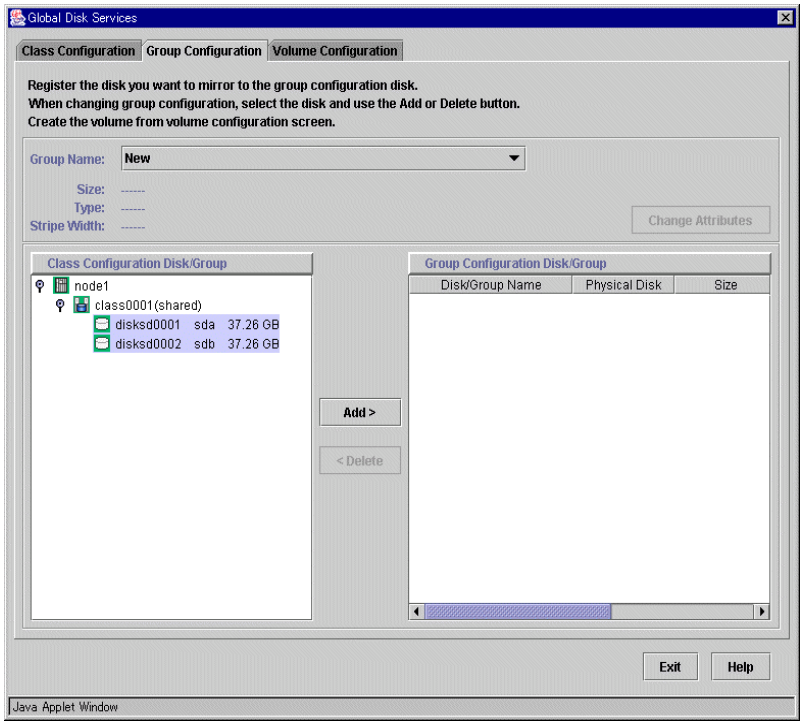
   At the GDS window, select *Class Configuration* from the *Settings* menu.



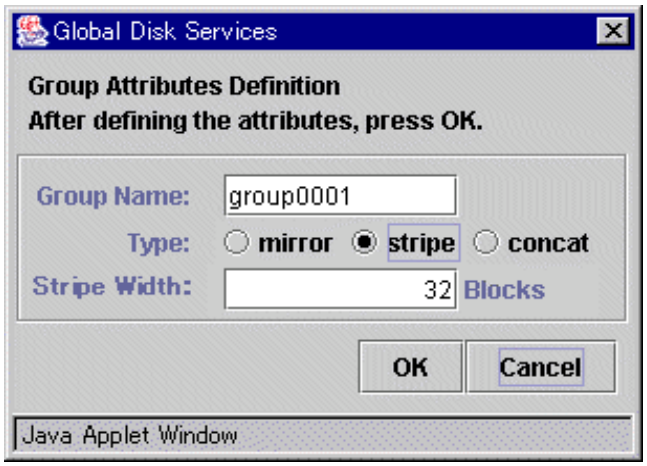
   At the above screen, select the physical disk to be registered from the *Physical Disk* list, and then click *Add*. When *Add* is clicked, the class attribute definition screen opens. Enter the "Class name" but do not change the "Type" value (leave the value as "shared"). Then click *Exit*.

2. Setting up the disk group configuration

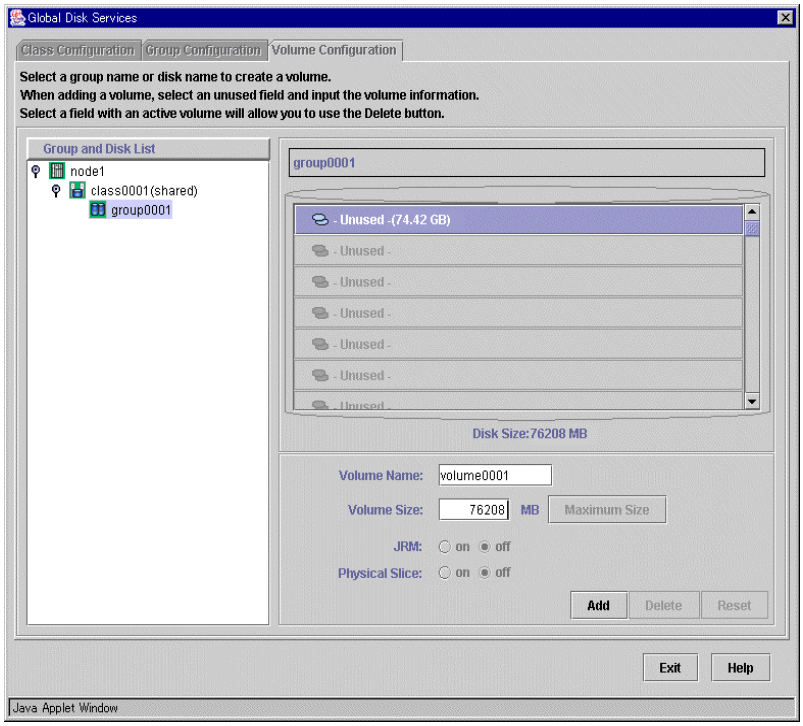
   Click the *Group Configuration* tab.



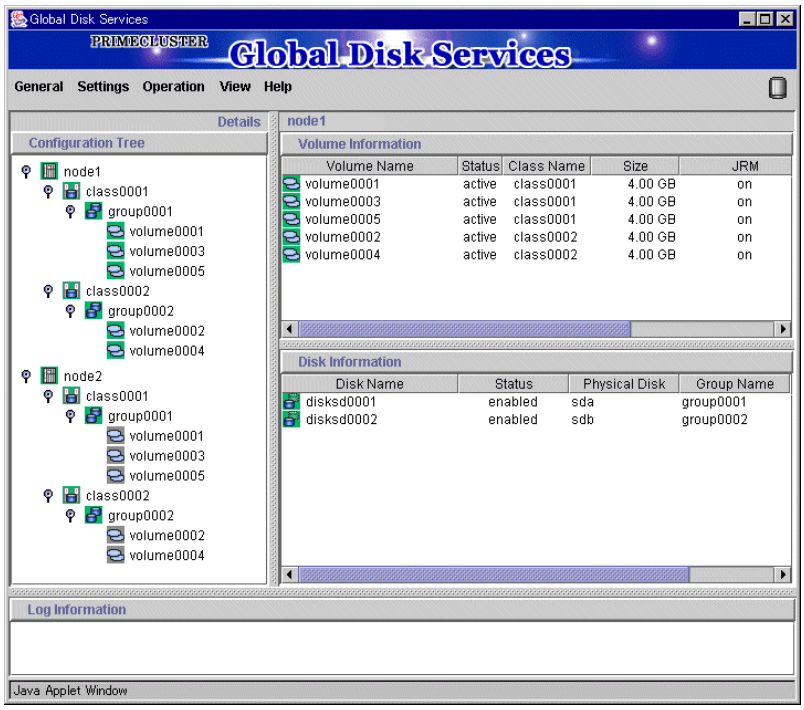
At the above screen, select the disk to be added to the group from the *Class Configuration Disk/Group* list, and then click *Add*.
Enter the "Group Name" and "Type" in the group attribute definition screen, and then click *OK*.



3. Creating a volume
Click the *Volume Configuration* tab, and select the group that was created in Step 2 from the *Group and Disk List*. Select *Unused* in the volume diagram, and enter the "Volume Name," the "Volume Size," and the volume attributes.
Click *Add* to enable the settings.
Check the setup information, and then click *Exit*.



4. Checking the configuration
The disk configuration is displayed as shown below.



■ File system setup

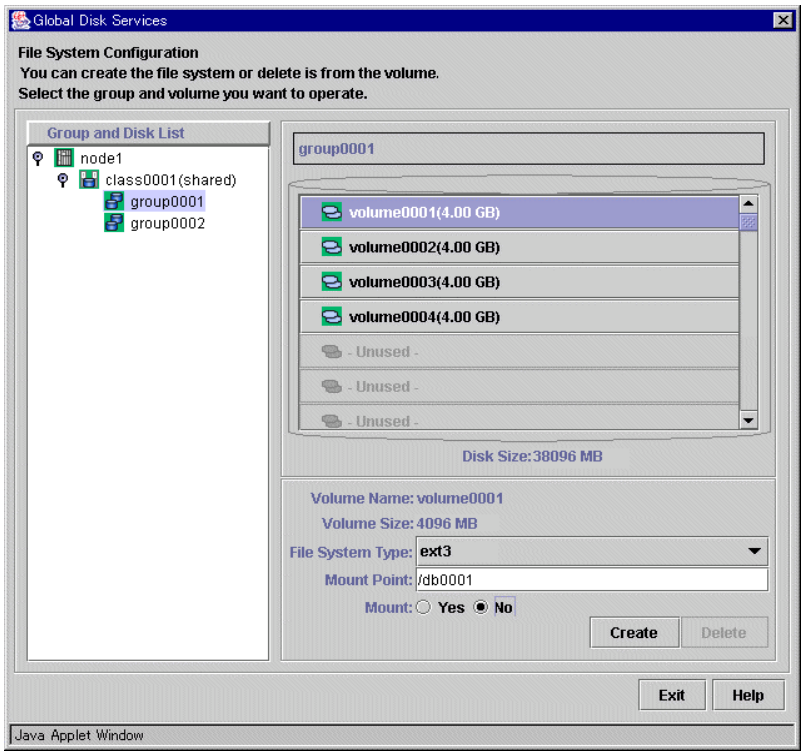
You can set up a file system on the file system configuration screen for the created volume. For Red Hat Linux(R), you can set up the “ext3” file system.

Note

If you set up a file system according to this procedure, the entries of the created file system are added to the "/etc/fstab" file. To use the created file system as an Fsystem resource, you must modify the entries that were added to the “/etc/fstab” file. For details, see 6.7.3.2 " Setting Up Fsystem Resources."

◆ Operation Procedure:

1. At the GDS window, select *File System Configuration* from the *Settings* menu, enter the “File System Type” of the volume and other information, and then click *Create*.



2. To exit the *File System Configuration*, click *Exit*.

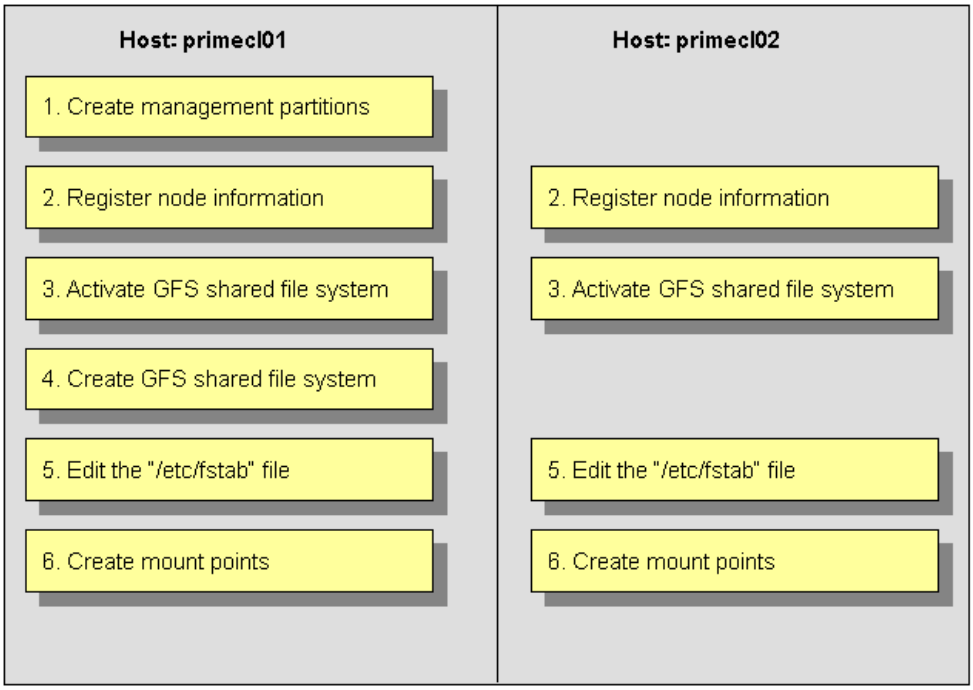
6.4 Initial GFS Setup

For a Global File Services (GFS) shared file system to be created on the Global Disk Services (GDS) volume, there must be a GDS volume and that volume must be active. If the volume is stopped, start the volume.

See

For information on the volume startup procedure, see "4.2.3 Operation" or "D.4 sdxvolume - Volume operations" in the "*PRIMECLUSTER Global Disk Services Configuration and Administration Guide*."

To use the GFS shared file system in RMS cluster operation, you need to set up GFS according to the flow below:



The device name and mount points that are specified here correspond to the values on the A.8.2 "GFS Shared File System Setup Worksheet."

Note

You need to prepare a management partition that is exclusive to the GFS shared file system. The GDS volume disk class is used for a switching file system and non-switching file system. For the management partition, non-switching file system must be allocated.

◆ Operation Procedure:

1. Create a management partition for the GFS shared file system on any one of the nodes.

```
# sfcsetup -c /dev/sfdsk/class0001/rdsk/GFSctl
```

2. Register the node information in the management partition on each node.

```
primecl01# sfcsetup -a /dev/sfdsk/class0001/rdsk/GFSctl
primecl02# sfcsetup -a /dev/sfdsk/class0001/rdsk/GFSctl
```

3. Activate the GFS shared file system on each node.

```
primecl01# sfcfrmstart
primecl02# sfcfrmstart
```

If sfcfrmstart ends abnormally, confirm that sfcprmd is started with the ps command. If sfcprmd has not been started, execute the following command on the node on which sfcprmd is not started:

```
# service sfcfsrm start
```

4. Create a GFS shared file system on any one of the nodes.

```
# sfcmkfs -o node=primecl01,primecl02
/dev/sfdsk/class0002/dsk/volume0001
```

5. Add the mount information of the GFS shared file system to /etc/fstab on each node. Specify “noauto” in the “mount options” filed of the mount information. Do not specify “noatrc” in the same field.

```
/dev/sfdsk/class0002/dsk/volume0001 /sfcfs1 sfcfs rw,noauto 0 0
```

6. Create a mount point on each node.

```
primecl01# mkdir /sfcfs1
primecl02# mkdir /sfcfs1
```

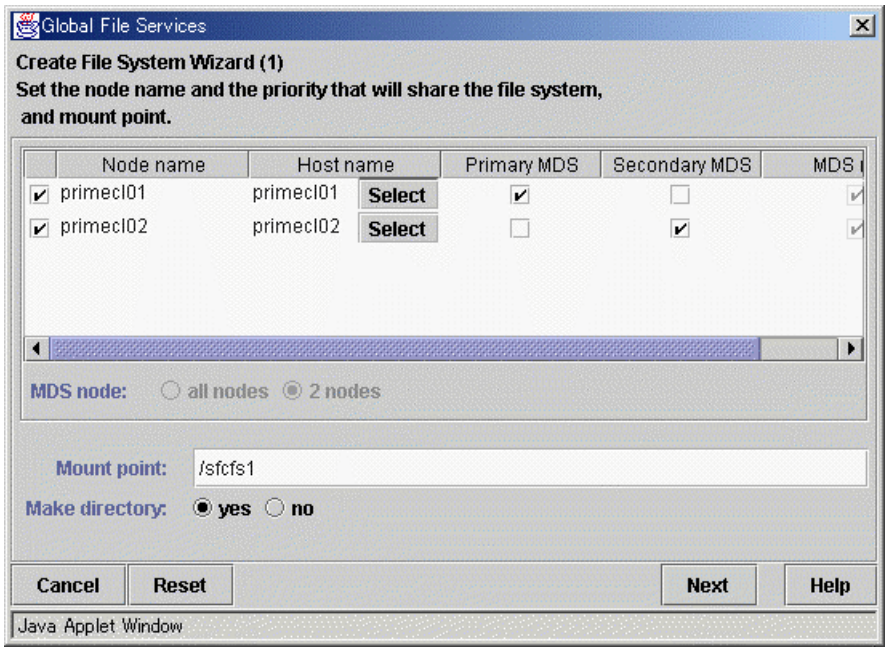
The operations described in procedures 4, 5, and 6 can be set up by using the GUI management view. For details, see 6.4.1 "File System Creation."

6.4.1 File System Creation

This section explains how to create a file system.

◆ Operation Procedure

1. Start the GFS management view.
   Choose Global File Services on the Web-Based Admin screen, select a node from the node list, and then display the main screen of Global File Services.
2. Set up shared information.
   Select *Operation* -> *Create* and then open the “File System Creation Wizard (1).”
   Set up the node information that is to be shared within the file system and then mount the information using the “File System Creation Wizard (1).”



Selecting "Node names"

Select the node names to be shared with "Node Names." You must select two nodes.

Note, that the selection of the local node (displayed node) cannot be canceled.

Selecting a "Host name"

To select a host name other than that which is currently displayed, click the *Select* button and specify the host name of the LAN to be used on each node. Note that two or more host names cannot be specified.

Setting the "Primary MDS" and "Secondary MDS"

Specify the nodes that boot the management server of the shared file system in "Primary MDS" and "Secondary MDS."

Setting the "Mount point" and "Create directory"

Specify the full path for the "Mount point." if you select "Create" from "Create directory," create a directory with the following attributes:

- Owner: root
- Group: sys
- Access authority: 775

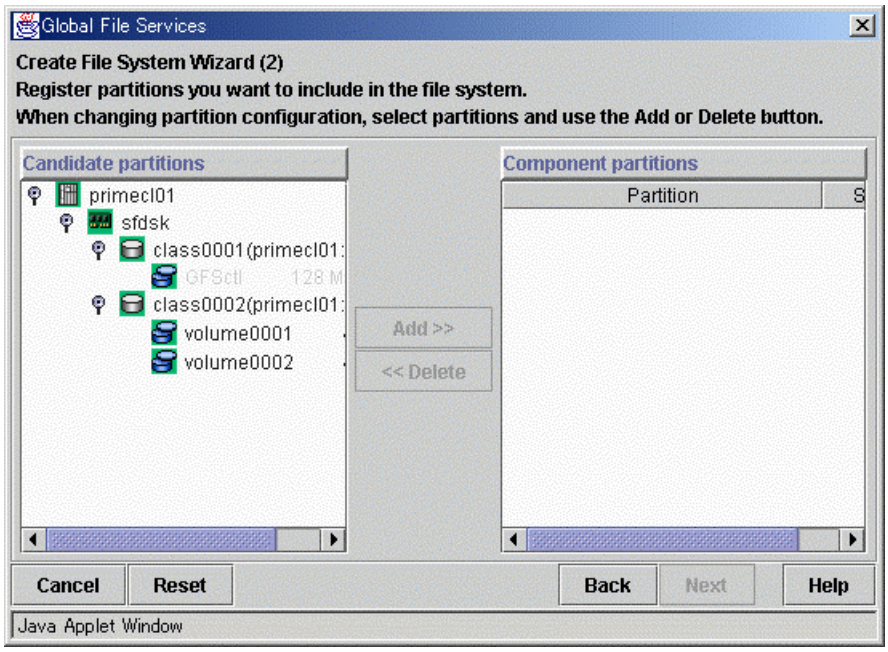
After setting or changing this information, click the *Next* button to open the "File System Creation Wizard (2)."

To return each setup item to its default value, click the *Reset* button.

To stop the processing of the file system creation, click the *Cancel* button.

3. Select the configuration partition.

   Using the "File System Creation Wizard (2)," register the partition that is to be used as the file system.



Select the partition to be used from the [*Candidate partitions*] list and then click the *Add* button.

Only one partition can be selected at a time. A partition that is already being used as a file system or as a management partition cannot be selected.

After the partition has been selected, click the *Next* button to open the “File System Creation Wizard (3).”

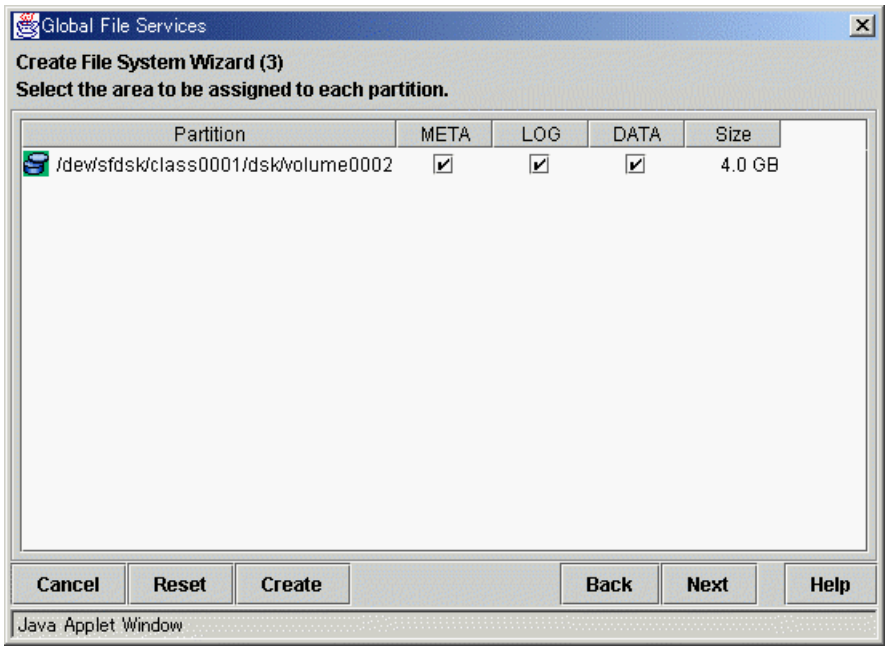
To return to the File System Creation Wizard (1),” click the *Back* button.

To abandon file system creation, click the *Cancel* button.

4. Set up the partition information.

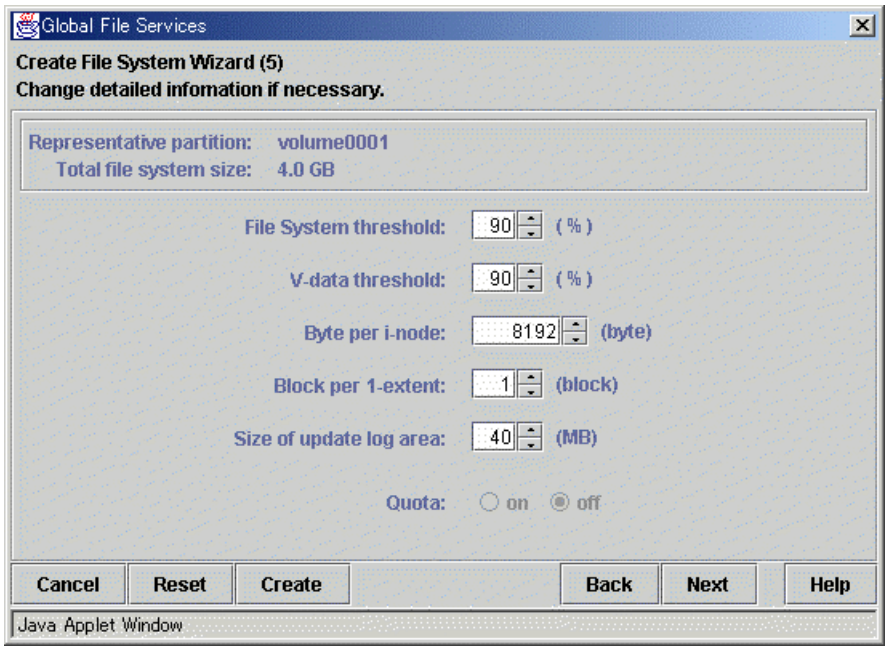
   Using the “File System Creation Wizard (3),” select the meta, log, and data areas that are to be allocated to each of the partitions selected with the “File System Creation Wizard (2).”

   The partition to which the meta data area is allocated is used as the representative partition.



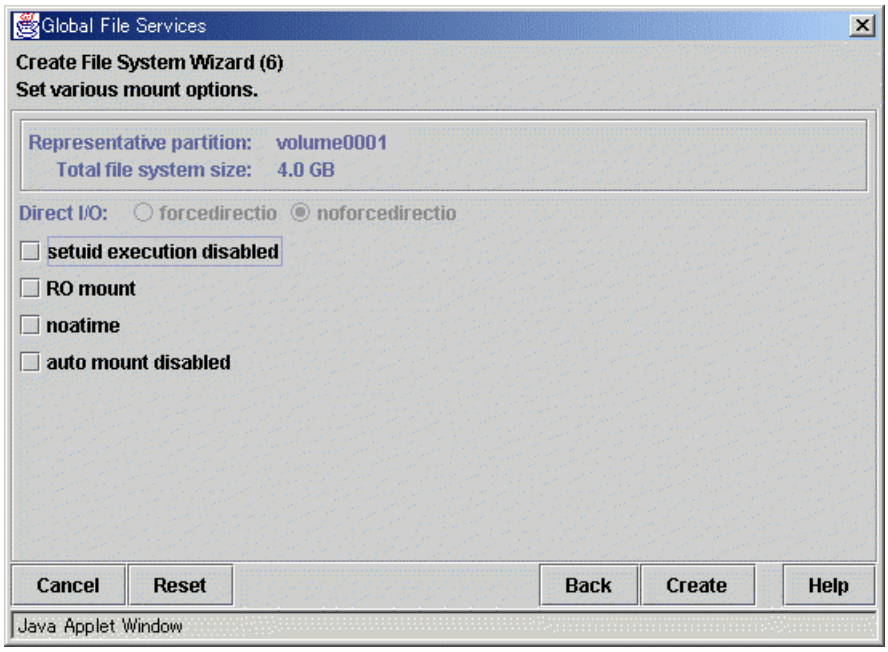
After setting the above information, click the *Next* button to open the “File System Creation Wizard (4)."
No information can be set with the “File System Creation Wizard (4).” Go to the “File System Creation Wizard (5).”
To return each setup item to its default value, click the *Reset* button.
To return to “File System Creation Wizard (2),” click the *Back* button.
To abandon file system creation, click the *Cancel* button.
To create the file system while leaving the default settings of the extended, detailed, and mount information as is, click the *Create* button.

5. Set up the detailed information.
   Set up the “Detailed information” by using the “File System Creation Wizard (5)."



After setting the above information, click the *Next* button to open the “File System Creation Wizard (6).”
To return each setup item to its default value, click the *Reset* button.
To return to the “File System Creation Wizard (4),” click the *Back* button.
To abandon file system creation, click the *Cancel* button.
To create the file system while leaving the default setting of the mount information as is, click the *Create* button.

6. Set up the mount information.
   Set up the “Mount information” by using the “File System Creation Wizard (6).”



After setting the above information, click the *Create* button to create the file system. To return each setup item to its default value, click the *Reset* button.
To return to the “File System Creation Wizard (5),” click the *Back* button.
To abandon file system creation, click the *Cancel* button.

6.5 Setting Up the Application Environment

Configure an environment for the applications to be used in the PRIMECLUSTER system.
The environment configuration for the individual applications may involve registering resources to the PRIMECLUSTER system.
There are also products that require you to set up an environment that uses the shared disk units and takeover networks that were set in this chapter.

See the manuals for the individual applications

6.6 Setting Up Online/Offline Scripts

Create Online and Offline scripts to start and stop ISV applications and user applications in line with the userApplication state transition.
Set the created scripts as Cmdline resources and set those resources in userApplication.
An Online script is started when userApplication is switched to Online.
An Offline script is started when userApplication is switched to Offline.
A Check script is used to monitor the state of the resource that is started or stopped with an Online or Offline script.
This section presents script examples and describes notes on script creation.

■ Sample scripts

This section shows samples of the online and offline scripts, which are set as Cmdline resources.

```
#!/bin/sh
#
# Script.sample
#    Sample of Online/Offline Script
#
# Copyright(c) 2003 FUJITSU LIMITED.
# All rights reserved.
#
# $1 -c : OnlineScript
#    -u : OfflineScript

if [[ $1 = "-c" ]]; then
      # Start your application
elif [[ $1 = "-u" ]]; then
      # Stop your application
else
      # Default operation
      exit 1 # Error
fi
exit 0
```

The above Script sample covers both the Start script and the Stop script.
An example Check script is shown below:

```
#!/bin/sh
#
# Script.sample.check
#    Sample of Check script
#
# Copyright(c) 2003 FUJITSU LIMITED.
# All rights reserved.
#
# Check the current state of target resource.

# If status is Online:
      exit 0
# If status is not Online:
      exit 1
```

Set up the above scripts in the Cmdline resource as shown below:

- Start script $FULL_PATH/Script.sample -c
- Stop script $FULL_PATH/Script.sample -u
- Check script $FULL_PATH/Script.sample.check

For information on how to set up these scripts, see 6.7.3.1 "Setting Up Cmdline Resources."

■ Notes on script creation

● Hot-standby operation

To enable hot-standby operation of the Cmdline resources, the following must be prepared:

- Online/Offline/Check scripts that support hot-standby operation.
- The setting of attributes for the Cmdline resources

1. Create the Online, Offine, and Check scripts to support hot-standby operation. The sample scripts are shown below.

```
#!/bin/sh
#
# Script.sample
#    Sample of Online/Offline Script
#
# Copyright(c) 2003 FUJITSU LIMITED.
# All rights reserved.
#
# $1 -c : OnlineScript
#    -u : OfflineScript

if [[ $1 = "-c" ]]; then
      if [ ${HV_LAST_DET_REPORT} = "Offline" ]; then
            if [ ${HV_INTENDED_STATE} = "Standby" ]; then
                  # commands for Offline -> Standby
            else
                  # commands for Offline -> Online
            fi
      else
            # commands for Standby -> Online
      fi
elif [[ $1 = "-u" ]]; then
      if [ ${HV_LAST_DET_REPORT} = "Standby" ]; then
            # commands for Standby -> Offline
      else
            # commands for Online -> Offline
      fi
else
      # Default operation
      exit 1 # Error
fi
exit 0
```

The following example shows Check script that supports hot-standby operation.

```
#!/bin/sh
#
# Script.sample.check
#    Sample of Check script
#
# Copyright(c) 2003 FUJITSU LIMITED.
# All rights reserved.
#

# Check the current state of target resource.
# If status is Online:
   exit 0
# If status is Standby:
   exit 4
# If status is Faulted:
  exit 2
# If status is Offline:
   exit 1
```

2. Setting attributes for the Cmdline resources
   Enable the STANDBYCAPABLE and the ALLEXITCODES attributes.
   For details, see 6.7.3.1 "Setting Up Cmdline Resources."

- **Online/Offline script exit code**

The state transition process of userApplication changes according to the exit code of the Online/Offline script:

0: Normal exit

The system assumes that the state transition of the Cmdline resource was processed normally, and state transition processing of the userApplication continues. If all the resources of the userApplication are processed normally, the state transition of the userApplication is also processed normally.

Other than 0: Abnormal exit

The system assumes that an error occurred during the state transition of the Cmdline resources and interrupts state transition processing of the userApplication.

- **Check script exit code**

The state of the Cmdline resource is determined by the exit code of Check script. The exit code and the Cmdline resource are associated each other as follows:

0： Indicates the Online state.
Other than 0： Indicates the Offline state.

When ALLEXITCODES variables of the Cmdline resources are enabled, Check script will provide more detailed state of the resource. The exit code and Cmdline resource are associated each other as follows:

0： Indicates the Online state.
1： Indicates the Offline state.
2： Indicates the Fault state.
3： Indicates the Unknown state.

4 : Indicates the Standby state.
For details, see "HELP."

- **Timeout**

If script processing is not completed within the specified time, a timeout occurs, script processing is interrupted by the SIGTERM signal, and state transition ends with an error.
Default: 300 seconds
The timeout value can be specified with the TIMEOUT flag value of the Cmdline resources.
When creating the Cmdline resource, you need to set up a timeout value in "Change the attribute" of 6.7.3.1 "Setting Up Cmdline Resources." If a timeout occurs when a Cmdline resource is used, change the timeout value to an appropriate value according to the instructions in 8.1 "Changing the Cluster Configuration."

- **Environment variables**

When the script is executed, the environment variables shown in the table below are set.

Environment variable	Outline
HV_APPLICATION	This variable sets the userApplication name that the resource belongs to. Example) app1
HV_AUTORECOVER	This variable sets the AUTORECOVER value. For details on AUTORECOVER, see "7 Appendix -Attributes" in "*PRIMECLUSTER RMS Configuration and Administration Guide*." 0: No is set. 1: Yes is set.
HV_FORCED_REQUEST	This variable sets a value that indicates whether or not forced failover was requested by operator intervention. 0: Forced failover was not requested. 1: Forced failover was requested.
HV_NODENAME	This variable contains the resource name. Example) Cmdline0
HV_OFFLINE_REASON	This variable sets the trigger for bringing the resource Offline. SWITCH: The resource was set to Offline because of a userApplication switchover request (hvswitch). STOP: The resource was set to Offline because of a userApplication stop request (hvutil -f) FAULT: The resource was set to Offline because of a resource fault. DEACT: The resource was set to Offline because of a userApplication deactivate request (hvutil –d) SHUT: The resource was set to Offline because of an RMS stop request (hvshut)
HV_SCRIPT_TYPE	This variable sets the type of script that was executed. Online: Online script Offline: Offline script
HV_LAST_DET_REPORT	This variable sets the state of the current resources. Online: Online state Offline: Offline state Standby: Standby state Faulted: Faulted state Warning: Warning state
HV_INTENDED_STATE	This variable sets the resource state that is expected after state transition is completed. Online: Online state Offline: Offline state Standby: Standby state Faulted: Faulted state Warning: Warning state

Environment variable	Outline
NODE_SCRIPTS_TIME_OUT	This variable sets the timeout duration (seconds) of the script. Example) 300

RMS also has other environment variables. For information on the other environment variables, see the files below.

File Names	Contents
hvenv	Environment variable file to be defined in the entire cluster system
hvenv.local	Environment variable file to be defined only in that node

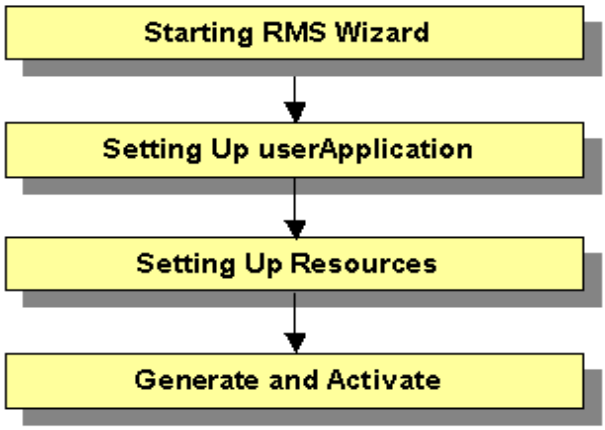
See

- For details on the RMS environment variable files (hvenv and hvenv.local), see "2.8 Environment variables" in "*PRIMECLUSTER RMS Configuration and Administration Guide*."
- For details on the RMS environment variables, see "8 Appendix – Environment variables" in "*PRIMECLUSTER RMS Configuration and Administration Guide*."

6.7 Setting Up Cluster Applications

This section explains how to set up a cluster application.
You can use any one of the nodes of the cluster system for the settings described in this section.

■ Cluster application setup flow



Information

- After you finish setting up the cluster application, start the cluster applications. For instructions on starting the application, see 7.2.2.1 "Starting a Cluster Application."
- For instructions on changing a cluster application, see 8.1 "Changing the Cluster Configuration." For instructions on deleting a cluster application, see 8.6 "Deleting a Cluster Application."

Note

- Set up the cluster application and resources based on the cluster application and resource information in the A.10 "Cluster Application Worksheet," which was created in the planning stage. If you need to change the cluster application after it is created, the worksheet is helpful.
- Generate and Activate process fail if RMS is running. Using ClusterAdmin or hvdisp(1M), you need to confirm that RMS has not started before creating a cluster application. If RMS has already started, stop RMS from ClusterAdmin or execute the “hvshut(1M)“ command to stop RMS on all the nodes of the cluster system. For details on hvdisp(1M) and hvshut(1M), see the pages of these commands respectively.
- Set up “remote file copy” and “remote command execution“ for the RMS Wizard. See the notes on 5.2.1 "Setting Up CF and CIP."
  If the cluster interconnector is not protected by security, cancel the “remote file copy” and “remote command execution” settings on all the cluster nodes after setting up the cluster applications.

6.7.1 Starting RMS Wizard

Execute the hvw command.

The following is an example of starting the RMS Wizard with the configuration file name (testconf):

```
# /opt/SMAW/SMAWRrms/bin/hvw -n testconf
```

6.7.2 Setting Up userApplication

This section explains how to configure a cluster application.

Note that the term “userApplication” has the same meaning as “cluster application.”

◆ Operation Procedure

1. Select “Application-Create” from the "Main RMS management menu."

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                      10) Configuration-Remove
 2) QUIT                      11) Configuration-Freeze
 3) Application-Create        12) Configuration-Thaw
 4) Application-Edit          13) Configuration-Edit-Global-Settings
 5) Application-Remove        14) Configuration-Consistency-Report
 6) Application-Clone         15) Configuration-ScriptExecution
 7) Configuration-Generate    16) Configuration-Push-Disabled
 8) Configuration-Activate    17) RMS-CreateMachine
 9) Configuration-Copy        18) RMS-RemoveMachine
Choose an action: 3
```

2. Select "CRM" from the "Application type selection menu."

```
Creation: Application type selection menu:
1) HELP
2) QUIT
3) RETURN
4) OPTIONS
5) CRM
6) GENERIC
7) ORACLE
Application Type: 5
```

3. Next, "turnkey wizard CRM" will be output. Select "Machines+Basics" and then set up userApplication.

```
Settings of turnkey wizard "CRM"
1) HELP
2) NO-SAVE+EXIT
3) SAVE+EXIT
4) REMOVE+EXIT
5) ApplicationName=APP1
6) Machines+Basics(-)
Choose the setting to process: 6
```

4. The userApplication setup page will appear. Set up the following for the userApplication:
   - Nodes that constitute the userApplication
   - Attributes of the userApplication

   Set up the attributes of the userApplication as follows:
   - Enable the cluster application to automatically start during RMS startup.
     Set "AutoStartUp" to "yes."

— Enable the cluster application to switch over to another node in the event of node shutdown, a node failure, or a resource failure.
Set "AutoSwitchOver" to "HostFailure|ResourceFailure|Shutdown."
— Enable RMS to eliminate the node and complete failover of userApplication if another error arises during failover.

To ensure safe operation, set this to “yes.”

For details on the attributes, see “6 Appendix -Object types” in the “*PRIMECLUSTER RMS Configuration and Administration Guide*.”
After the completion of setup, select "SAVE+EXIT."

Operator intervention requests and error resource messages are displayed only when the AutoStartUp and PersistentFault attributes are set to yes(1). When the operator intervention and error resource messages are to be displayed, set yes(1) for the AutoStartUp and PersistentFault attributes. For information on the operator intervention and error resource messages, see D.4 "Failed Resource and Operator Intervention Messages.”

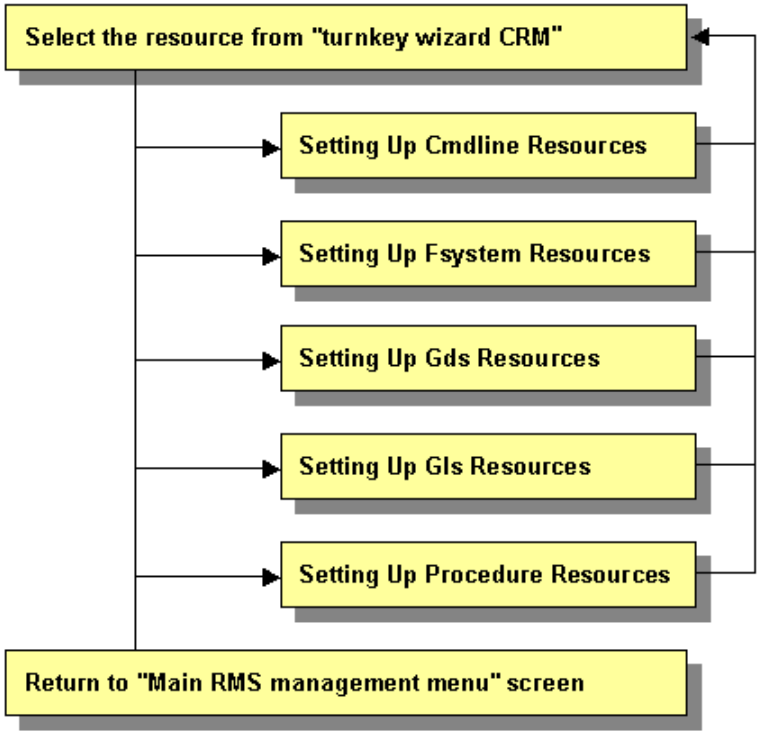
```
Machines+Basics (appl:consistent)
 1) HELP
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) AdditionalMachine
 6) AdditionalConsole
 7) Machines[0]=node1RMS
 8) Machines[1]=node2RMS
 9) (PreCheckScript=)
10) (PreOnlineScript=)
11) (PostOnlineScript=)
12) (PreOfflineScript=)
13) (OfflineDoneScript=)
14) (FaultScript=)
15) (AutoStartUp=yes)
16) (AutoSwitchOver=HostFailure|ResourceFailure|ShutDown)
17) (PreserveState=no)
18) (PersistentFault=0)
19) (ShutdownPriority=)
20) (OnlinePriority=)
21) (StandbyTransitions=)
22) (LicenseToKill=no)
23) (AutoBreak=yes)
Choose the setting to process:
```

6.7.3 Setting Up Resources

This section explains how to register resources to the userApplication that was set up in the previous section.
You can register the following resources:

- Cmdline resources
  You can use Cmdline resources to set up script files or commands as resources. The Cmdline resources are required to generate the state transition of userApplication along with the stop of user applications, and conversely, to start or stop ISV applications or user applications along with the state transition of the userApplication.
- Fsystem resources
  Used when you mount a file system along with userApplication startup.
- Gds resources
  Used when you set up a disk class that is to be defined in a userApplication with Global Disk Services (GDS).
- Gls resources
  Used when you set up a takeover IP address that is to be defined in a userApplication with the redundant line control function, or when you set a takeover IP address in a userApplication with the single line control function.
- Procedure resources
  Used when you register a state transition procedure in the userApplication.

■ Resource setup flow



6.7.3.1 Setting Up Cmdline Resources

This section describes the procedure for creating Cmdline resources.

◆ **Operation Procedure**

1. Select “CommandLines” from "turnkey wizard CRM."

```
Settings of turnkey wizard "CRM"
 1) HELP                          10) LocalFileSystems(-)
 2) -                             11) RemoteFileSystems(-)
 3) SAVE+EXIT                     12) IpAddresses(-)
 4) -                             13) Gds:Global-Disk-Services(-)
 5) ApplicationName=APP1          14) Gls:Global-Link-Services(-)
 6) Machines+Basics(app1)
 7) CommandLines(-)
 8) Controllers(-)
 9) CRM(-)
Choose the setting to process: 9
```

2. "CommandLines" will appear. Select”AdditionalStartCommand.”

```
CommandLines (Cmd_APP1:not yet consistent)
1) HELP                           4) REMOVE+EXIT
2) -                              5) AdditionalStartCommand
3) SAVE+EXIT                      6) (ReturnCodes)
Choose the setting to process: 5
```

3. Select "FREECHOICE" and then enter the full path of the StartCommand. If you need to specify arguments, delimit them with blanks.
   StartCommand is executed during Online processing to start user applications.
   [StartCommand exit codes]
   StartCommand has the following exit codes:
   0: Normal exit. The Online processing is successfully done.
   Other than 0: Abnormal exit. The Online processing fails. When the script exits with the cord other than 0, the resource will enter Faulted.

```
1) HELP
2) RETURN
3) FREECHOICE
Set a start command: 3
       >>
```

4. "CommandLines" will appear. If you need to stop the user programs, select "StopCommands."
   StopCommand is executed during Online processing to stop user applications.
   You do not always have to set up the StopCommand.
   [StopCommand exit codes]
   StopCommand has the following exit codes:
   0: Normal exit. The Online processing is successfully done.
   Other than 0: Abnormal exit. The Offline processing fails. When the script exits with the cord other than 0, the resource will enter Faulted.

   If you do not use StopCommand, start from step 6.

```
CommandLines (Cmd_APP1:consistent)
 1) HELP                          6) StartCommands[0]='xxxx'
 2) -                             7) StopCommands[0]=none
 3) SAVE+EXIT                     8) CheckCommands[0]=none
 4) REMOVE+EXIT                   9) Flags[0]=D
 5) AdditionalStartCommand       10) (ReturnCodes)
Choose the setting to process:
```

5. Select "FREECHOICE" and then enter the full path of StopCommand. If you need to specify arguments, delimit them with blanks.

```
1) HELP
2) RETURN
3) FREECHOICE
4) NONE
Set a start command: 3
      >>
```

6. "CommandLines" will appear. Select ”CheckCommands.”
   CheckCommand is executed periodically to notify RMS of the state of the user applications.
   [CheckCommand exit codes]
   CheckCommand has the following exit codes:
   0: Online.
   Other than 0: Offline.

   If you enable the ALLEXITCODES attribute, the script that is defined in CheckCommand provides more detailed state of the user applications. Change the attribute in step 8.

```
CommandLines (Cmd_APP1:consistent)
 1) HELP                          6) StartCommands[0]='xxxx'
 2) -                             7) StopCommands[0]= 'yyyy'
 3) SAVE+EXIT                     8) CheckCommands[0]=none
 4) REMOVE+EXIT                   9) Flags[0]=D
 5) AdditionalStartCommand       10) (ReturnCodes)
Choose the setting to process:
```

7. Select "FREECHOICE" and then enter the full path of the CheckCommand. If you need to specify arguments, delimit them with blanks.

```
1) HELP
2) RETURN
3) FREECHOICE
4) NONE
Set a start command: 3
      >>
```

8. Change the attribute.
   Change the attribute to suit the purpose. To change the attribute, select ”Flags[0].” For details on the attribute, see “7 Appendix -Attributes” and “HELP” in the “*PRIMECLUSTER RMS Configuration and Administration Guide*.”

If you enable the ”NULLDETECTOR” attribute, CheckCommand is not started from

RMS. For hot-standby operation, enable the following attributes;

- STANDBYCAPABLE
  RMS executes Standby processing of the resources on all nodes where the userApplication is Offline.
- ALLEXITCODES
  Check script provides the detailed state of the resource with the exit code.

For further details about the hot-standby operation settings, see “6.6 Setting Up Online/Offline Scripts."

9. Finally, select ”SAVE+EXIT.”

```
CommandLines (Cmd_APP1:consistent)
 1) HELP                          6) StartCommands[0]='xxxx'
 2) -                             7) StopCommands[0]=none
 3) SAVE+EXIT                     8) CheckCommands[0]=none
 4) REMOVE+EXIT                   9) Flags[0]=D
 5) AdditionalStartCommand       10) (ReturnCodes)
Choose the setting to process:
```

6.7.3.2 Setting Up Fsystem Resources

Set up an Fsystem resource if you want to mount a file system when userApplication is started. To control multiple mount points in parent-child relationships, create the file system as one Fsystem resource.

[Prerequisites]

Enable the Fsystem resources using the following steps:

1. Define the mount point, which is to be used as a resource, in /etc/fstab on all the nodes where userApplication might run. Each line must begin with “RMS."
   (Example) When you define (add) two mount points in /etc/fstab

```
#RMS#/dev/sdd1        /mnt/swdsk1          ext3    defaults        1 2
#RMS#/dev/sdd2        /mnt/swdsk2          ext3    defaults        1 2
```

   If you create a file system from the GDS setup page, the mount point is created. Each line of the mount point that is defined with the GDS must begin with “RMS."
   (Example) When two mount points have been defined in /etc/fstab.

```
#RMS#/dev/sfdsk/class0001/dsk/volume0001 /mnt/swdsk1 ext3 noauto 0 0
#RMS#/dev/sfdsk/class0001/dsk/volume0002 /mnt/swdsk2 ext3 noauto 0 0
```

2. Construct a file system on the disk partition that is to be used as a resource.
   (Example) When you create an ext3 file system.

```
# /sbin/mkfs -t ext2 /dev/sdd1
# /sbin/tune2fs -j /dev/sdd1
```

   Confirm on each node that the file system can be mounted.
   (Example) When you check the mounting.

```
# /bin/mount -t ext3 /dev/sdd1 /mnt/swdsk1
# /bin/umount /mnt/swdsk1
```

◆ **Operation Procedure**

1. Select "LocalFileSystems" from "turnkey wizard CRM."

```
Settings of turnkey wizard "CRM"
 1) HELP                              9) CRM(-)
 2) -                                10) LocalFileSystems(-)
 3) SAVE+EXIT                        11) RemoteFileSystems(-)
 4) -                                12) IpAddresses(-)
 5) ApplicationName=APP1             13) RawDisks(-)
 6) Machines+Basics(app1)            14) LVM-VolumeManagement(-)
 7) CommandLines(-)                  15) Gds:Global-Disk-Services(-)
 8) Controllers(-)                   16) Gls:Global-Link-Services(-)
Choose the setting to process: 10
```

2. Select "AdditionalMountPoint."

```
File systems (Lfs_APP1:not yet consistent)
1) HELP              4) REMOVE+EXIT            7) (Timeout=180)
2) -                 5) AdditionalMountPoint
3) SAVE+EXIT         6) (Filter=)
Choose the setting to process: 5
```

3. The mount point, which is defined in /etc/fstab, will appear. Select a mount point to be registered in userApplication.

```
1) HELP                               6) /mnt/swdsk2
2) RETURN
3) FREECHOICE
4) ALL
5) /mnt/swdsk1
Choose a mount point: 5
```

4. Select "SAVE+RETURN."
   If you register multiple mount points, repeat steps 2 to 4 for each mount point.

```
Set flags for mount point: /mnt/swdsk1 Currently set: LOCAL,AUTORECOVER (LA)
1) HELP               4) DEFAULT               7) SHARE(S)
2) -                  5) SYNC(Y)               8) MONITORONLY(M)
3) SAVE+RETURN        6) NOT:AUTORECOVER(A)
Choose one of the flags: 3
```

5. Select "SAVE+EXIT."

```
File systems (Lfs_APP1:consistent)
1) HELP                              5) AdditionalMountPoint
2) -                                 6) MountPoints[0]=L:/mnt/swdsk1
3) SAVE+EXIT                         7) (Filter=)
4) REMOVE+EXIT                       8) (Timeout=180)
Choose the setting to process: 3
```

6.7.3.3 Setting Up Gds Resources

[Prerequisites]

If you need to set up a Gds resource, you must first set up a shared volume.
Also, execute the following command on any one of the nodes before setting the Gds resource, and then bring the shared volume offline.

```
# /usr/opt/reliant/bin/hvgdsetup -a [class-name]
```

◆ **Operation Procedure**

1. Select "Gds:Global-Disk-Services" from "turnkey wizard CRM."

```
Settings of turnkey wizard "CRM"
 1) HELP                              9) CRM(-)
 2) -                                10) LocalFileSystems(-)
 3) SAVE+EXIT                        11) RemoteFileSystems(-)
 4) -                                12) IpAddresses(-)
 5) ApplicationName=APP2             13) RawDisks(-)
 6) Machines+Basics(app2)            14) LVM-VolumeManagement(-)
 7) CommandLines(-)                  15) Gds:Global-Disk-Services(-)
 8) Controllers(-)                   16) Gls:Global-Link-Services(-)
 Choose the setting to process: 15
```

2. Select "AdditionalDiskClass" from "Volume management."
   If you want to register multiple resources, repeat steps 2 to 3 for each resource.
   Example of registering the class [CL] of the shared volume in userApplication:

```
Volume management (Gds_APP1:not yet consistent)
1) HELP               4) REMOVE+EXIT          7) (AutoRecover=no)
2) -                  5) AdditionalDiskClass  8) (Timeout=1800)
3) SAVE+EXIT          6) (ClassNameFilter=)
Choose the setting to process: 5
```

3. A list of the cluster resources that can be registered in userApplication appears.
   Select the cluster resource.

```
1) HELP
2) RETURN
3) FREECHOICE
4) CL
Choose the disk class: 4
```

4. Select "SAVE+EXIT."

```
Volume management (Gds_APP1:consistent)
1) HELP               4) REMOVE+EXIT          7) (ClassNameFilter=)
2) -                  5) AdditionalDiskClass  8) (AutoRecover=no)
3) SAVE+EXIT          6) DiskClasses[0]=CL    9) (Timeout=1800)
Choose the setting to process: 3
```

6.7.3.4 Setting Up Gls Resources

[Prerequisites]

Before setting up the Gls resources, you must first register the virtual interfaces and takeover resources. For details, see "*PRIMECLUSTER Global Link Services Configuration and Administration Guide: Redundant Line Control Function*."

◆ Operation Procedure

1. Select "Gls" from "turnkey wizard CRM."

```
Settings of turnkey wizard "CRM"
 1) HELP                          9) CRM(-)
 2) -                            10) LocalFileSystems(-)
 3) SAVE+EXIT                    11) RemoteFileSystems(-)
 4) -                            12) IpAddresses(-)
 5) ApplicationName=APP2         13) RawDisks(-)
 6) Machines+Basics(app2)        14) LVM-VolumeManagement(-)
 7) CommandLines(-)              15) Gds:Global-Disk-Services(-)
 8) Controllers(-)               16) Gls:Global-Link-Services(-)
 Choose the setting to process: 16
```

2. Select "AdditionalTakeoverIpaddress" and then set the takeover IP address.
   If you need to register multiple resources, repeat steps 2 to 4 for each resource.

```
Gls (Gls_APP1:not yet consistent)
 1) HELP                          4) REMOVE+EXIT
 2) -                             5) AdditionalTakeoverIpaddress
 3) SAVE+EXIT                     6) (Timeout=60)
Choose the setting to process: 5
```

3. The takeover resources (takeover IP addresses) are displayed as options.
   Select one.

```
 1) HELP
 2) RETURN
 3) FREECHOICE
 4) 192.168.1.100
Choose a takeover IP address for Gls: 4
```

4. Set up the operation mode of the resource.
   The operation modes of the resources are "AUTORECOVER(A)" (selective value) and "NOT:AUTORECOVER(N)" (default value). If you select "SAVE+RETURN," the default value "NOT:AUTORECOVER(N)" is set. Select "SAVE+RETURN" as is.

```
Set a flag for takeover IP address: 192.168.1.100
Currently set:
 1) HELP                          5) AUTORECOVER(A)
 2) -
 3) SAVE+RETURN
 4) DEFAULT
 Choose additonally one of the flags: 3
```

5. To save the Gls resource settings and then exit, select “SAVE+EXIT.”
   You can change the timeout value of the GLS resource by selecting "(Timeout=60)" and setting any value (seconds).

```
Gls (Gls_APP1:consistent)
 1) HELP                          5) AdditionalTakeoverIpaddress
 2) -                             6) TakeoverIpaddress[0]=N,192.168.1.100
 3) SAVE+EXIT                     7) (Timeout=60)
 4) REMOVE+EXIT
Choose the setting to process: 3
```

6.7.3.5 Setting Up Procedure Resources

The procedure resource setting is used to register the state transition procedure resource of the products supported by PRIMECLUSTER in userApplication.

[Prerequisites]

To create a procedure resource, you must first create a state transition procedure and register the procedure to the resource database.
For details, see E.1 ”Registering a Procedure Resource.”

◆ **Operation Procedure:**

1. Select “CRM” from "turnkey wizard CRM."

```
Settings of turnkey wizard "CRM"
 1) HELP                        10) LocalFileSystems(-)
 2) -                           11) RemoteFileSystems(-)
 3) SAVE+EXIT                   12) IpAddresses(-)
 4) -                           13) Gds:Global-Disk-Services(-)
 5) ApplicationName=APP1        14) Gls:Global-Link-Services(-)
 6) Machines+Basics(app1)
 7) CommandLines(-)
 8) Controllers(-)
 9) CRM(-)
Choose the setting to process: 9
```

2. "Crm" will appear. Select the resource class of the resource.
   When the cluster resource is to be registered in the userApplication, select the resource class name for the cluster resource.
   The following shows an example of registering a cluster resource of the BasicApplication class in the userApplication:

```
Crm (CRM_APP1:not yet consistent)
 1) HELP
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) SystemState2(-)
 6) SystemState3(-)
 7) BasicApplication(-)
 8) Application(-)
Choose the setting to process: 7
```

3. Select "AdditionalResource" from "Application detail Resource wizard."
   To register multiple resources, execute steps 3 to 5 for each resource.

```
Application detail Resource wizard
1) HELP
2) NO-SAVE+RETURN
3) -
4) REMOVE+RETURN
5) AdditionalResource
Choose the setting to process: 5
```

4. The list of cluster resources will appear. Select one.

If a cluster resource does not appear on this screen, it indicates that the cluster resource has not been registered in the resource database. Confirm whether the cluster resource has been registered on each node of the userApplication, which is designed with 6.7.2 “Setting Up userApplication.” Register cluster resources if they

are not registered. For details on the clgettree(1) command, see the manual pages this command. For details on registering the cluster resource in the resource database, see E.1 ”Registering a Procedure Resource.”

```
1) HELP
2) RETURN
3) -
4) rscl
Choose the resource: 4
```

5. You can change the following on this screen. If necessary, select "SAVE+RETURN" from "Application detail Resource wizard" after that.
   - Timeout value of the state transition procedure
     The default value is 1,800 seconds. If you use a machine that requires more than 1800 seconds for timeout, you need to change the value by selecting "Flags[0]=OT1800."
   - Priority within the resource class
     The default value is specified by –p option when the state transition procedure resource is registered with the “claddprocrsc(1M)” command. If the –p option is not specified, 65535 is used as the default value. If you register multiple resources of the same class in the cluster application and specify the order of online and offline, change this value by selecting "Priority[0]=65535" from the following screen. The resources will be online in the ascending order, and will be offline in the descending order.

```
Application detail Resource wizard
1) HELP
2) NO-SAVE+RETURN
3) SAVE+RETURN
4) REMOVE+RETURN
5) AdditionalResource
6) ResourceName[0]=rscl
7) Flags[0]=OT1800
8) Priority[0]=65535
Choose the setting to process: 3
```

6.7.4 Generate and Activate

This section explains how to execute Generate and Activate. You need to confirm first that the cluster application has been correctly created.

◆ **Operation Procedure:**

1. Select "Configuration-Generate" from the "Main RMS management menu."

```
nodel: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                      10) Configuration-Remove
 2) QUIT                      11) Configuration-Freeze
 3) Application-Create        12) Configuration-Thaw
 4) Application-Edit          13) Configuration-Edit-Global-Settings
 5) Application-Remove        14) Configuration-Consistency-Report
 6) Application-Clone         15) Configuration-ScriptExecution
 7) Configuration-Generate    16) Configuration-Push-Disabled
 8) Configuration-Activate    17) RMS-CreateMachine
 9) Configuration-Copy        18) RMS-RemoveMachine
Choose an action: 7
```

2. Select “Configuration-Activate” from the "Main RMS management menu."

```
nodel: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                      10) Configuration-Remove
 2) QUIT                      11) Configuration-Freeze
 3) Application-Create        12) Configuration-Thaw
 4) Application-Edit          13) Configuration-Edit-Global-Settings
 5) Application-Remove        14) Configuration-Consistency-Report
 6) Application-Clone         15) Configuration-ScriptExecution
 7) Configuration-Generate    16) Configuration-Push-Disabled
 8) Configuration-Activate    17) RMS-CreateMachine
 9) Configuration-Copy        18) RMS-RemoveMachine
Choose an action: 8
```

6.7.5 Attributes

See

For information on the attributes, see "6 Appendix -Object types " in the "*PRIMECLUSTER RMS Configuration and Administration Guide*. "

Part 3 Operations

Chapter 7 Operations

This chapter describes the functions that manage PRIMECLUSTER system operations.
The following user groups are allowed to do each specific operation:

- Viewing the PRIMECLUSTER system operation management screens (All user groups)
- Operating the PRIMECLUSTER system (wvroot, clroot, cladmin)
- Monitoring the PRIMECLUSTER system (All user groups)
- Actions to take if the state of a resource changes (wvroot, clroot, cladmin)

7.1 Viewing the PRIMECLUSTER System Operation Management Screens

PRIMECLUSTER provides GUIs for viewing and performing cluster system operations.

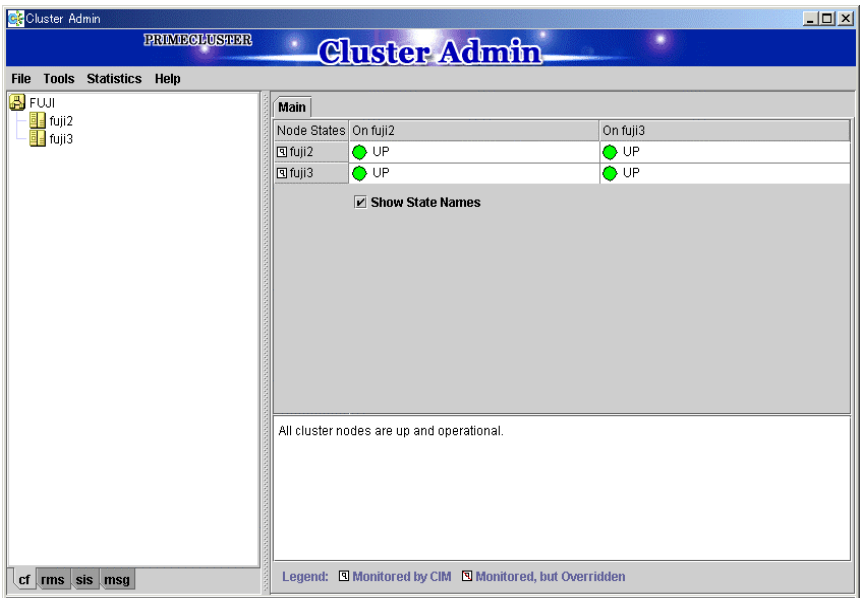
- CF main window
  Use this screen to set up the configuration of the nodes that make up the cluster, manage the nodes, and display the node state.
- RMS main window
  Use this screen to monitor the state of the cluster system and to manage cluster applications and resources.
- MSG main window
  This screen displays messages for cluster control.

See

For instructions on displaying each screen, see 4.3.3 "Cluster Admin Functions."

7.1.1 CF Main Window

The CF main window allows you to set up the configuration of the cluster nodes in the cluster, manage the nodes, and display the node state.



See

For details, see "5 GUI administration" in "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."

7.1.2 RMS Main Window

The RMS main window consists of the following elements:

- RMS tree
- Configuration information or object attributes
- Switchlogs and application logs

7.1.2.1 RMS Tree

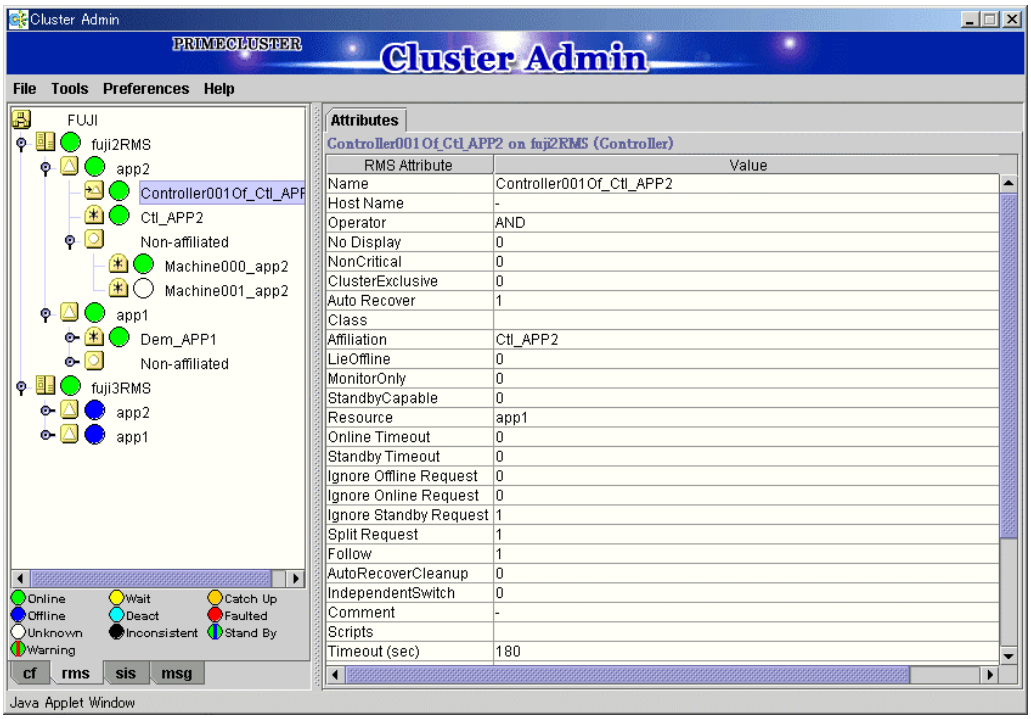
The RMS tree displays the configuration information of the cluster in a hierarchical format. The tree has the following levels:

- Root of the tree - Represents the cluster.
- First level - Represents the system nodes in the cluster.
- Second level - Represents the userApplication objects running on each of the system nodes.
- Third level - Represents the sub-applications (an aggregation of objects if any exist).
- Fourth level - Represents the resources required for each of the sub-applications.

If an application has sub-applications, the fourth level represents resources used by that sub-application. If an application does not have sub-applications, then the third level represents all the resources used by userApplication.

Dependency relationships between cluster applications are indicated by controller objects in the RMS tree.

RMS main window



■ Meanings of object icons

Icon	Meaning
	Represents the cluster.
	Represents a node.
	Represents a parent object (cluster application) that has a child object.
	Represents a child object (cluster application or resource).
	Represents a leaf object (cluster application or resource). A leaf object is an object that cannot have a child object.
	Represents a controller object (cluster application). This object controls an object of another cluster application.

■ Meanings of state display icons

On the right side of the object icons shown above is displayed a color-coded circle that indicates the state of each object. This section describes the meaning of the colored circles (state display icons).

State display icons are not displayed in cluster icons. Instead, the RMS cluster table can be displayed. For details, see 7.3.3 "Concurrent Viewing of Node and Cluster Application States."

◆ Node state display

The state icons that are displayed in nodes are shown below.

Icon	Icon color	Outline	Details
 Node	Green	Online	Node is enabled and ready for use.
	Blue	Offline	Node is disabled and should not be used.
	Red	Faulted	Node encountered an error condition.
	Yellow	Wait	Node is undergoing a state transition.

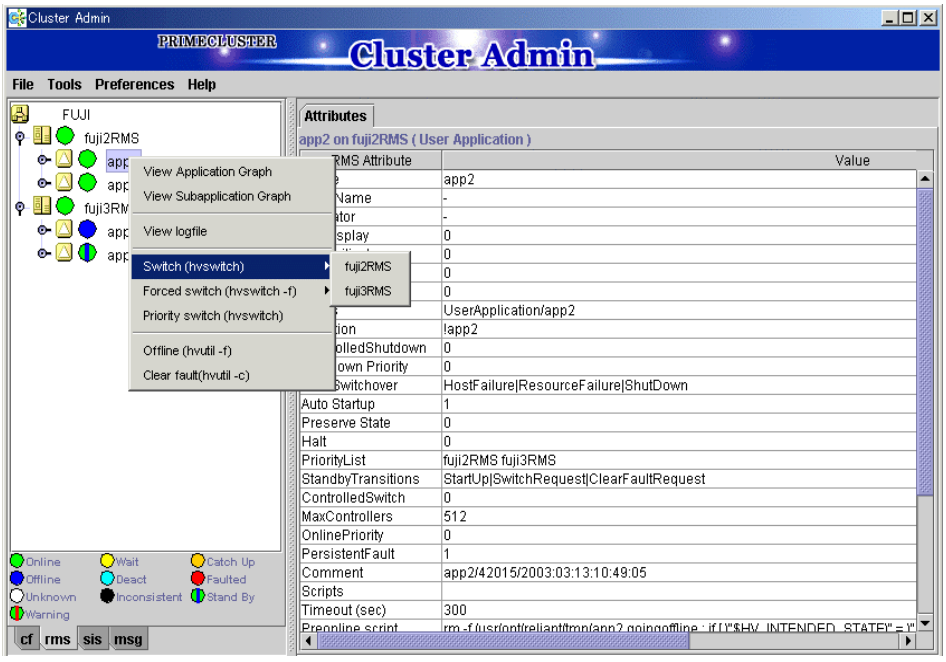
◆ State display of other objects

The following state icons are displayed with object icons that fall under parent objects.

Icon	Icon color	Outline	Details
Parent object	Green	Online	Object is enabled and ready for use.
	Green with vertical red lines	Warning	Object has exceeded some warning threshold.
Child object	Blue	Offline	Object is disabled and should not be used.
	Red	Faulted	Object encountered an error condition.
Controller object	White	Unknown	Monitoring and control are not being executed for the object.
	Yellow	Wait	Node is undergoing a state transition.
Leaf object	Sky blue	Deact	Node is deactivated because of maintenance, etc.
	Black	Inconsistent	Node state is inconsistent.
	Green with vertical blue lines	Stand By	Object is in such a state that it can be quickly brought Online when needed

■ Pop-up menu

If you right-click an object in the RMS tree, a pop-up menu lists the operations for that object. You can also use this menu for monitoring the state.

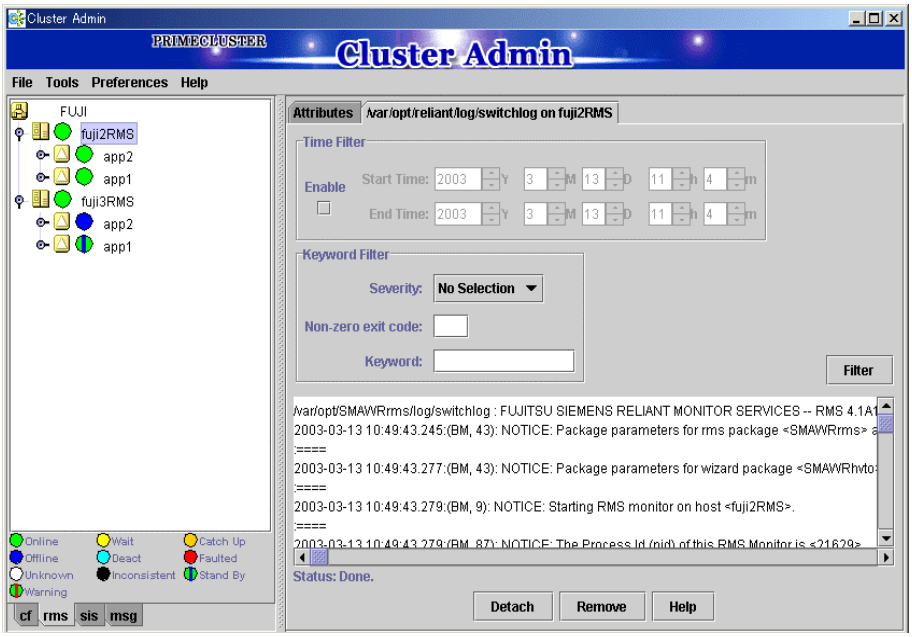


7.1.2.2 Configuration information or object attributes

View the configuration information for the individual objects by left-clicking the object in the RMS tree. The properties are displayed in a tabular format on the right-hand side panel of the RMS main window.

7.1.2.3 Switchlogs and application logs

Each node has a log file referred to as the switchlog. In this file, switchover requests and node failures are recorded. The switchlog is displayed in a tab on the right-side panel.
Display the application log by right-clicking on an application on the RMS tree and choosing *View Application Log*.



7.2 Operating the PRIMECLUSTER System

7.2.1 RMS Operation

To monitor RMS, RMS needs to be activated.
To stop multiple nodes at the same time, you must stop the user applications and RMS.

To stop two or more nodes at the same time, it is necessary to first stop RMS.
Note that the user application is also stopped when you stop RMS. For instructions on stopping RMS, see 7.2.1.2 "Stopping RMS."

The sections below explain how to start and stop RMS.

7.2.1.1 Starting RMS

This section explains how to start RMS.

◆ **Operation Procedure:**

From the top screen of Web-Based Admin View, open Cluster Admin according to the following procedure:

1. Select Global Cluster Services.
2. Click *Cluster Admin* to switch to the cluster menu.
3. Select the *rms* tab.
4. Start RMS.
   1) Use the *Tools* pull-down menu of the RMS main window, and click *Start RMS -> all available nodes*. When the confirmation screen is displayed, click *Ok*.
   2) To specify an option for the RMS start command, click the *Option* box.

   You can also start RMS on one or all nodes using the command pop-up as follows:
   1) Choose either one node or all the nodes from the pop-up window.
   2) To specify an option for the RMS start command, click the *Option* box.

See "4.3.1 Starting RMS" in "*PRIMECLUSTER RMS Configuration and Administration Guide*."

7.2.1.2 Stopping RMS

This section explains how to stop RMS.

◆ **Operation Procedure:**

1. When a node on which a cluster application is running is to be stopped, first switch over the cluster application.
   See 7.2.2.3 "Switching a Cluster Application."

Skip this step if you don't need to switch over a cluster application.

2. Use the *Tool* pull-down menu on the RMS main window or right-click the system node, and then select the shutdown mode on the screen that appears next.
   1) Choose either a specific node or all the nodes.
   2) Choose to stop all cluster applications, leave the applications running, or forcibly shut down the node(s).

See

See "4.3.2 Stopping RMS" in "*PRIMECLUSTER RMS Configuration and Administration Guide*."

7.2.2 Cluster Application Operations

This section explains how to change the operation state of the PRIMECLUSTER system. The operations include starting and stopping a cluster application.

7.2.2.1 Starting a Cluster Application

The procedure for starting a cluster application is described below.

◆ **Operation Procedure:**

1. On the RMS tree in the RMS main window, right-click the cluster application to be started, and select *Online* from the pop-up menu that is displayed.
   The cluster application will start.

Information

You can also display the pop-up menu by right-clicking the target icon in an RMS graph or the RMS cluster table. For details on RMS graphs and the RMS cluster table, see 7.3.5 "Viewing Detailed Resource Information" and 7.3.3 "Concurrent Viewing of Node and Cluster Application States."

7.2.2.2 Stopping a Cluster Application

The procedure for stopping a cluster application is described below.

◆ **Operation Procedure:**

1. To stop a running cluster application, first switch over the cluster application.
   See 7.2.2.3 "Switching a Cluster Application."

Note

Skip this step if you don't need to switch over a cluster application.

2. On the RMS tree in the RMS main window, right-click the cluster application to be stopped, and select *Offline* from the displayed pop-up menu.
   The cluster application will stop.

Information

You can also display the pop-up menu by right-clicking the target icon in an RMS graph or the RMS cluster table. For details on RMS graphs and the RMS cluster table, see 7.3.5 "Viewing Detailed Resource Information" and 7.3.3 "Concurrent Viewing of Node and

Cluster Application States."

7.2.2.3 Switching a Cluster Application

The procedure for switching a cluster application is described below.

◆ **Operation Procedure:**

1. Right-click on the application object and select the *Switch* menu option.
   A pull-down menu appears listing the available nodes for switchover.
2. Select the target node from the pull-down menu to switch the application to that node.

You can also display the pop-up menu by right-clicking the target icon in an RMS graph or the RMS cluster table. For details on RMS graphs and the RMS cluster table, see 7.3.5 "Viewing Detailed Resource Information" and 7.3.3 "Concurrent Viewing of Node and Cluster Application States."

7.2.2.4 Bringing Faulted Cluster Application to Online State

The procedure for bringing a Faulted cluster application to Online is described below

◆ **Operation Procedure:**

1. Right-click on the cluster application object in the RMS tree, and select *Clear Fault*.
   If you clear Fault while the cluster application is Online, RMS brings the faulted resource Online.
   If you clear Fault while the cluster application is Offline, RMS brings the faulted resource Offline.

You can also display the pop-up menu by right-clicking the target icon in an RMS graph or the RMS cluster table. For details on RMS graphs and the RMS cluster table, see 7.3.5 "Viewing Detailed Resource Information" and 7.3.3 "Concurrent Viewing of Node and Cluster Application States."

7.2.2.5 Clearing the Wait State of a Node

The procedure for clearing the Wait state of a node is described below.

◆ **Operation Procedure:**

1. Right-click on the system node and select the “*Online*“ or “*Offline*“ option from the pop-up menu.

If you clear the Wait state of a system node manually with the GUI, hvutil -u SysNode, or cftool –k, then RMS, SF, and CF assumes that you have already checked that the target node is stopped.
If you clear the Wait state when the node has not been stopped, this may lead to the data corruption.

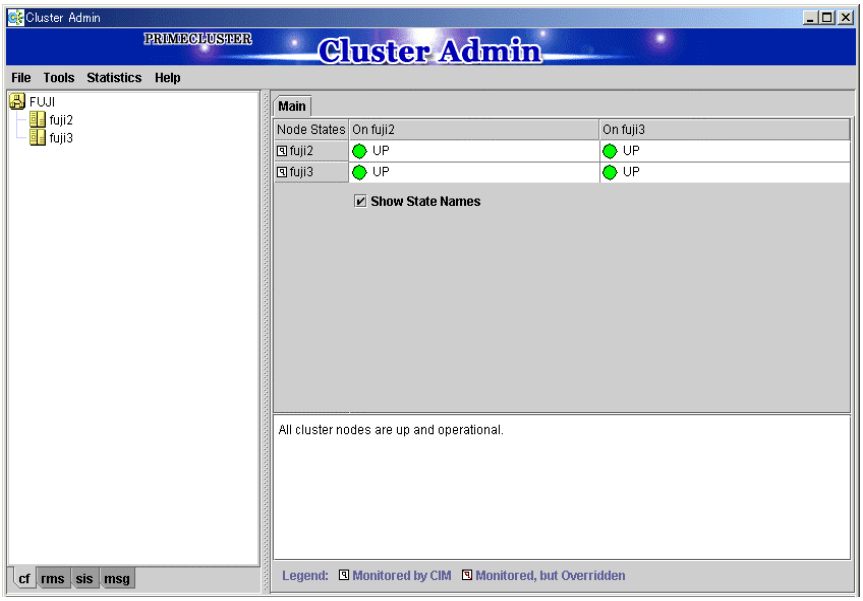
You can also display the pop-up menu by right-clicking the target icon in an RMS graph or the RMS cluster table. For details on RMS graphs and the RMS cluster table, see 7.3.5 "Viewing Detailed Resource Information" and 7.3.3 "Concurrent Viewing of Node and Cluster Application States."

7.3 Monitoring the PRIMECLUSTER System

This section describes how to monitor the state of a cluster application or node from the Cluster Admin screen.

7.3.1 Monitoring the State of a Node

Click a node on the CF tree. The node state will appear in the right panel.

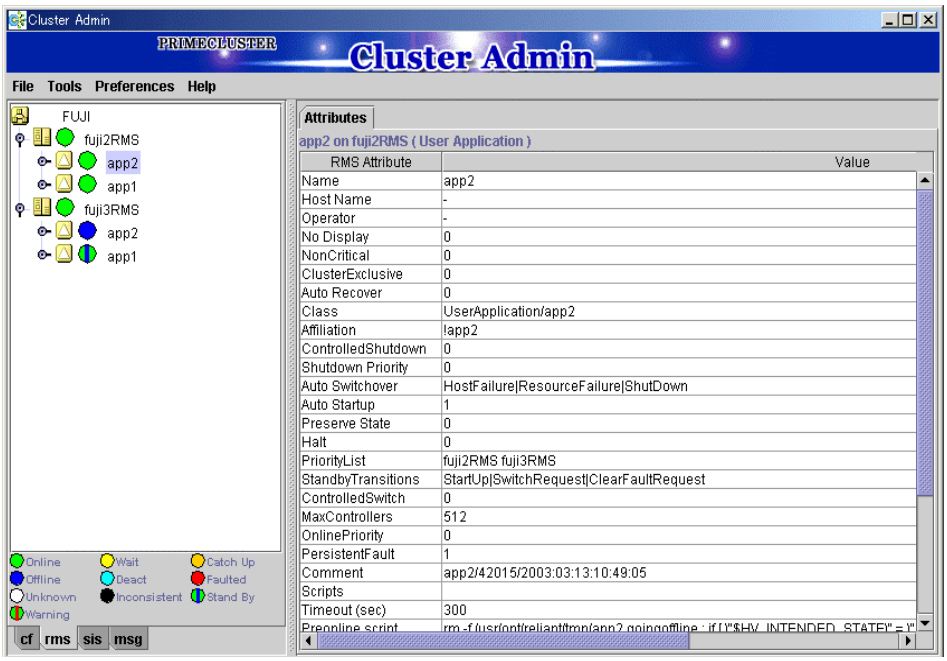


The node indicates one of the following states;

- States
  - UP: The node is running as part of the cluster system.
  - DOWN: The node is down and not in the cluster.
  - UNKNOWN: The node state is unknown.
  - LEFTCLUSTER: The node state is unknown since nodes are not connected each other.

7.3.2 Monitoring the State of a Cluster Application

When you display a cluster application in an RMS tree, the cluster application state appears to the right of the icon. The right panel displays the properties of the cluster application.



The cluster application shows one of the following states:

- Online
- Offline
- Unknown
- Wait
- Deact
- Inconsistent
- Faulted
- Stand By

See

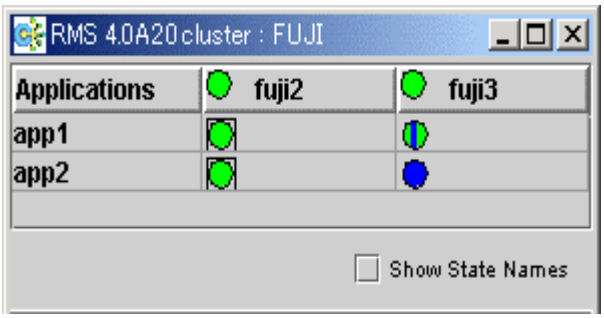
See "State display of other objects" in 7.1.2.1 "RMS Tree."

7.3.3 Concurrent Viewing of Node and Cluster Application States

To view the states of the nodes and cluster applications concurrently, display the RMS cluster table.

Right-click the cluster icon on the RMS tree, and select *View Cluster Wide Table* from the displayed pop-up menu. The RMS cluster table is displayed as shown below.

- **RMS clusterwide table**



The first line shows the names of the nodes that RMS is managing (fuji2 and fuji3 in the example above). To the left of each node name is a state display icon that shows the state of that node. The second and subsequent lines show the names of all cluster applications that RMS is managing and the states of those applications.
The RMS cluster table enables you to display the states of nodes and cluster applications in one table.

- **Viewing the RMS Cluster Table**

If the background color of the cluster application name is the same as that of the background of the window

It indicates that the cluster application is online.

If the background of the cluster application name is pink

This condition indicates that the cluster application is in the Faulted state and a failure has occurred in one or more SysNode.

If the background of the cluster application name is sky blue

This condition indicates that the cluster application is in the Offline state.

If the state display icon of a cluster application is enclosed in a rectangle

This condition indicates that the node has the highest priority among those nodes that configure the cluster application. If the cluster application is started after creating the cluster application, the node in a rectangle will be in the online state.

Displaying/hiding state names

Select the *Show State Names* checkbox to display state names to the right of the state display icons.

For details on the RMS cluster table, see “4.2.6 RMS clusterwide table" in "*PRIMECLUSTER RMS Configuration and Administration Guide*."

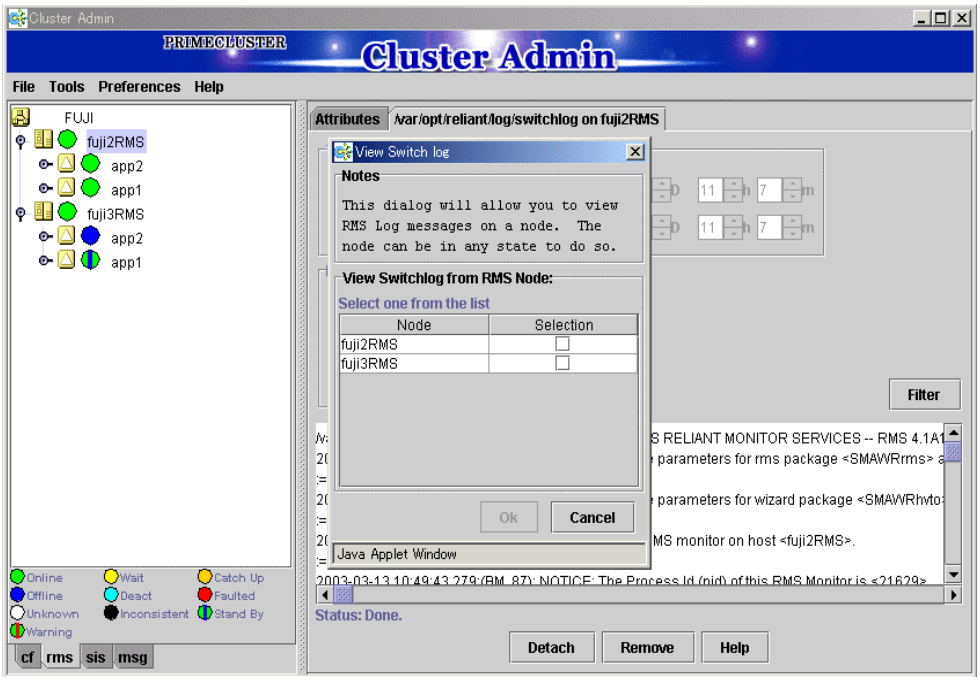
7.3.4 Viewing Logs Created by the PRIMECLUSTER System

There are two types of logs that can be viewed in the PRIMECLUSTER system:

- Switchlog
  The switchover requests or failures that occur in nodes are displayed.
- Application log
  The operation log of the cluster application is displayed.

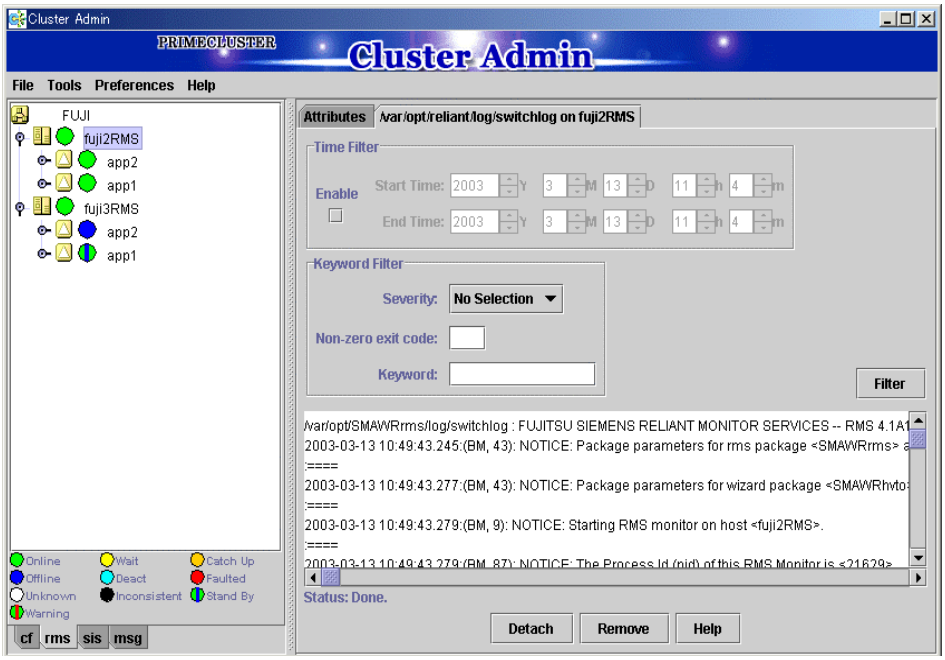
7.3.4.1 Viewing switchlogs

Right-click the system node and select the *View Switchlog* option from the pop-up menu. The switchlog is displayed on the right side of the screen.



7.3.4.2 Viewing application logs

Right-click an application on the RMS tree and choose *View Log File*. The application log for that application will be displayed on the right side of the screen.



Information

The following display formats are enabled for the log. For details, see "4 Administration" in "*PRIMECLUSTER RMS Configuration and Administration Guide*."

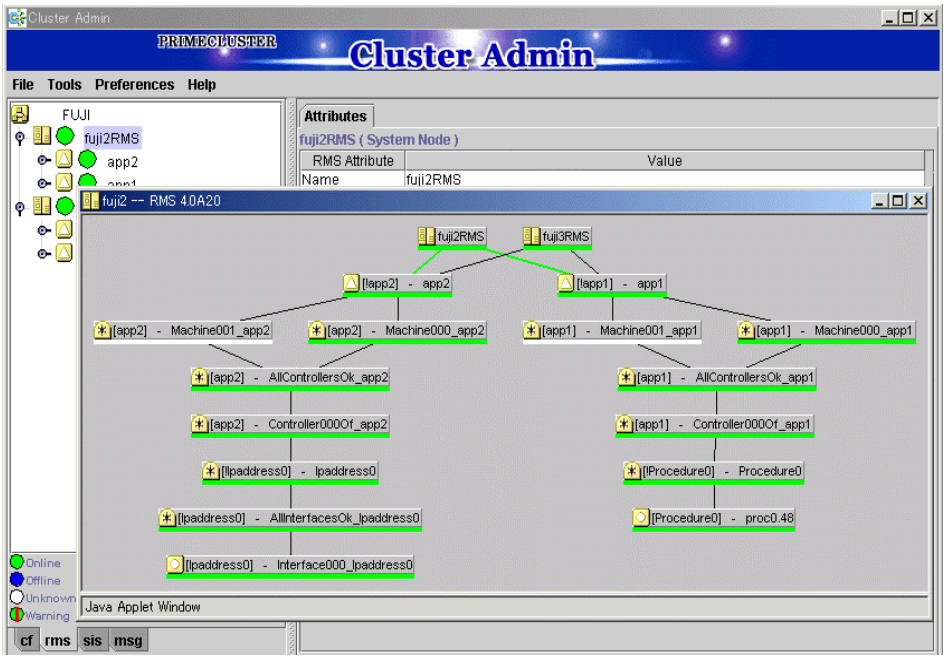
- Narrow the log by date or keyword.
- Scroll or jump to any entry.
- Search by keyword, date range, error message significance, or exit code other than 0 to exclude unrelated entries.

7.3.5 Viewing Detailed Resource Information

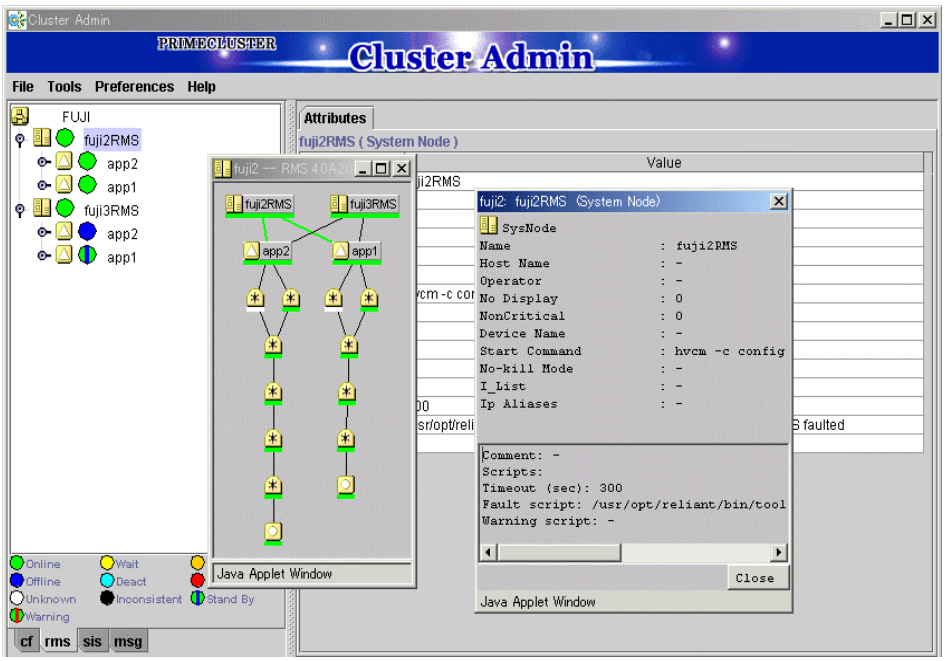
Use RMS graphs to display detailed resource information for each cluster application.
There are four types of RMS graphs. Each type can be displayed from the menu when you right-click an object on the RMS tree.

- Full graph
  Displays the configuration of the entire cluster system in which RMS is running.
- Application graph
  Shows all objects used by the specified application. You can check the details of the specific object using this graph.
- Sub-application graph
  Lists all sub-applications used by a given application and shows the connections between the sub-applications.
- Composite sub-applications graph
  Shows all sub-applications that the application depends on directly or indirectly.

■ RMS graphs



If you left-click the target object, the attributes of the object will be displayed on a pop-up screen.

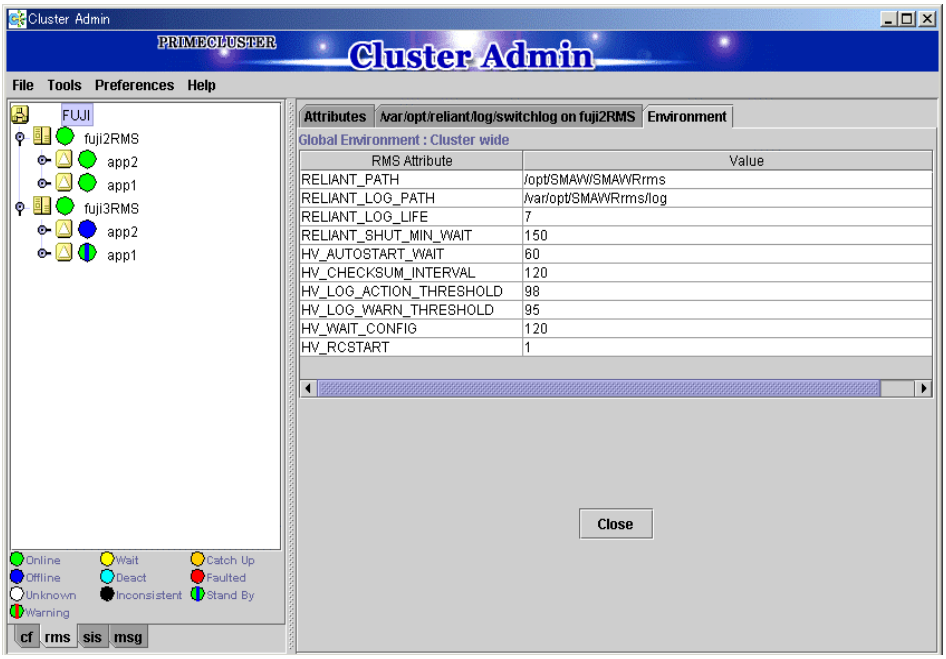


See

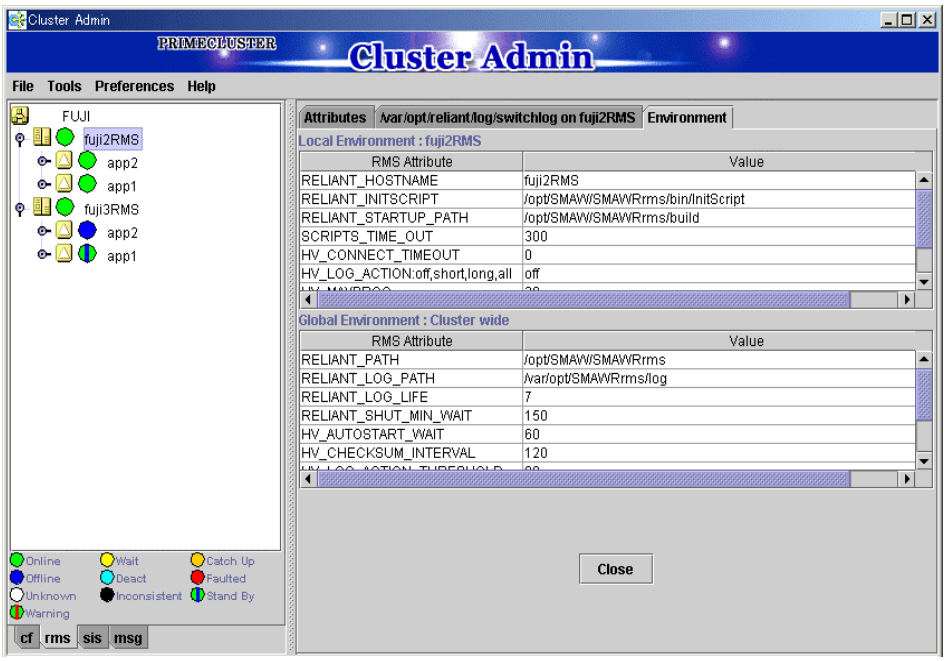
See "4.2.5 RMS graphs" in "*PRIMECLUSTER RMS Configuration and Administration Guide*."

7.3.6 Displaying environment variables

Right-click a cluster in the RMS tree window and select *View Environment*. The local and global variables are displayed.



Right-click a node in the RMS tree, and select *View Environment*. The local variables are displayed.



7.3.7 Monitoring Cluster Control Messages

Select the *msg* tab, which is found at the bottom of the tree panel. If a new message was added to the text area since the last time the area was displayed, this tab is displayed in red.
You can clear the message text area or isolate it from the main panel.

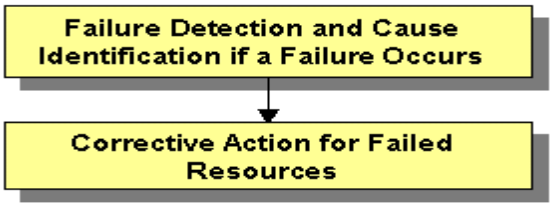
7.4 Corrective Actions for Resource Failures

A hardware or software failure might occur while the cluster system is running. If a failure occurs in a resource, a message indicating that a failure occurred is displayed in the console screen. Based on this message, you need to identify the faulted resource using the CF and RMS main window and take corrective actions to maintain high availability in the cluster system.
This section describes the actions to be taken for the following cases:

- If the resource state became failed.

7.4.1 Corrective Action in the event of a resource failure

This section describes the corrective actions to take when a resource failure occurs.



7.4.1.1 Failure Detection and Cause Identification if a Failure Occurs

If a failure occurs in a resource, you can use the functions of PRIMECLUSTER and the operating system to detect the failure and identify the faulted resource that caused the failure.

◆ Failure detection

Normally, the RMS main window (a) is used to monitor the cluster applications.

- If a failure occurs in a resource or the system
  Failover of the userApplication or node panic will occur.
  In such a case, you can detect the failure by observing the following conditions:
  - The color of the icons in the RMS main window (a) changes.
  - A message is output to the msg main window (c), Syslog(e), and the console (f).

- If a warning-level failure occurs in the system
  If a warning-level failure (for example, insufficient disk space or insufficient swap area) occurs in the system, you can detect the failure by observing the following conditions:
  - A message is output to Syslog(e) and the console (f).

- If RMS fails to start on all the nodes, the userApplication will not start. You can start the userApplication by executing the “clreply(1M)” command.
  - By executing the clreply(1M) command, you can confirm an operator intervention request to which no response has been entered and start up the userApplication by responding to it. For information on the “clreply(1M)“ command, see the manual pages.
  - The operator intervention request message will be output to Syslog(e) and the console (f). By responding to the operator intervention request message, you can start the userApplication.

  For further details, see D.4.1 "Operator Intervention Messages."

If there are multiple operator intervention request messages for which no response has yet been entered, you need to respond to each of them.

In addition, you can use the features described in "Failure confirmation features" to detect the failure.

◆ Cause identification

You can also use the function that detected the failure and the features listed in "Failure confirmation features" below to identify the faulted resource that caused the failure.

◆ Failure confirmation features

a. RMS main window
   The RMS tree and the RMS cluster table can be used from this screen.
   For instructions on viewing the RMS main window, see 7.1.2 "RMS Main Window."

b. CF main window
   The CF tree can be used from this screen.
   For instructions on viewing the CF main window, see 7.1.1 "CF Main Window."

c. MSG main window
   The cluster control messages can be viewed in this screen.
   To display this screen, select the *msg* tab in the Cluster Admin screen.

d. Application log
   For instructions on displaying the application log, see 7.3.4.2 "Viewing application logs."

e. Syslog

f. Console
   Messages that are displayed on the console or Syslog can be checked.
   For message details, see Appendix D "Messages."

- The operator intervention request messages (message numbers: 1421, 1423), incurred when RMS is not started on all nodes, are displayed only when yes(1) is set for the AutoStartUp attribute of the userApplication. For information on the userApplication attribute, see “6 Appendix -Object types” in the *“PRIMECLUSTER RMS Configuration and Administration Guide*.”
- The operator intervention request messages (message numbers: 1422, 1423) and the error resource messages incurred after a resource or system error occurs are displayed only when yes(1) is set for the PersistentFault attribute of the userApplication. For information on the userApplication attribute, see “6 Appendix -Object types” in the “*PRIMECLUSTER RMS Configuration and Administration Guide*.”
- The operator intervention request and error resource messages are displayed by using the “clwatchlogd” daemon to monitor switchlog. You need to send the SIGHUP signal to clwatchlogd when you change the value of RELIANT_LOG_PATH that is defined in the “hvenv.local” file. When clwatchlogd receives this signal, clwatchlogd acquires the latest value of RELIANT_LOG_PATH. After you change RELIANT_LOG_PATH, you must start RMS.

g. GDS GUI
   For details, see the "*PRIMECLUSTER Global Disk Services Configuration and Administration Guide*."

7.4.1.2 Corrective Action for Failed Resources

Take the following steps for failed resources;

1. Correct the faulted resource
   Correct the problem in the failed resource. For details, see "5 Troubleshooting" in "*PRIMECLUSTER RMS Configuration and Administration Guide*."

   If you are using an operation management product other than a PRIMECLUSTER product, you may need to take corrective actions prescribed for that product.
   For details, see the manual provided with each operation management product.
   [Examples] Symfoware

2. Recover the cluster application
   At the RMS main window, check the state of the cluster application to which the corrected resource is registered. If the cluster application is in the Faulted state, execute the Faulted clear operation.
   For details on the Fault clear operation, see 7.2.2.4 "Bringing Faulted Cluster Application to Online State."

Part 4 System Configuration Modification

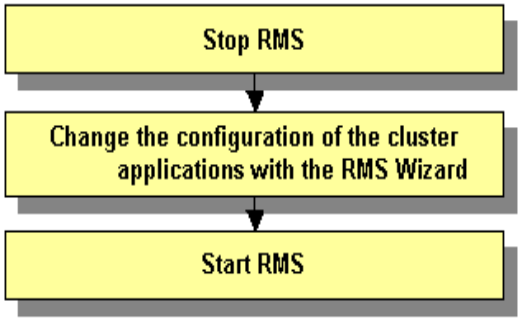
Chapter 8 Changing the Operation Configuration

This chapter explains how to add nodes and cluster applications to the PRIMECLUSTER system and change the configuration contents

8.1 Changing the Cluster Configuration

This section explains how to modify a cluster configuration related to the followings:

◆ Operation flow



◆ Operation Procedure:

1. Stop RMS.
   If RMS is running, see 7.2.1.2 "Stopping RMS" and stop RMS.
2. Change the configuration of the cluster applications with the RMS Wizard.
   1) Log on to any one of the cluster nodes using system administrator access privileges.
   2) Start up the RMS Wizard.
      Execute the hvw –n *configuration* file command. Specify a name of the configuration file in which the configuration is defined.
      The following example shows how to start up RMS Wizard with the configuration file name “testconf."

```
# /opt/SMAW/SMAWRrms/bin/hvw -n testconf
```

   3) Select "Application-Edit" from the "Main RMS management” menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 4
```

   4) Select the userApplication that needs modification of configuration from “Application selection” menu. The following example shows how to select “APP1."

```
Edit: Application selection menu (restricted):
1) HELP
2) QUIT
3) RETURN
4) OPTIONS
5) APP1
Application Name: 5
```

   5) When “turnkey wizard” appears, select what you want to change from the following table.

Contents to be changed	Selection item
Name of the userApplication	“ApplicationName”
Attribute of the userApplication	“Machines+Basics”
Cmdline resource configuration	“CommandLines”
Fsystem resource configuration	“LocalFileSystems”
Gds resource configuration	“Gds:Global-Disk-Services”
Gls resource configuration	“Gls:Global-Link-Services”
Procedure resource configuration	“CRM”

For details on the operation when you select above items, see 6.7 ”Setting Up the Cluster Applications.” Select "SAVE+EXIT" to return to the "Main RMS management” menu.

```
Settings of turnkey wizard "CRM"
 1) HELP                          9) CRM(CRM_APP1)
 2) -                            10) LocalFileSystems(-)
 3) SAVE+EXIT                    11) RemoteFileSystems(-)
 4) -                            12) IpAddresses(-)
 5) ApplicationName=APP1         13) RawDisks(-)
 6) Machines+Basics(app1)        14) LVM-VolumeManagement(-)
 7) CommandLines(-)              15) Gds:Global-Disk-Services(-)
 8) Controllers(-)               16) Gls:Global-Link-Services(-)
Choose the setting to process:
```

The following example shows how to change the attribute of “AutoStartUp” of the userApplication setting from “no” to “yes”:

1- Select "Machines+Basics" from “turnkey wizard.”

2- Select "AutoStartUp."

```
Machines+Basics (app1:consistent)
 1) HELP
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) AdditionalMachine
 6) AdditionalConsole
 7) Machines[0]=node1RMS
 8) Machines[1]=node2RMS
 9) (PreCheckScript=)
10) (PreOnlineScript=)
11) (PostOnlineScript=)
12) (PreOfflineScript=)
13) (OfflineDoneScript=)
14) (FaultScript=)
15) (AutoStartUp=no)
16) (AutoSwitchOver=HostFailure|ResourceFailure|ShutDown)
17) (PreserveState=no)
18) (PersistentFault=0)
19) (ShutdownPriority=)
20) (OnlinePriority=)
21) (StandbyTransitions=)
22) (LicenseToKill=no)
23) (AutoBreak=yes)
Choose the setting to process: 15
```

3- Select "yes."

```
1) HELP
2) RETURN
3) yes
4) no
Set the AutoStartUp mode: 3
```

4- Confirm that "AutoStartUp" is changed to "yes," and then select "SAVE+EXIT."

```
Machines+Basics (appl:consistent)
 1) HELP
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) AdditionalMachine
 6) AdditionalConsole
 7) Machines[0]=node1RMS
 8) Machines[1]=node2RMS
 9) (PreCheckScript=)
10) (PreOnlineScript=)
11) (PostOnlineScript=)
12) (PreOfflineScript=)
13) (OfflineDoneScript=)
14) (FaultScript=)
15) (AutoStartUp=yes)
16) (AutoSwitchOver=HostFailure|ResourceFailure|ShutDown)
17) (PreserveState=no)
18) (PersistentFault=0)
19) (ShutdownPriority=)
20) (OnlinePriority=)
21) (StandbyTransitions=)
22) (LicenseToKill=no)
23) (AutoBreak=yes)
Choose the setting to process: 3
```

5- Select "SAVE+EXIT" from “turnkey wizard.”

```
Settings of turnkey wizard "CRM"
1) HELP                          9) CRM(CRM_APP1)
2) -                            10) LocalFileSystems(-)
3) SAVE+EXIT                    11) RemoteFileSystems(-)
4) -                            12) IpAddresses(-)
5) ApplicationName=APP1         13) RawDisks(-)
6) Machines+Basics(appl)        14) LVM-VolumeManagement(-)
7) CommandLines(-)              15) Gds:Global-Disk-Services(-)
8) Controllers(-)               16) Gls:Global-Link-Services(-)
Choose the setting to process: 3
```

6- Select “RETURN” from the "Application selection menu."

```
Edit: Application selection menu (restricted):
1) HELP
2) QUIT
3) RETURN
4) OPTIONS
5) APP1
Application Name: 3
```

6) Select “Configuration-Generate” from the "Main RMS management” menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 7
```

7) Select “Configuration-Activate” from the "Main RMS management” menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 8
```

8) Select “QUIT” from the "Main RMS management” menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 2
```

3. Start RMS.
   Start RMS as described in 7.2.1.1 "Starting RMS."

8.2 Changing an IP Address on the Public LAN

This section explains how to change the IP address setting if the IP address of a public LAN or management LAN changes after the PRIMECLUSTER system is installed. Note that when you change an IP address, do not change the host name.

◆ Operation Procedure:

1. Execute the following command on one of the cluster nodes to stop RMS operation:
   # **hvshut -a**
2. Execute the following commands on all nodes to start the system in single-user mode.
   # **/sbin/shutdown -t0 now**
3. Mount the local file system on all nodes.
   Example:
   /sbin/mount -a -t ext3
4. Edit the “/etc/hosts“ file, and change the IP address on each node.
5. Change the IP address of the public LAN.
   Example :
   /usr/sbin/netconfig --ip=10.20.30.40 --netmask=255.255.255.0 -d eth0
6. If the IP address, used by the remote service mode, must be changed at the same time as the public/management LAN, correct the “/etc/opt/SMAW/SMAWsf/SA_rsb.cfg“ file on each node.

   See

   For details, see 5.2.2 "Setting Up the Shutdown Facility."

7. In each node, change the IP address of the public LAN used by Web-Based Admin View.

   See

   For details, see "7.1 Network address," "7.3 Management server," and "7.5 Multi-network between server and client by classified use" in the "*PRIMECLUSTER Web-Based Admin View Operation Guide*."
8. If a takeover IP address must be changed, correct the IP address being used as the takeover IP address in the “/etc/hosts“ file of each node.
9. If a Gls resource is created, edit the “/opt/SMAW/SMAWRrms/bin/hvenv.local“ file of each cluster node as shown below so that RMS does not start automatically when the node is rebooted.
   # **vi /opt/SMAW/SMAWRrms/bin/hvenv.local** <Return>

   ```
   export HV_RCSTART=0
   ```

10. Restart the system on all nodes.
    # **/sbin/shutdown -r now**
11. If the takeover IP address is defined by GLS, see “3.2.2 Changing configuration Information” in the “*PRIMECLUSTER Global Link Services Configuration and Administration Guide: Redundant Line Control Function*.”
12. If you edited the "/opt/SMAW/SMAWRrms/bin/hvenv.local" file in Step 9, return the file to its previous setting.

If a takeover IP address has been defined by GLS and if the takeover IP address is specified directly with an IP address value, not a host name, in the GLS environment settings and the Gls resource settings, first delete the Gls resource. Then change /etc/hosts and the GLS environment settings, and register the Gls resource.
For details, see 6.2.1 "GLS Setup," and 6.7.3.4 "Setting Up Gls Resources."

8.3 Changing a CIP Address

This section describes how to change the IP address if the IP address of interconnect is changed after installation of the PRIMECLUSTER system.

◆ Operation Procedure:

1. Start all nodes in the cluster system.
   If the nodes are already operating, you do not need to restart them.
2. Stop CF in all nodes.
   For instructions on stopping CF, see "5.6 Starting and Stopping CF" in "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."
3. View "/etc/cip.cf" and check the CIP name in all nodes.
   For details on "/etc/cip.cf," see "2.2 CIP Configuration File" in "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."
4. Change the IP address of the CIP name that is defined in "/etc/hosts."
5. Start CF in all nodes.
   For instructions on starting CF, see "5.6 Starting and Stopping CF" in "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."
6. Check that the IP address was changed by executing the "ciptool(1M)" command. For details on the ciptool(1M) command, see the manual page of ciptool(1M).

8.4 Changing the Operation Attributes of a userApplication

PRIMECLUSTER allows operation attributes to be set by CUI operation, according to the needs of the user. Change the operation attributes to match the desired operation.

- Operation attribute types
  A list of the userApplication operation attributes is shown. For details, see 8.4.1 "Operation Attribute Types."
- Change methods
  - 8.4.2 "Changing Operation Attributes (CUI)"
    Explains how to change the operation attributes of the userApplication.
  - 8.4.3 "Changing Environment Variables"
    Explains how to change the RMS environment variables.

Be sure to stop RMS before you change the operation attributes of userApplication. For instructions on stopping RMS, see 7.2.1.2 "Stopping RMS."

8.4.1 Operation Attribute Types

The following table lists the operation attributes of the userApplication.

Operation attributes of userApplication objects

Operation	userApplication attribute/environment variable	Setting value (Bold: Default)	Description
Failover operation	AutoSwitchOver	**No**	Automatic failover is disabled.
		HostFailure	Failover occurs if a node fails.
		ResourceFailure	Failover occurs if a resource fails.
		Shutdown	Failover occurs if RMS stops.
Operation if resource inactivation fails	Halt	**0**	The node is not forcibly stopped.
		1	The node is forcibly stopped.
Operation for cluster application startup	OnlinePriority	**0**	The highest node of the PriorityList attribute becomes the active system.
		1	The node that was the active system last becomes the active system.
Operation of failover function for node startup	HV_RCSTART environment variable in hvenv.local file	**0**	The failover function is not started automatically.
		1	The failover function is started automatically.

Operation	userApplication attribute/environment variable	Setting value (Bold: Default)	Description
Handling of failed nodes	PersistentFault	**0**	The failed node is not eliminated after the node is restarted.
		1	The failed node is eliminated even after the node is restarted.

8.4.2 Changing Operation Attributes (CUI)

This section explains how to change the userApplication attributes with CUI.
For further details about the operation attribute specified in step 7, see 8.4.1 "Operation Attriubte Types."

◆ Operation Procedure

"Application" on the CU screen indicates a cluster application.

1. Log on to any one of the cluster nodes using system administrator access privileges.
2. Execute the hvw command.
   # **/opt/SMAW/SMAWRrms/bin/hvw -n** *<configuration file>*
   Specify an optional Configuration file name in <*configuration file*>.
3. Select "Application-Edit" from the main menu of CUI. Enter a number and then press the *Enter* key.

Main menu

```
apple: Main RMS management menu, current configuration: config
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) RMS-CreateMachine
 8) Configuration-Activate        17) RMS-RemoveMachine
 9) Configuration-Copy
Choose an action:
```

4. Select the userApplication for which you want to change the operation attributes from the "Application selection" menu.
   The following example shows how to select "APP1."

Cluster application selection menu

```
Edit: Application selection menu (restricted):
1) HELP
2) QUIT
3) RETURN
4) OPTIONS
5) APP1
Application Name: 5
```

5. When turnkey wizard CRM appears, select "Machines+Basics" and then change the operation attributes of the userApplication.

turnkey wizard "CRM"

```
Settings of turnkey wizard "CRM"
 1) HELP                          9) CRM(CRM APP1)
 2) READONLY                     10) LocalFileSystems(-)
 3) SAVE+EXIT                    11) RemoteFileSystems(-)
 4) -                            12) IpAddresses(-)
 5) ApplicationName=APP1         13) RawDisks(-)
 6) Machines+Basics(app1)        14) LVM-VolumeManagement(-)
 7) CommandLines(-)              15) Gds:Global-Disk-Services(-)
 8) Controllers(-)               16) Gls:Global-Link-Services(-)
Choose the setting to process: 6
```

6. Select the operation attribute that you want to change from "Machines+Basics."

Machines+Basics

```
Machines+Basics (app1:consistent)
 1) HELP
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) AdditionalMachine
 6) AdditionalConsole
 7) Machines[0]=chagne1RMS
 8) Machines[1]=chagne2RMS
 9) (PreCheckScript=)
10) (PreOnlineScript=)
11) (PostOnlineScript=)
12) (PreOfflineScript=)
13) (OfflineDoneScript=)
14) (FaultScript=)
15) (AutoStartUp=yes)
16) (AutoSwitchOver=HostFailure|ResourceFailure|ShutDown)
17) (PreserveState=no)
18) (PersistentFault=0)
19) (ShutdownPriority=)
20) (OnlinePriority=)
21) (LicenseToKill=no)
22) (AutoBreak=yes)
23) (HaltFlag=no)
Choose the setting to process:
```

To change the value:

Select the item that you want to change. Enter a number and then press the *Enter* key.

Example

`Choose the setting to process: 20` <RETURN>

The setup menu will appear.

To save the change and exit:

Select "SAVE+EXIT." Enter a number and then press the *Enter* key.

`Choose the setting to process: 3` <RETURN>

The same cluster application selection menu as that shown in step 9 will appear.

To exit without saving the change:

Select "NO-SAVE+EXIT." Enter a number and then press the *Enter* key.

`Choose the setting to process: 3` <RETURN>

The same cluster application selection menu as that shown in step 9 will appear.

7. Set up the value from the value setup menu.

Value setup menu (Example of OnlinePriority)

```
1) HELP
2) RETURN
3) 0
4) 1
Enable Online Priority (Active Standby) feature for this application:
```

Select a setup value. Enter a number and then press the *Enter* key.

Select "RETURN" to return to the previous menu.

If there are multiple attributes to be changed, repeat steps 6 and 7 for each attribute.
If the attribute is other than "OnlinePriority," the menu number in step 7 will be different from that in this example.

8. Select "SAVE+EXIT" from the "Machines+Basics" screen to return to the turnkey wizard "CRM."

turnkey wizard "CRM"

```
Settings of turnkey wizard "CRM"
 1) HELP                          9) CRM(-)
 2) -                            10) LocalFileSystems(-)
 3) SAVE+EXIT                    11) RemoteFileSystems(-)
 4) -                            12) IpAddresses(Adr APP1)
 5) ApplicationName=APP1         13) RawDisks(-)
 6) Machines+Basics(app1)        14) LVM-VolumeManagement(-)
 7) CommandLines(-)              15) Gds:Global-Disk-Services(-)
 8) Controllers(-)               16) Gls:Global-Link-Services(-)
Choose the setting to process:
```

Select "SAVE+EXIT" to return to the cluster application selection menu.

9. Select "RETURN" to return to the main menu.

Cluster application selection menu

```
Edit: Application selection menu (restricted):
1) HELP
2) QUIT
3) RETURN
4) OPTIONS
5) APP1
Application Name: 3
```

10. Select "Configuration-Generate" and then "Configuration-Activate" from the main menu.
Content changes will be enabled on all the cluster nodes.

Main menu

```
apple: Main RMS management menu, current configuration: config
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) RMS-CreateMachine
 8) Configuration-Activate        17) RMS-RemoveMachine
 9) Configuration-Copy
Choose an action:
```

```
apple: Main RMS management menu, current configuration: config
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) RMS-CreateMachine
 8) Configuration-Activate        17) RMS-RemoveMachine
 9) Configuration-Copy
Choose an action:
```

Configuration distribution

```
About to activate the configuration config ...
Testing for RMS to be up somewhere in the cluster ... done
Arranging sub applications topologically ... done.
Check for all applications being consistent ... done.
Running overall consistency check ... done.
Generating pseudo code [one dot per (sub) application]: .... done
Generating RMS resources..................................... done
hvbuild using /usr/opt/reliant/build/wizard.d/config/config.us
About to distribute the new configuration data to hosts:
test node1RMS,test node2RMS
The new configuration was distributed successfully.
About to put the new configuration in effect ... done.
The activation was finished successfully.
Hit CR to continue
```

Note

When the processing is successfully done, the message “The activation was finished successfully” appears. If this message is not displayed, the modified information contains incorrect settings. Check and correct the settings.

11. Press the *Enter* key to return to the main menu.

Main menu

```
apple: Main RMS management menu, current configuration: config
No RMS active in the cluster
 1) HELP                        10) Configuration-Remove
 2) QUIT                        11) Configuration-Freeze
 3) Application-Create          12) Configuration-Thaw
 4) Application-Edit            13) Configuration-Edit-Global-Settings
 5) Application-Remove          14) Configuration-Consistency-Report
 6) Application-Clone           15) Configuration-ScriptExecution
 7) Configuration-Generate      16) RMS-CreateMachine
 8) Configuration-Activate      17) RMS-RemoveMachine
 9) Configuration-Copy
Choose an action:
```

12. Select "QUIT" to terminate the processing.
13. Start up RMS and userApplication from Cluster Admin.

8.4.3 Changing Environment Variables

This section explains how to change RMS environment variables.
The environment variables are configured in the following RMS environment files. You can change the environment variables by editing the files directly and setting or changing the values. You can also check the currently set values.

File Names	Contents
/opt/SMAW/SMAWRrms/bin/hvenv	Environment variable file that is defined in the entire cluster
/opt/SMAW/SMAWRrms/bin/hvenv.local	Environment variable file that is defined only in that node

See

- For details on the RMS environment variable files (hvenv and hvenv.local), see "2.8 Environment variables" in "*PRIMECLUSTER RMS Configuration and Administration*."
- For details on the RMS environment variables, see "8 Appendix – Environment variables" in "*PRIMECLUSTER RMS Configuration and Administration*."
- Create the “hvenv.local(4)” file as required. See the manual pages of hvenv.local(4).

8.5 Changing PRIMECLUSTER Operation Attributes

The PRIMECLUSTER operation attributes are set with RMS environment variables. To change the PRIMECLUSTER operation attributes, change the environment variables in the hvenv.local file, and restart RMS.
Note that the change procedure differs depending on whether the environment variable is global or local.

See

- For information on the RMS environment variables and how to change the variable settings, see "2.8 Environment variables" in "*PRIMECLUSTER RMS Configuration and Administration*."
- For details on the RMS environment variables, see "8 Appendix – Environment Variables" in "*PRIMECLUSTER RMS Configuration and Administration*."

8.6 Deleting a Cluster Application

This section explains how to delete a cluster application and its resources.

Be sure to stop RMS before deleting a cluster application and its resources. For instructions on stopping RMS, see 7.2.1.2 "Stopping RMS."

8.6.1 Deleting a Resource

This section explains how to delete a resource.

◆ **Operation Procedure:**

1. Log on to any one of the cluster nodes using system administrator access privileges.
2. Start the RMS Wizard.
   Execute the hvw –n *configuration file* command. Specify a name of the configuration file in which the resource is defined.
   The following example shows how to start RMS Wizard with the configuration file name “testconf."

```
# /opt/SMAW/SMAWRrms/bin/hvw -n testconf
```

3. Select "Application-Edit" from the "Main RMS management” menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 4
```

4. Select the userApplication in which the resource is registered from the "Application selection” menu. The following example shows how to select “APP1."

```
Edit: Application selection menu (restricted):
1) HELP
2) QUIT
3) RETURN
4) OPTIONS
5) APP1
Application Name: 5
```

5. Use the “turnkey wizard” to select the resource.
   Select “REMOVE+EXIT” from the screen after selecting the resource.
   Then, select "SAVE+EXIT" to return to the "Main RMS management menu."

```
Settings of turnkey wizard "CRM"
 1) HELP                          9) CRM(CRM_APP1)
 2) -                            10) LocalFileSystems(-)
 3) SAVE+EXIT                    11) RemoteFileSystems(-)
 4) -                            12) IpAddresses(-)
 5) ApplicationName=APP1         13) RawDisks(-)
 6) Machines+Basics(app1)        14) LVM-VolumeManagement(-)
 7) CommandLines(Cmd_APP1)       15) Gds:Global-Disk-Services(-)
 8) Controllers(-)               16) Gls:Global-Link-Services(-)
Choose the setting to process:
```

6. Select "Configuration-Generate" from the "Main RMS management" menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 7
```

7. Select "Configuration-Activate" from the "Main RMS management" menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 8
```

8. Select “QUIT” from the "Main RMS management" menu to exit from the RMS Wizard.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 2
```

When deleting a Gds resource, you need to bring the Gds volume Online.
See 8.6.1.1 “Deleting Gds resource.”

8.6.1.1 Settings made when deleting a Gds resource

You can delete a Gds resource as follows. Keep the GDS volume online.

◆ **Operation Procedure:**

Execute the following command on the node on which you want to delete resources.

```
# /usr/opt/reliant/bin/hvgdsetup -d [class-name]
```

8.6.2 Deleting a userApplication

This section explains how to delete the userApplication.

- If you delete a userApplication, all the resources registered to the userApplication will also be deleted.
- If Gds resources are registered to the userApplication to be deleted, bring the Gds volume online. See 8.6.1.1 “Settings made when deleting a Gds resource.”

◆ Operation Procedure:

1. Log on to any one of the cluster nodes using system administrator access privileges.
2. Start the RMS Wizard.
   Execute the hvw –n *configuration file* command. Specify a name of the configuration file in which the userApplication is defined.
   The following example shows how to start RMS Wizard with the configuration file name “testconf."

```
# /opt/SMAW/SMAWRrms/bin/hvw -n testconf
```

3. Select "Application-Remove" from the "Main RMS management“ menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 4
```

4. Select the userApplication that you want to delete from the "Application selection” menu.
   The following example shows how to select APP2.

```
Edit: Application selection menu (restricted):
1) HELP
2) QUIT
3) RETURN
4) OPTIONS
5) APP1
6) APP2
Application Name: 6
```

   Enter “yes” in response to the following message.

```
 About to remove all data of APP2,
     Please confirm this by typing yes: yes
```

5. Select "Configuration-Generate" from the "Main RMS management” menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 7
```

6. Select "Configuration-Activate" from the "Main RMS management" menu.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 8
```

7. Select “QUIT” from the "Main RMS management" menu to exit from the RMS Wizard.

```
node1: Main RMS management menu, current configuration: testconf
No RMS active in the cluster
 1) HELP                          10) Configuration-Remove
 2) QUIT                          11) Configuration-Freeze
 3) Application-Create            12) Configuration-Thaw
 4) Application-Edit              13) Configuration-Edit-Global-Settings
 5) Application-Remove            14) Configuration-Consistency-Report
 6) Application-Clone             15) Configuration-ScriptExecution
 7) Configuration-Generate        16) Configuration-Push-Disabled
 8) Configuration-Activate        17) RMS-CreateMachine
 9) Configuration-Copy            18) RMS-RemoveMachine
Choose an action: 2
```

Part 5 PRIMECLUSTER Products

This section explains the PRIMECLUSTER products.

- PRIMECLUSTER Product List
- PRIMECLUSTER Wizard for Oracle

Chapter 9 PRIMECLUSTER Product List

The following lists the version levels of PRIMECLUSTER products and the range of support:

Table 9-1 PRIMECLUSTER Product List

Product name	Operation mode	Standby operation	Notes
	System Configuration	Standby (1:1)	
	IP address takeover of GLS	Yes	
PRIMECLUSTER Wizard for Oracle 4.0A20		○	

9.1 What Are the PRIMECLUSTER Operation Modes?

This section explains the cluster operation mode.

- **Cluster system operation mode**

Cluster operation mode	Description
1:1 standby	A single standby cluster application runs on a system that consists of two nodes. One is an operating node, and the other is a standby node.

- **Cluster application operation mode**

Cluster operation mode	Description
Standby operation mode	1:1 standby

- **Public LAN takeover function**

Public LAN takeover function	Description
IP address takeover of GLS	In standby operation, this faction takes over one or more IP addresses from an operating node to a standby node when a failure such as node shutdown, hang-up, and error detection in transfer routes occurs on the operation node.

Chapter 10 PRIMECLUSTER Wizard for Oracle

10.1 Functional Overview

PRIMECLUSTER Wizard for Oracle is a software product that facilitates cluster operation management for Oracle operating on a PRIMECLUSTER system.

Standby operation for Oracle (cold standby) is enabled on the PRIMECLUSTER system.

Startup and stop control

In line with the state transition of the cluster system, scripts automatically start or stop an Oracle instance or an Oracle listener. These scripts first check and then start up the Oracle instance. If damage has occurred, the scripts automatically recover the Oracle instance. For example, if the Oracle instance fails during online backup, the scripts automatically execute “end backup” to start up the Oracle instance. (When the AutoRecover is set to “Yes.") When stopping the Oracle instance, the scripts stop it in the immediate mode (default). If this does not occur properly, the scripts stop the instance in the abort mode. This means operational node switchover can be performed at high-speed.

Monitoring

A detector monitors an Oracle instance and an Oracle listener. The detector connects itself to Oracle using system user. Then, this enables the detector periodically to create, update and delete a dummy table, which should be generated in the system user’s default table space, by executing an SQL command. Consequently, a logical failure can be detected as well as the process of the Oracle instance being active or inactive. When the Oracle instance hangs, and if the SQL command is not returned within a specified time, the detector times out and notifies a user of the failure. The two types of monitoring of the Oracle listener are process detection and the “tnsping” command.

Environment setup

The environment setup tool provides an “ORACLE” Wizard that generates userApplications in the RMS configuration by executing the “hvw” command of PRIMECLUSTER RMS Wizard.

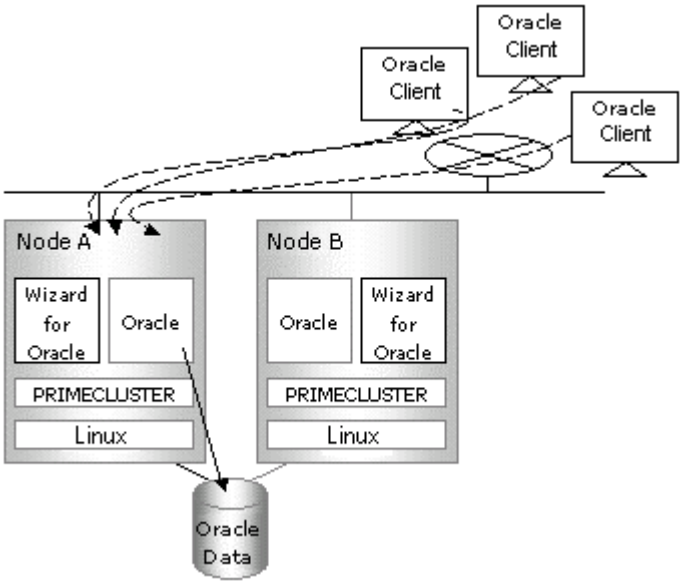
10.2 Operation Environment

10.2.1 System Configuration

System configuration figures are shown below:

Standby operation (cold standby)

In standby operation, a cluster system consists of an operational node and standby nodes. On the operational node, Oracle applications, a logical IP address and shared disks are active. On the standby nodes, these resources are inactive. In the event of a failure, production operation is switched to one of the standby nodes, and the resources in this standby node are activated. The client can connect to the running node using the logical IP address without configuration changes.



10.2.2 Supported Modes

For details, see the Table 9-1 "PRIMECLUSTER Product List."

10.2.3 Overview of Cluster System Support

The PRIMECLUSTER Wizard for Oracle provides the environment setup wizard that is used to build Oracle on the cluster system, the start/stop script, and the state-monitoring detector. It also supports Oracle cold standby operation.

10.3 Notes

For details on the environment setup, etc., see *"PRIMECLUSTER Wizard for Oracle Configuration and Administration Guide,"* which is attached to the PRIMECLUSTER Wizard for Oracle.

Appendix A PRIMECLUSTER System Design Worksheets

A.1 Worksheet Purpose

The PRIMECLUSTER System Design Worksheets allow you to determine necessary parameters before you configure the PRIMECLUSTER system. Filling out all items in the worksheet will enable you to proceed smoothly with the PRIMECLUSTER installation work.
The worksheets consist of the following:

- **Overall Design Worksheet**
  This worksheet is used to design basic items for the PRIMECLUSTER system.
- **CE Instruction Worksheet**
  This worksheet compiles necessary information for installation and configuration, and is used to communicate instructions to the Fujitsu technician (CE).
- **Cluster Installation Environment Setup Worksheet**
  This worksheet is used to configure an environment before the installation of Linux(R), PRIMECLUSTER, and other required and related software, and the configuration of the PRIMECLUSTER system using Web-Based Admin View. This worksheet facilitates the installation of software products.
- **Kernel Parameter Worksheet**
  This worksheet allows you to determine the fundamental PRIMECLUSTER values for estimating the kernel parameters. After installing the Linux(R) software and PRIMECLUSTER packages, configure the new values for the kernel parameters, as necessary.
- **Cluster Configuration Worksheet**
  This worksheet organizes the necessary items for configuring the PRIMECLUSTER system with Web-Based Admin View. Using this worksheet and determining the parameter values beforehand will enable you to smoothly set up operations using Web-Based Admin View.
- **Cluster Application Configuration Worksheets**
  When building a cluster application, use these worksheets to design how the application should operate. There are individual worksheets for configuring RMS, GFS, GLS, GDS, and cluster applications.
- **Cluster Application Setting Worksheet**
  This worksheet is used for configuring cluster applications and resources.

A.2 Notes on Worksheet Creation

Note the following points when creating PRIMECLUSTER design worksheets.

- Specify appropriate values in the blank sections of each design sheet. For instructions on specifying each item, see the point explanations.
- Items marked with "<>" are selection items. Select one of the items written in the box.
- Items marked with "[ ]" are selection items. You can select multiple items written in the box.
- Different values can be specified depending on the model in which PRIMECLUSTER is to be installed. Read the point explanations before specifying values.

A.3 Overall Design Worksheet

Select the operation mode of the cluster system.

See

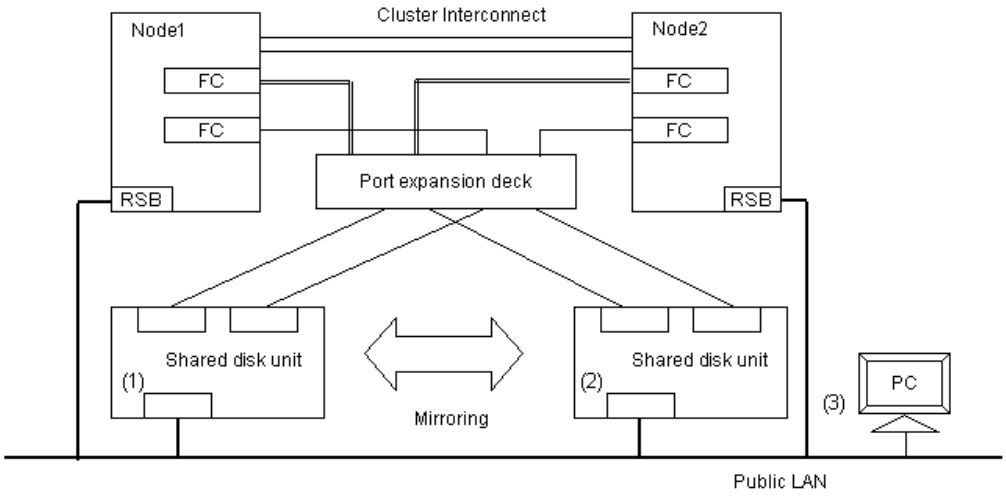
See A.11 "System Design Examples" when determining values for the setup items in the Overall Design Worksheet.

Cluster :	
System requirement	Selective product/function/configuration
Cluster system topology (1) Installation objective ( )Improvement of availability (2) Node count ( )2 nodes	<>Standby operation ( )1:1 standby
(3) Web-Based Admin View operation modes ( )2-layer model ( )3-layer model	<>1 PC required <>Operation management server and 1 PC required
(4) Web-Based Admin View operation modes	
1)2-layer model <>RAID <>Interface <>Fibre Channel <>Path <>Single path <>Path duplex switchover <>Manage disk cabinet	[ ]Multipath disk control facility <>GRMPD (GR multipath driver) [ ]GDS (Global Disk Services)
2)Switchover file system selection <>ext2, ext3 <>High reliability above ext2, ext3 <>Simultaneous sharing <>File system <>RAW	[ ]GFS (Global File Services)
(5)NTP	
1)Cluster topology ( )No existing NTP network. ( )Existing NTP network.	<>NTP broadcast <>Place NTP server on the cluster node <>Synchronous with the NTP server outside the cluster
2)NTP network setting	Host name / IP address
( )When there is an NTP server outside the cluster system	
( )NTP setting within the cluster system Primary NTP server Secondary NTP server	

A.4 CE (FE for North America) Instruction Worksheet

The CE Instruction Worksheet indicates information required for hardware installation for a Fujitsu customer engineer (CE). This worksheet is also used for specifying information that was configured by the CE.

For information on hardware installation in the field, see the cluster field installation operation procedure.



Shared RAID unit	IP address (1)	__ . __ . __ . __
	IP address (2)	__ . __ . __ . __
	Gateway	__ . __ . __ . __
	Subnet mask	__ . __ . __ . __
ServerView management machine	IP address (3)	__ . __ . __ . __

A.5 Cluster Installation Environment Worksheet

The Cluster Installation Environment Worksheet organizes items related to installation of Linux(R) software, PRIMECLUSTER, required and related software. Create the Cluster Installation Environment Worksheet.

The Cluster Installation Environment Worksheet contains initial configuration items related to the entire PRIMECLUSTER system. Configure a system on each node according to the information specified here.

Cluster system name:		**Cluster Installation Environment Worksheet**
Node name:		

Settings					Notes
(1) Software to be installed	[ ]Optional software		[ ]GRMPD (GR multipath driver)		
(2) Version of Solaris	<> Red Hat Advanced Server 2.1		Use the same version on all nodes.		
(3) Partition information			Logical path	Size	
	/boot				Configuration should be synchronized on all nodes
	/var				
	/				
	/opt				
	/var/crash				
	/usr				
	/home				
	/var/opt				
	/etc/opt				
	/temp				
(4) System locale	<> C <> Ja <> Other ( )				
(5) Time zone	<> Japan <> Other ( )				
(6) Node information Node name IP					
(7)Web-Based Admin View					
	Node name	IP	Access I/F	Http port number	RMI port number
Primary management server					
Secondary management server					

A.6 Kernel Parameter Worksheet

When you build the PRIMECLUSTER system, the default values for the kernel parameters of the Linux(R) may be inadequate. The Kernel Parameter Worksheet shows the kernel parameter values used for PRIMECLUSTER. If the values have been set in /etc/sysctl.conf, you need to edit the values (Defined values + kernel parameter values used for PRIMECLUSTER). If the values have not been set, you need to set the values (Linux(R) default values + the kernel parameter values used for PRIMECLUSTER.)

The kernel parameter values differ depending upon:

- CF configuration
- RMS configuration

- The values used by products and user applications that operate in the PRIMECLUSTER system must also be included in the kernel parameter values.
- To enable values that have been changed, you must restart the system after the installation.
- If a kernel parameter value is already maximized, the change will not be added to the system.

A.6.1 CF Configuration

To enable the resource database, you must change the default value of the Linux(R) kernel parameter.
The kernel parameters can be configured with the sysctl (8) utility when they are executed. The procedures for changing the kernel parameters and setting up a new kernel parameter are explained below.
The value of SHMMAX can be changed as follows:

- Edit the /etc/sysctl.conf file.
- Add the following entry. kernel.shmmax =value

Change the semaphore parameter values as follows:

```
kernel.sem = value1 value2 value3 value4
```

Define the original values as follows:

```
value1 = value of SEMMSL
value2 = value to SEMMNS
value3 = value of SEMOPM
value4 = value of SEMMNI
```

As the resource manager does not use SEMMSL or SEMOPM, you do not need to change these values. If you execute the following commands, the original parameter values will be displayed.

```
#sysctl -a | grep sem
#sysctl -a | grep shm
```

If you execute the following command, each parameter will be changed.

```
#sysctl -p filename (the default value of filename is /etc/sysctl.conf)
```

This command enables the value of /etc/sysctl.conf for the kernel. You do not have to reconfigure the kernel.
To change the kernel parameter while the OS is running, use sysctl (8). For details on the operation of sysctl, see the manual pages describing sysctl (8).

Kernel parameter	minimum value	Comments (parameter description)
SEMMNI	20	Value required for resource database
SEMMNS	90	Value required for resource database
SHMMAX	1048576+ Value required for the resource database *	Value required for resource database
SHMMNI	30	Value required for resource database

*

Estimate the value required for resource database according to the following equation:

```
Value required for resource database = 2776 x number of resources
```

Estimate the number of resources according to the following equation:

```
Number of resources = Number of disks in shared system devices x (number of shared nodes +1) x 2
```

Specify the following in "Number of disks in shared system devices":

- For a disk array unit, specify the number of logical units (LUN).
- For other than a disk array unit, specify the number of physical units.

Specify the number of nodes connected to the shared disk in "number of shared nodes."

For system expansion, if you increase the number of nodes and logical disks, you need to re-estimate the resources and restart each node in the cluster system. If you add nodes or disks to the cluster after installation, you must then calculate the resources required for the total number of nodes and logical disks after addition.

A.6.2 RMS Configuration

The table below shows the values of the kernel parameters required for the RMS configuration. If the kernel parameters do not come up to the following minimum values when RMS is installed, they will be automatically changed to the minimum values. The adjustable kernel values shown below will be replaced by the value of /etc/system.

Kernel parameter	minimum value	Comments (parameter description)
kernel.msgmnb	4194304	Byte size of the message queue
kernel.msgmax	16384	Maximum size of the message text
kernel.msgmni	8192	Maximum number of message queues for the entire system

If you uninstall the RMS package from /etc/sysctl.conf by executing the “rpm -e” command, you need to restart the system after uninstallation.

A.7 Cluster Configuration Worksheet

The Cluster Configuration Worksheet is required building a cluster.
Use this worksheet to organize the items before using Web-Based Admin View to set up the PRIMECLUSTER system.

See

For information on the setup items for this worksheet, see Chapter 5 "Building a Cluster."
Also see the A.11.1 "Cluster Building Worksheet" in the A.11 "System Design Examples."

Item					Setting		Remarks
Product type					<>HA <>Clustering Base		
Shared disk unit: Type 1	Interface						
	Path						
	File system selection						
Shared disk unit: Type 2	Interface						
	Path						
	File system selection						
NTP	Operation mode						
	Protocol (only when broadcast is specified)						
	Network configuration	External NTP servers	Host name				
			IP address				
		NTP server settings in cluster	Primary NTP server	Host name			
				IP address			
			Secondary NTP server	Host name			
				IP address			
Operation management topology	Web-Based Admin View operation mode				layer		
	Public LAN						
	Primary management server IP						
	Secondary management server IP						
User group					Group name	User name	
					<>wvroot		
					<>clroot		
					<>cladmin		
					<>clmon		

Cluster name					
Node information	CIP	Number of subnets			
		Subnet IP			
		Net mask			
	Node 1	Node name (uname -n)			
		CF node name			
		Public LAN	Network interface name		
			IP address		
			Net mask		
			Gateway		
		Cluster interconnect	Path 0 NIC name		
			Path 1 NIC name		
		RSB	IP address		(Only when RSB is used)
			User ID		(Only when RSB is used)
			Password		(Only when RSB is used)
		Panic status notification disk name			(Only when the shared disk is connected)
		Node in CF quorum set		<>[Yes] <>No	Do not change the default setting.
	Node 2	Node name (uname -n)			
		CF node name			
		Public LAN	Network interface name		
			IP address		
			Net mask		
			Gateway		
		Cluster interconnect	Path 0 NIC name		
			Path 1 NIC name		
		RSB	IP address		(Only when RSB is used)
			User ID		(Only when RSB is used)
			Password		(Only when RSB is used)
		Panic status notification disk name			(Only when the shared disk is connected)
		Node in CF quorum set		<>[Yes] <>No	Do not change the default setting.
	IP interconnect setup			<>[Not used] <>Used (IP interconnect count)	
Cluster resource management facility	Hardware device to be registered in the resource database			[ ]Network device *1 [ ]Disk unit *2	*1) Required when public LAN takeover is used *2) Required when GDS and GFS are used
Shutdown facility (SF)	Means of stopping a node forcibly			Means / Operation after stop [ ]RSB / <>[Stop] <>Reboot	Remote service port

Note: Values enclosed in brackets ([ ]) are default values.

A.8 Cluster Application Configuration Worksheets

Use the Cluster Application Configuration Worksheet to organize the items before building a cluster application.

The following worksheets are required for building a cluster application.

- A.8.1 RMS Setup Worksheet
- A.8.2 GFS Shared File System Setup Worksheet
- A.8.3 GLS Setup Worksheet
- A.9 GDS Setup Worksheets
- A.10 Cluster Application Worksheets

See

For information on the setup items for this worksheet, see Chapter 6 "Building Cluster Applications."

A.8.1 RMS Setup Worksheet

You can follow the RMS setup worksheet to configure RMS.

See

For information on the setup items in this worksheet, see 6.1 "Initial RMS Setup."

Item	Environment variable (global)	Setup value	Remark (specified value using CUI)
RMS automatic startup	HV_RCSTART	<>[No] <>Yes	[0] * 1

* To set up automatic startup of RMS when one of the nodes is started, select "Yes."

A.8.2 GFS Shared File System Setup Worksheet

If you plan to use a GFS (Global File Services) Shared File System, use the GFS Shared File System Setup Worksheet to organize the input items beforehand.

See

For information on the setup items in this worksheet, see 6.4 "Initial GFS Setup." Also see A.11.2 "GFS Shared File System Setup Worksheet" in A.11 "System Design Examples."

Item			Setting
GFS Shared File System settings		Device name	
		Mount point	
		Device name	
		Mount point	

A.8.3 GLS Setup Worksheet

If you will be using Global Link Services (GLS), use the GLS Setup Worksheet to organize the input items beforehand.
This section describes the worksheet settings for the following typical duplexing modes:

- NIC switching mode (logical IP takeover)

See

- For configuration instructions for other duplexing modes, see "Appendix B Examples of Setting Up" in the *"PRIMECLUSTER Global Link Services Configuration and Administration Guide: Redundant Line Control Function"* .
- For information on the items in this sheet, see the explanation at the bottom of the sheet and 6.2 "Initial GLS Setup." Also see A.11.3 "GLS Setup Worksheet" in A.11 "System Design Examples."

■ NIC Switching Mode (Logical IP Takeover)

Item				Setting
GLS settings	Switching mode			<Y>NIC switching mode (logical IP takeover)
	Takeover virtual interface name			
		Takeover virtual IP address (or host name)		
		Subnet mask		
	Node name (1)			
		Configuration information	Virtual interface name	
			Primary physical interface name	
			Secondary physical interface name	
			Physical IP address (or host name)	
			Logical IP address (or host name)	
		Monitoring destination	IP address (or host name) of primary	
			IP address (or host name) of secondary	
		Optional function	Standby NIC patrol	<>Disable <>Enable
	Node name (2)			
		Configuration information	Virtual interface name	
			Primary physical interface name	
			Secondary physical interface name	
			Physical IP address (or host name)	
			Logical IP address (or host name)	
		Monitoring destination	IP address (or host name) of primary	
			IP address (or host name) of secondary	
		Optional function	Standby NIC patrol	<>Disable <>Enable

[Setup items]

- Switching mode
  Specify a redundant operation type for GLS; Fast switching mode, NIC (Network Interface Card) switching mode, or RIP mode.
  Add d (logical IP takeover of the NIC switching mode) to the "–m" option of the “hanetconfig create” command.
- Takeover virtual interface name
  Specify the name of the virtual interface for cluster switchover.
  The virtual interface is automatically created under the name of shaX:NN (X and NN are numbers) as a result of executing the “hanethvrsc create” command.
- Takeover virtual IP address (or host name)
  Specify the IP address (or host name) for cluster switchover.
  The same logical IP address (or host name) that was set in nodes (1) and (2) is set as a result of executing the “hanethvrsc create” command.
- Subnet mask
  Specify the subnet mask for the takeover virtual IP address by using the hanetmask create command.
  This value should be the same as the virtual IP for the subnet mask.
  If subnet is not used, you don’t need to specify the value.
- Virtual interface name
  Specify the virtual interface name to be assigned to the physical interface to be duplexed.
  Specify shaX (X is a number) to the "–n" option of the “hanetconfig create” command.
  Set the same name for node (1) and node (2).
- Physical interface name (1) and (2)
  Specify the name of the interface to be first activated among the duplexed physical interfaces(e.g. eth0, etc.)
  Specify the name to the "–t" option of the “hanetconfig create” command.

- Secondary physical interface name
  Among the duplexed physical interfaces, specify the name of the interface to be activated after switchover from the primary physical interface. Specify the name to the "–t" option of the “hanetconfig create” command.
- Physical IP address (or host name)
  Specify the physical IP address (or host name) to be assigned to the physical interface to be duplexed.
  Specify the value to the "–e" option of the “hanetconfig create” command.
  Specify different values for node (1) and node (2).
- Logical IP address (or host name)
  Specify the logical IP address (or host name) to be assigned to the physical interface to be duplexed.
  Specify the value to the "–i" option of the “hanetconfig create” command. Specify the same value for node (1) and node (2).
- Primary monitoring-destination IP address (or host name)
  Specify the IP address (or host name) of the switching hub to be monitored when the primary physical interface is used.
  Specify the value to the "–p" option of the “hanetpoll create” command.
- Secondary monitoring-destination IP address (or host name)
  Specify the IP address (or host name) of the switching hub to be monitored when the secondary physical interface is used.
  Specify the value to the "–p" option of the “hanetpoll create” command.
- Standby NIC patrol
  When monitoring the standby NIC, specify p for standby patrol (automatic switchback in the event of a failure) or q for standby patrol (immediate automatic switchback) to the –m option of the “hanetconfig create” command.

A.9 GDS Setup Worksheets

You can follow the GDS setup worksheets to configure GDS (Global Disk Services) with this worksheet. This sheet includes the GDS Configuration Worksheet that is used for the shared disk setup.

See

- Before setting up the GDS configuration, you need to know basic information from reading *"PRIMECLUSTER Global Disk Services Guide."*
- For information on the items in this worksheet, see 6.3.2 "GDS Configuration Setup."

Note

The class name should be unique in the cluster system.

A.9.1 Shared Disk Setup Worksheet

If you are setting up shared disks, you must determine the GDS configuration beforehand.
Use the Shared Disk Setup Worksheet to organize the GDS configuration beforehand.

See

- Before setting up the GDS configuration, you need to know basic information from reading *"PRIMECLUSTER Global Disk Services Guide."*
- For information on the items in this worksheet, see 6.3.2.1 "Setting Up Shared Disks." Also see A.11.4 "GDS Configuration Worksheet" in A.11 "System Design Examples."

■ GDS Configuration Worksheet

Item					Setting
GDS configuration	Class 1	Class name			
		Class scope (node name)	Node 1		
			Node 2		
		Spare disk 1 (*1)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		
		Single disk 1 (*2)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		
			Single volume 1	Volume name	
				Size	
			Single volume 2	Volume name	
				Size	
		Single disk 2 (*2)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		
			Single volume 1	Volume name	
				Size	
			Single volume 2	Volume name	
				Size	

		Disk 1 to be connected to group (*3)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		
		Disk 2 to be connected to group (*3)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		
		Low-order group 1 (*4)	Group name		
			Group type		
			Stripe width (*6)		
			Disk /low-order group name	Disk /low-order group 1	
				Disk /low-order group 2	
		Low-order group 2 (*4)	Group name		
			Group type		
			Stripe width (*6)		
			Disk /low-order group name	Disk /low-order group 1	
				Disk /low-order group 2	

		Highest-order group 1 (*5)	Group name		
			Group type		
			Stripe width (*6)		
			Disk /low-order group name	Disk /low-order group 1	
				Disk /low-order group 2	
			Volume 1	Volume name	
				Size	
			Volume 2	Volume name	
				Size	
		Highest-order group 2 (*5)	Group name		
			Group type		
			Stripe width (*6)		
			Disk /low-order group name	Disk /low-order group 1	
				Disk /low-order group 2	
			Volume 1	Volume name	
				Size	
			Volume 2	Volume name	
				Size	

	Class 2	Class name			
		Class scope (node name)	Node 1		
			Node 2		
		Spare disk 1 (*1)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		
		Single disk 1 (*2)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		
			Single volume 1	Volume name	
				Size	
			Single volume 2	Volume name	
				Size	
		Single disk 2 (*2)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		
			Single volume 1	Volume name	
				Size	
			Single volume 2	Volume name	
				Size	
		Disk 1 to be connected to group (*3)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		
		Disk 2 to be connected to group (*3)	SDX disk name		
			Physical disk name in node 1		
			Physical disk name in node 2		

		Low-order group 1 (*4)	Group name		
			Group type		
			Stripe width (*6)		
			Disk /low-order group name	Disk /low-order group 1	
				Disk /low-order group 2	
		Low-order group 2 (*4)	Group name		
			Group type		
			Stripe width (*6)		
			Disk /low-order group name	Disk /low-order group 1	
				Disk /low-order group 2	
		Highest-order group 1 (*5)	Group name		
			Group type		
			Stripe width (*6)		
			Disk /low-order group name	Disk /low-order group 1	
				Disk /low-order group 2	
			Volume 1	Volume name	
				Size	
			Volume 2	Volume name	
				Size	

		Highest-order group 2 (*5)	Group name		
			Group type		
			Stripe width (*6)		
			Disk /low-order group name	Disk /low-order group 1	
				Disk /low-order group 2	
			Volume 1	Volume name	
				Size	
			Volume 2	Volume name	
				Size	

(*1) This item can be defined only if mirroring is performed.
(*2) This item must be defined only if a single volume is to be created.
(*3) This item must be defined only if mirroring, striping, or concatenation is performed.
(*4) This item must be defined only if the groups are to be arranged into a hierarchy.
(*5) This item must be defined only if mirroring, striping, or concatenation is performed.
(*6) This item must be defined only if the group type is stripe.

A.10 Cluster Application Worksheets

The Cluster Application Worksheets are necessary for setting up cluster applications and resources.

The following worksheets are available:

- **Resource configuration:**
  - Cmdline Resource Worksheet
  - Fsystem Resource Worksheet
  - Gds (Global Disk Services) Resource Worksheet
  - Gls (Global Link Services) Resource Worksheet
  - Takeover Network Resource Worksheet
  - Procedure Resource Worksheet
- **Cluster application configuration:**
  - Cluster Application Setup Worksheet
- **Exclusive relationship configuration for cluster applications:**
  - Cluster Application Exclusion Setup Worksheet
- **Global Settings in Configuration Setup:**
  - Configuration Global Settings Setup Worksheet

A.10.1 Cmdline Resource Worksheet

The Cmdline Resource Setup Worksheet is used for configuring a Cmdline resource.

Item				Setting value
Cmdline resource	Script to be controlled	Object	Start script	
			Stop script	
			Check script	
		Flag	NULLDETECTOR	<>Yes <>[No]
			ALLEXITCODES	<>Yes <>[No]
			LIEOFFLINE	<>Yes <>[No]
			CLUSTEREXCLUSIVE	<>[Yes] <>No
			AUTORECOVER	<>[Yes] <>No
			MONITORONLY	<>Yes <>[No]
			STANDBYCAPABLE	<>Yes <>[No]
			REALTIME	<>Yes <>[No]
			TIMEOUT	(Range: 45 to 31535999) [300]

Note: Values enclosed in brackets ([ ]) are default values.

A.10.2 Fsystem Resource Worksheet

The Fsystem Resource Worksheet is used for configuring an Fsystem resource.

Item				Setting value
Fsystem resource			Timeout	(Range: 45 to 3600) [180]
	Mount point to be controlled 1	Object	Mount point	
		Flag	AUTORECOVER	<>[Yes] <>No
			SHARE	<>Yes <>[No]
	Mount point to be controlled 2	Object	Mount point	
		Flag	AUTORECOVER	<>[Yes] <>No
			SHARE	<>Yes <>[No]
	Mount point to be controlled 3	Object	Mount point	
		Flag	AUTORECOVER	<>[Yes] <>No
			SHARE	<>Yes <>[No]

Note: Values enclosed in brackets ([ ]) are default values.

A.10.3 Gds Resource Worksheet

The Gds Resource Worksheet is used for configuring a Gds (Global Disk Services) resource.

Item				Setting value
Gds resource	Resource operation	Attribute	Use	Exclusive use <>[Enable] Hot Standby operation <>Enable <>[Disable] <>Disable
			AutoRecover	<>Yes <>[No]
			Timeout	(Range: 5 to 3600) [1800]
	Disk class to be controlled 1	Object	Disk Class	
	Disk class to be controlled 2	Object	Disk Class	
	Disk class to be controlled 3	Object	Disk Class	

Note: Values enclosed in brackets ([ ]) are default values.

A.10.4 Gls Resource Worksheet

The Gls Resource Worksheet is used for configuring a Gls (Global Link Services) resource.

Item				Setting value
Gls resource	Resource operation	Attribute	Timeout	(Range: 5 to 300) [60]
	Takeover IP address to be controlled 1	Object	Takeover IP address(IPv4)	
		Flag	AUTORECOVER *	<>Yes <>[No]
	Takeover IP address to be controlled 2	Object	Takeover IP address(IPv4)	
		Flag	AUTORECOVER *	<>Yes <>[No]
	Takeover IP address to be controlled 3	Object	Takeover IP address(IPv4)	
		Flag	AUTORECOVER *	<>Yes <>[No]

* Set AUTORECOVER to [No].
Note: The values enclosed in brackets ([ ]) are the default values.

A.10.5 Takeover Network Resource Worksheet

The Takeover Network Resource Worksheet is used for configuring a takeover network resource.

Item				Setting value
Takeover IP address resource	Network interfaces	Node 1 ( )		
		Node 2 ( )		
	Resource operation	Attribute	NeedAll	<>[Yes] <>No
			Timeout	(Range: 45 to 3600) [60]
			PingHost	
	Takeover IP address to be controlled	Object	Host name	
			IP address	
			Net mask	
		Flag	BASE	<>[virtual] <>base
			AUTORECOVER	<>[Yes] <>No
			PingHost	

* When the type of the takeover network is only IP address takeover is supported for 4.0A20.
Note: Values enclosed in brackets ([ ]) are default values.

A.10.6 Procedure Resource Worksheet

The Procedure Resource Worksheet is used for configuring a procedure resource.

Item				Setting value
Procedure resource	Resource name			
	Resource operation	Attribute	SCRIPTTIMEOUT	(Range: 45 to 31535999) [1800]
	Procedure resource to be controlled	Procedure class		<>Application <>BasicApplication <>SystemState2 <>SystemState3 <>( )
			Procedure resource	

Note: Values enclosed in brackets ([ ]) are default values.

A.10.7 Cluster Application Worksheet

The Cluster Application Worksheet is used for configuring a cluster application.

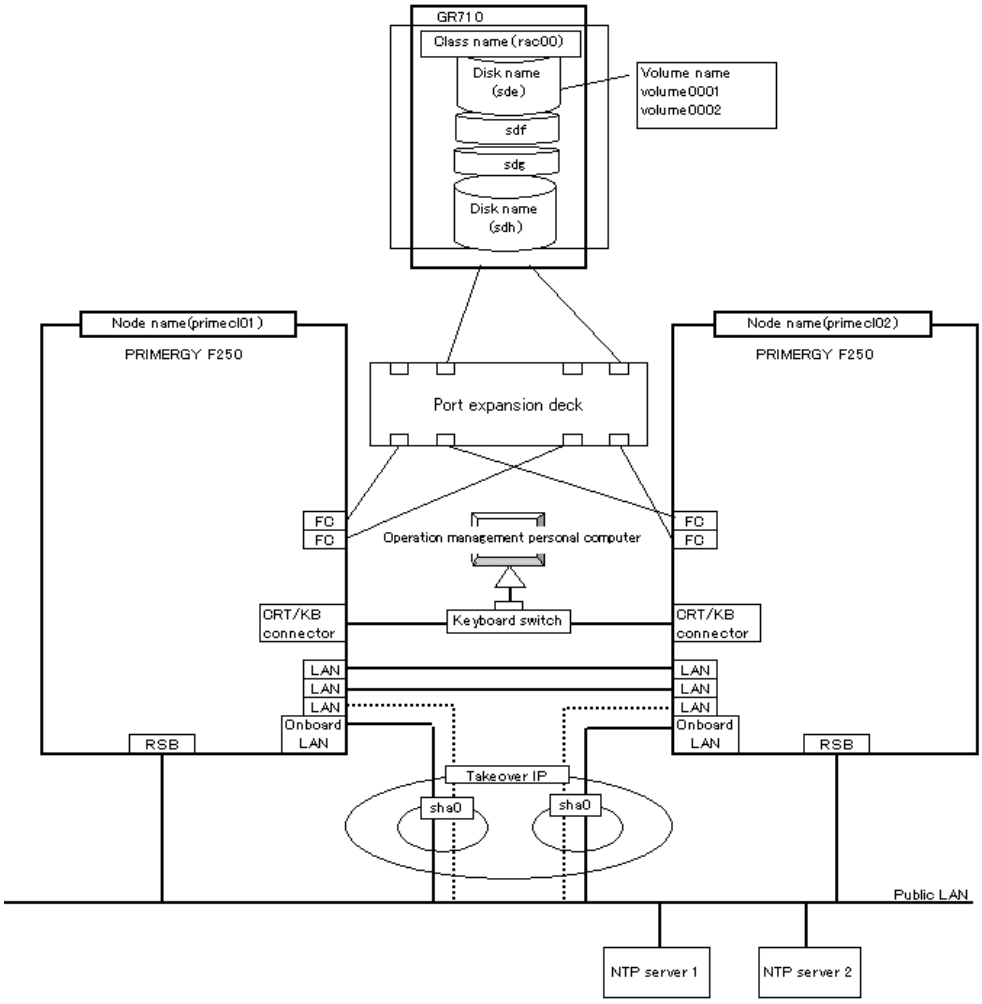
Item					Setting value	Remarks (value specified with GUI/CUI)
Cluster application settings	Configuration name					
	Cluster application name					
	Operating node		SysNode (Priority 1: High)			
			SysNode (Priority 2: Low)			
	Attribute	Start	Operating node at startup	OnlinePriority	<>[According to cluster application	[0]
					<>Operating node when RMS stopped	1
			Automatic startup	AutoStartUp	<>[Manual]	[No]
					<>Automatic	Yes
		Switchover	Switchover operation	AutoSwitchOver	<>[Manual]	[No]
					<>Automatic (more than one of the following can be selected)	
					[ ]At node failure	HostFailure
					[ ]At resource failure	ResourceFailure
					[ ]When RMS stops	ShutDown
		Operation in the event of a failure	Operation when RMS fails to control 2	HaltFlag	<>[Do not forcibly stop node]	[No]
					<>Forcibly stop node	Yes
			Handling of failed node	PersistentFault	<>[Use if fault is not detected when RMS is restarted]	[0]
					<>Use after operator clears fault	1
			Operation if cluster interconnect fails	ShutdownPriority	<>[NONE]	[NONE]
					<>Priority ( )	Priority (0 to 20) * Higher number indicates higher priority.
	Configuration	Resource				Specified resource name

A.11 System Design Examples

This section shows design examples of the PRIMECLUSTER system. Refer to these examples when designing the PRIMECLUSTER system.

System configuration

System configuration example



Note: The NTP server should be set to one of the following operation mode;

- Maintains time that is reliable for special hardware devices such as time units and GPS units.
- Uses another server that maintains time that is reliable for special hardware devices such as time units and GPS units, and uses NTP for time synchronization.

Used hardware

- PRIMERGY F250 x 2
- Remote service board (RSB) x 2 units
- Port expansion deck x 1 unit
- Fast Ethernet card x 6
- Fibre channel card x 4
- Disk array unit (GR710) x 1
- Expansion controller x 1 unit

■ Used software

- Red Hat Advanced Server 2.1
- PRIMECLUSTER 4.0A20
- Multipath driver
- Netscape Communicator 4.7x (installed in the operation management personal computer)
- Java(TM) 2 Runtime Environment Standard Edition v1.3.1(installed in the operation management personal computer)
- IBM(R) Runtime Environment for Linux(R), Java(TM)2 Technology Edition, Version 1.3.1, 32-bit version (Installed when Linux(R) is used as the operation management client.)

■ Shared disk array settings

Device name: GR710 (FC)	**Number of LU**	**Number of RAID groups**	**RAID level**	**Size**
	4	1	5	248.2GB
Device name: Expansion file unit (FC) x 2	-	-	-	18.2GB

A.11.1 Cluster Building Worksheet

Shown below is an example of creating the Cluster Building Worksheet.

Item					Setting	
Product type					<>HA <>Clustering Base	
Shared disk unit: Type 1					GR710	
	Interface				Fibre channel	
	Path				multipath	
	File system selection				GFS Local File System	
Shared disk unit: Type 2					Expansion file unit	
	Interface				SCSI	
	Path				single	
	File system selection				GFS Shared File System	
NTP	Operation mode				-	
					-	
	Protocol (only when broadcast is specified)				-	
					-	
	Network configuration	External NTP servers	Host name		-	
			IP address		-	
		NTP server settings in cluster	Primary NTP server	Host name	primecl01	
				IP address	10.34.214.181	
			Secondary NTP server	Host name	primecl02	
				IP address	10.34.214.182	
Operation management topology	Web-Based Admin View operation mode				2	layers
	Public LAN					
	Primary management server IP				10.34.214.181	
	Secondary management server IP				10.34.214.182	
User group					Group name	User name
					<Y>wvroot	root
					<Y>clroot	root
					<>cladmin	
					<>clmon	
Cluster name					PRIMECLUSTER	

Node information	CIP	Number of subnets			
		Subnet IP		192.168.1.0	
		Net mask		255.255.255.0	
	Node 1	Node name (uname -n)		primecl01	
		CF node name		primecl01	
		Public LAN	Network interface name	eth0/eth3	
			IP address	10.34.214.181	
			Net mask	255.255.255.0	
			Gateway	-	
		Cluster interconnect	Path 0 NIC name	/dev/eth1	
			Path 1 NIC name	/dev/eth2	
		RSB	IP address	10.34.214.183	
			User ID		
			Password		
		Panic status notification disk name		/dev/sde	
		Node in CF quorum set		<Y>[Yes] <>No	
	Node 2	Node name (uname -n)		primecl02	
		CF node name		primecl02	
		Public LAN	Network interface name	hme0/hme3	
			IP address	10.34.214.182	
			Net mask	255.255.255.0	
			Gateway	-	
		Cluster interconnect	Path 0 NIC name	/dev/hme1	
			Path 1 NIC name	/dev/hme2	
		RSB	IP address	10.34.214.183	
			User ID		
			Password		
		Panic status notification disk name		/dev/sde	
		Node in CF quorum set		<Y>[Yes] <>No	
	IP interconnect setup			<>[Not used] <>Used (IP interconnect count)	
Cluster resource management facility	IP interconnect setup			<Y>Network devices (*1) <Y>Disk units (*2)	
Shutdown facility (SF)	Means of stopping a node forcibly			Means	Operation after stop
				[ ]RSB	<>[Stop] <>Reboot

Note: Values enclosed in brackets ([ ]) are default values.

In each node, specify /etc/ntp.conf as shown below.

```
server 10.34.214.100
server 10.34.214.101
server 127.127.1.0

fudge 127.127.1.0 stratum 9

enable auth monitor
disable pll
driftfile /var/ntp/drift
statsdir /var/ntp/ntpstats/
filegen peerstats file peerstats type day enable
filegen loopstats file loopstats type day enable
filegen clockstats file clockstats type day enable
```

For detailed instructions on specifying /etc/inet/ntp.conf, see the online manual by executing the “ntpd(1M)” command.

```
# man ntpd
```

A.11.2 GFS Shared File System Setup Worksheet

Shown below is an example of creating the GFS Shared File System Setup Worksheet.

Item			Setting
GFS Shared File System		Device name	class0001:volume0001
		Mount point	/disk1
		Device name	class0001:volume0002
		Mount point	/disk2

A.11.3 GLS Setup Worksheet

Shown below are examples of creating the GLS Setup Worksheet.

■ NIC Switching Mode (Logical IP Takeover)

Item				Setting
GLS setup	Switching mode			<Y>NIC switching mode (logical IP takeover)
	Takeover virtual interface name			sha0:65
		Takeover virtual IP address (or host name)		10.34.214.185
		Subnet mask		255.255.255.0
	Node name (1)			primecl01
		Configuration information	Virtual interface name	sha0
			Primary physical interface name	eth0
			Secondary physical interface name	eth1
			Physical IP address (or host name)	10.34.214.181
			Logical IP address (or host name)	10.34.214.185
		Monitoring destination information	Primary monitoring destination IP address (or host name)	10.34.214.188
			Secondary monitoring destination IP address (or host name)	10.34.214.189
		Optional function	Backup NIC patrol	<>Disable <Y>Enable
	Node name (2)			primecl02
		Configuration information	Virtual interface name	sha0
			Primary physical interface name	eth0
			Secondary physical interface name	eth1
			Physical IP address (or host name)	10.34.214.182
			Logical IP address (or host name)	10.34.214.185
		Monitoring destination information	Primary monitoring-destination IP address (or host name)	10.34.214.188
			Secondary monitoring-destination IP address (or host name)	10.34.214.189
		Optional function	Backup NIC patrol	<>Disable <Y>Enable

A.11.4 GDS Configuration Worksheet

Shown below are examples of creating the GDS Configuration Worksheet.

■ System configuration example

For a system configuration example, set up the worksheet as shown below.

Item					Setting
GDS configuration	Class 1	Class name			rac00
		Class scope (node name)	Node 1		primecl01
			Node 2		primecl02
		Single disk 1	SDX disk name		disk0001
			Physical disk name in node 1		sde
			Physical disk name in node 2		sde
			Single volume 1	Volume name	volume0001
				Size	1024 MB
			Single volume 2	Volume name	volume0002
				Size	1024 MB
		Single disk 2	SDX disk name		disk0002
			Physical disk name in node 1		sdf
			Physical disk name in node 2		sdf
		Single disk 3	SDX disk name		disk0003
			Physical disk name in node 1		sdg
			Physical disk name in node 2		sdg
		Single disk 4	SDX disk name		disk0004
			Physical disk name in node 1		sdh
			Physical disk name in node 2		sdh

Examples of creating the GDS Configuration Worksheet are provided below.

■ Example 1. Managing a disk as a single disk:

In this example, single volumes Volume1 and Volume2 are created in physical disk sdj.

Item				Setting
Class 1	Class name			Class1
	Class scope (node name)	Node 1		Node1
		Node 2		Node2
	Single disk 1	SDX disk name		Disk1
		Physical disk name in node 1		sdi
		Physical disk name in node 2		sdj
		Single volume 1	Volume name	Volume1
			Size	1024 blocks
		Single volume 2	Volume name	Volume2
			Size	1024 blocks

■ Example 2. If a disk is not mirrored but may be changed to a mirror configuration later:

In this example, mirror group Group1, which consists only of physical disk sdi, is created, and single volumes Volume1 and Volume2 are created in Group1.

Since Group1 consists of only one disk, Volume1 and Volume2 are not mirrored. If another disk is added to Group1, then Volume1 and Volume2 can be changed to a mirror configuration.

Item				Setting
Class 1	Class name			Class1
	Class scope (node name)	Node 1		Node1
		Node 2		Node2
	Disk 1 connected to group	SDX disk name		Disk1
		Physical disk name in node 1		sdi
		Physical disk name in node 2		sdj
	Highest-order group 1	Group name		Group1
		Group type		mirror
		Stripe width		–
		Disk/low-order group name	Disk/low-order group 1	Disk1
		Volume 1	Volume name	Volume1
			Size	1024 blocks
		Volume 2	Volume name	Volume2
			Size	1024 blocks

■ Example 3. If disk mirroring is to be executed:

In this example, mirror group Group1, which consists of physical disks sdk and sdl, is created, and mirrored volumes Volume1 and Volume2 are created in Group1.

Item				Setting
Class 1	Class name			Class1
	Class scope (node name)	Node 1		Node1
		Node 2		Node2
	Spare disk 1	SDX disk name		Disk3
		Physical disk name in node 1		sdi
		Physical disk name in node 2		sdj
	Disk 1 connected to group	SDX disk name		Disk1
		Physical disk name in node 1		sdk
		Physical disk name in node 2		sdl
	Disk 2 connected to group	SDX disk name		Disk2
		Physical disk name in node 1		sdm
		Physical disk name in node 2		sdn
	Highest-order group 1	Group name		Group1
		Group type		mirror
		Stripe width		–
		Disk/low-order group name	Disk/low-order group 1	Disk1
			Disk/low-order group 2	Disk2
		Volume 1	Volume name	Volume1
			Size	1024 blocks
		Volume 2	Volume name	Volume2
			Size	1024 blocks

■ Example 4. If disk striping is to be executed:

In this example, striping group Group1, which consists of physical disks sdi and sdj, is created, and striped volumes Volume1 and Volume2 are created in Group1.

Item				Setting
Class 1	Class name			Class1
	Class scope (node name)	Node 1		Node1
		Node 2		Node2
	Disk 1 connected to group	SDX disk name		Disk1
		Physical disk name in node 1		sdi
		Physical disk name in node 2		sdj
	Disk 2 connected to group	SDX disk name		Disk2
		Physical disk name in node 1		sdk
		Physical disk name in node 2		sdl
	Highest-rder group 1	Group name		Group1
		Group type		stripe
		Stripe width		32
		Disk/low-order group name	Disk/low-order group 1	Disk1
			Disk/low-order group 2	Disk2
		Volume 1	Volume name	Volume1
			Size	1024 blocks
		Volume 2	Volume name	Volume2
			Size	1024 blocks

■ Example 5. If disk concatenation is to be executed:

In this example, concatenation group Group1, which consists of physical disks sdi and sdk, is connected, and volumes Volume1 and Volume2 are created in Group1.

Item				Setting
Class 1	Class name			Class1
	Class scope (node name)	Node 1		Node1
		Node 2		Node2
	Disk 1 connected to group	SDX disk name		Disk1
		Physical disk name in node 1		sdi
		Physical disk name in node 2		sdj
	Disk 2 connected to group	SDX disk name		Disk2
		Physical disk name in node 1		sdk
		Physical disk name in node 2		sdl
	Highest-order group 1	Group name		Group1
		Group type		concat
		Stripe width		-
		Disk/low-order group name	Disk/low-order group 1	Disk1
			Disk/low-order group 2	Disk2
		Volume 1	Volume name	Volume1
			Size	1024 blocks
		Volume 2	Volume name	Volume2
			Size	1024 blocks

■ Example 6. If disk striping and mirroring are to be executed:

In this example, mirror group Group1, which consists of striping group Group2 and striping group Group3 is created, and volumes Volume1 and Volume2 are created in Group1. Striping group Group2 consists of physical disks sdg and sdi, and striping group Group3 consists of physical disks sdk and sdm.

Item				Setting
Class 1	Class name			Class1
	Class scope (node name)	Node 1		Node1
		Node 2		Node2
	Spare disk 1	SDX disk name		Disk5
		Physical disk name in node 1		sde
		Physical disk name in node 2		sdf
	Disk 1 connected to group	SDX disk name		Disk1
		Physical disk name in node 1		sdg
		Physical disk name in node 2		sdh
	Disk 2 connected to group	SDX disk name		Disk2
		Physical disk name in node 1		sdi
		Physical disk name in node 2		sdj
	Disk 3 connected to group	SDX disk name		Disk3
		Physical disk name in node 1		sdk
		Physical disk name in node 2		sdl
	Disk 4 connected to group	SDX disk name		Disk4
		Physical disk name in node 1		sdm
		Physical disk name in node 2		sdn
	Low-order group 1	Group name		Group2
		Group type		stripe
		Stripe width		32
		Disk/low-order group name	Disk/low-order group 1	Disk1
			Disk/low-order group 2	Disk2
	Low-order group 2	Group name		Group3
		Group type		stripe
		Stripe width		32
		Disk/low-order group name	Disk/low-order group 1	Disk3
			Disk/low-order group 2	Disk4
	Highest-order group 1	Group name		Group1
		Group type		mirror
		Stripe width		–
		Disk/low-order group name	Disk/low-order group 1	Group2
			Disk/low-order group 2	Group3
		Volume 1	Volume name	Volume1
			Size	1024 blocks
		Volume 2	Volume name	Volume2
			Size	1024 blocks

Appendix B Manual Pages

This appendix provides online manual page lists for CCBR, CF, CIP, operator intervention, PAS, the cluster resource management facility, RMS, SIS, Web-Based Admin View, procedure resource, and the RMS wizards.

To view a manual page, enter the following command:

```
$ man man_page_name
```

Note:

To view these manual pages, you must set the MANPATH environment variable so that /etc/opt/FJSVcluster/man is included.

To print a hard copy of a manual page, enter the following command:

```
man man_page_name |col-b |lpr
```

B.1 CF

- **System administrator**

Command	Function
cfconfig	Configures or deconfigures a node for a PRIMECLUSTER cluster.
cfregd	CF registry synchronization daemon
cfset	Applies or modifies /etc/default/cluster.config entries into the CF module.
cftool	Prints the node communications state of a node or the cluster.
changeng	Replaces a node group definition.
deleteng	Deletes a node group.
descng	Replaces a node group explanation.
detailng	Displays the dynamic expansion of a node group.
newng	Creates a new node group.
rcqconfig	Configures or starts the quorum operation of a cluster system.
rcqquery	Acquires the state of consistency (quorum) of the cluster.
showng	Displays the name and definition of the node group.

B.2 CIP

- **System administrator**

Command	Function
cipconfig	Starts or stops CIP 2.0.
ciptool	Retrieves CIP information about local and remote nodes in the cluster.

- **File format**

Command	Function
cip.cf	CIP configuration file format

B.3 Operator Intervention

- **System administrator**

Command	Function
clreply	Responds to an operator intervention request message.

B.4 PAS

- **System administrator**

Command	Function
mipcstat	MIPC statistics

B.5 Cluster Resource Management Facility

- **System administrator**

Command	Function
clbackuprdb	Saves the resource database.
clinitreset	Reset the resource database.
clrestorerdb	Restores the resource database.
clsetparam	Checks the connections of shared disk units and sets up the operation for automatic resource registration.
clsetup	Sets up the resource database.
clstartrsc	Activates a resource (GDS only).
clstoprsc	Deactivates a resource (GDS only).

- **User command**

There is also a clgettree command in the Web-Based System Administration tool WSA.

Command	Function
clgettree	Outputs tree information for the resource database.

B.6 RMS

- **System administrator**

Command	Function
hvassert	Asserts (tests for) an RMS resource state.
hvcm	Start the RMS configuration monitor.
hvconfig	Displays or saves the RMS configuration file.
hvdisp	Displays RMS resource information.
hvdist	Distributes RMS configuration files.
hvdump	Collects debugging information about RMS.
hvgdmake	Compiles an RMS custom detector.

Command	Function
hvlogclean	Clean the RMS log files.
hvlogcontrol	Controls the size of the log disk.
hvshut	Shuts down RMS.
hvswitch	Switches control of an RMS user application resource to another host.
hvthrottle	Prevents multiple RMS scripts from running simultaneously.
hvutil	Manipulates the availability of an RMS resource.

- **File format**

Command	Function
config.us	Format of the RMS node configuration file
hvenv.local	RMS local environment configuration file

B.7 SIS

- **System administrator**

Command	Function
dtcpadmin	Starts the SIS administration utility.
dtcpd	Starts the SIS daemon for configuring VIPs.
dtcpstat	Displays state information on SIS.

B.8 Web-Based Admin View

- **System administrator**

Command	Function
fjsvwvbs	Stops Web-Based Admin View.
wvCntl	Starts, stops, or gets debugging information for Web-Based Admin View.
wvGetparam	Displays the Web-Based Admin View environment variables.
wvSetparam	Sets the Web-Based Admin View environment variables.
wvstat	Displays the operating state of Web-Based Admin View.

B.9 Procedure Resource

- **System administrator**

Command	Function
claddprocrsc	Registers an application resource that uses a state transition procedure.
cldelproc	Deletes a state transition procedure.
cldelprocrsc	Deletes an application resource that uses state transition procedure.
clgetproc	Gets a state transition procedure.
clsetproc	Registers a state transition procedure.
clsetprocrsc	Changes the registered information of an application resource that uses a state transition procedure.

- **User command**

Command	Function
cldspproc	Outputs information on the resource that uses the state transition procedure.

B.10 RMS Wizards

RMS Wizards and RMS Application Wizard

The manual for the RMS wizards is stored on the CD-ROM SMAWRhvdo package as an html document. If you install this package, the manual will be saved in the following directory:

/usr/doc/packages/SMAWRhv-do/wizards.en

Appendix C Troubleshooting

This appendix explains how to collect troubleshooting information if an error occurs in the PRIMECLUSTER system.

C.1 Collecting Troubleshooting Information

If an error occurs in the PRIMECLUSTER system, collect the information required for the error investigation from all nodes that constructs the cluster and the cluster management servers. Then, contact your customer support representative.

1. PRIMECLUSTER investigation information
   - Use pclsnap to collect information.
   - Retrieve the system dump.
   - Collect the Java Console on the clients.
     See "Appendix B.2.2 Java console" in the "*PRIMECLUSTER Web-Based Admin View Operation Guide*."
   - Collect a hard copy of the client screens.
     See "Appendix B.2.3 Screen hard copy" in the "*PRIMECLUSTER Web-Based Admin View Operation Guide*."
2. Investigation information for the failed application
3. Error reproduction procedure manual if the error can be reproduced

- When reporting a problem, collect the information required for an error investigation. If you do not provide information for problem checking and error reproduction execution, it may take a long time to reproduce and diagnose the problem or it may become impossible to do so.
- Collect investigation material promptly from all nodes of the PRIMECLUSTER system. Necessary information may become lost if a long time elapses after the error occurs. This applies especially to information collected by pclsnap.

C.1.1 Executing the pclsnap Command

The “pclsnap” command is a tool with which you can collect information for troubleshooting of PRIMECLUSTER. If a failure occurs in the PRIMECLUSTER system, this tool enables you to collect required information to pursue an investigation into the cause of the problem. You can execute this command as follows:

1. Log in with system administrator authority.
2. Execute the “pclsnap” command.
   `/opt/FJSVpclsnap/bin/pclsnap -a` *`output`*
   or
   `/opt/FJSVpclsnap/bin/pclsnap -h` *`output`*
   - If -a is specified, the amount of data becomes large because all detailed information is collected. If -h is specified, only cluster control information is collected.
   - Specify a file name or an output file name (/dev/st0) to output information. The specified name is the file to which collected information is output when the “pclsnap” command is executed.

See

For details on the “pclsnap” command, see the “README.ja” file, which is the README file included in the “FJSVsnap” package.

Information

Execution timings for the pclsnap command

- For problems that occur during operation, for example, if an error message is output, execute the “pclsnap” command immediately after the problem occurs.
- If the “pclsnap” command cannot be executed because the system hangs, collect a crash dump. Then start the system in single user mode, and execute the “pclsnap” command.
  For information on how to collect a crash dump, see C.1.2 "Crash Dump."
- After an error occurs, if a node restarts automatically (the node could not be started in single-user mode) or if the node is mistakenly started in multi-user mode, execute the “pclsnap” command.
- If investigation information cannot be collected because the “pclsnap” command results in an error or the “pclsnap” command does not return, then collect a system dump.

Information

Free space required for the execution of the pclsnap command

The approximate amount of free space required for the execution of the pclsnap command is listed in the following table:

	Default directory	Free space (approximate) (MB)
Output directory	Current directory during the execution of the command	300
Temporary directory	/tmp	500

Note

The listed values for the amount of free space (300 MB, 500 MB) may be insufficient depending on the system environment.
If troubleshooting information cannot be collected successfully due to there being insufficient directory space, the pclsnap command outputs an error message or a warning message upon the termination of the execution. In this case, re-execute the command according to the corrective action given below:

Corrective action when the amount of free space in the output directory is insufficient

The pclsnap command outputs the error message shown below when the creation of the output file has failed:

```
ERROR: failed to generate the output file "xxx".
DIAG: ...
```

Corrective action:

Change the output directory to one with a large amount of free space, and then re-execute the command.

Example :
When the output directory is be changed to /var/crash
```
# /opt/FJSVpclsnap/bin/pclsnap -a /var/crash/output
```

When there is insufficient free space in the temporary directory
The pclsnap command may output the following warning message upon the termination of the command execution:
```
WARNING: The output file "xxx" may not contain some data files.
DIAG: ...
```

The output of this warning message indicates that the output file of the pclsnap command has been created. However, part of the information to be collected may not be included in the output file.

Corrective action:
Change the temporary directory to one with sufficient free space, and then re-execute the command.

Example:
When the temporary directory is to be changed to /var/crash
```
# /opt/FJSVpclsnap/bin/pclsnap -a -T/var/crash output
```

If the same warning message continues to be output even after you change the temporary directory, the error may be caused by one of the following:

(1) A timeout occurs for a specific information collecting command due to the state of the system.
(2) The file from which information is to be collected is larger than the amount of free space in the temporary directory.

In the case of (1), the log of timeout occurrence is recorded in the pclsnap.elog file that is contained in the pclsnap output file. If possible, collect a crash dump from the pclsnap.elog file and from the pclsnap output file.
In the case of (2), confirm that the sizes of (a) and (b), below, are not larger than the amount of free space in the temporary directory:

(a) Log file size
- /var/log/messages
- Log files (SMAWsf/log/rcsd.log etc.) placed under
- /var/opt/SMAW*/log/

(b) Total size of the core files
- GFS core file
  /var/opt/FJSVsfcfs/cores/*
- GDS core file
  /var/opt/FJSVsdx/*core/*

If these are larger than the amount of free space in the temporary directory, move the relevant files to another partition that contains neither the output directory nor the temporary directory, and then re-execute the pclsnap command. Do not delete the moved files. Instead, save them.

C.1.2 Crash Dump

In the environment in which Linux Kernel Crash Dump(LKCD) is installed, you can collect crash dumps as troubleshooting information.

- When the kernel outputs the Oops message
- When a panic occurs in the kernel
- When a system administrator presses <Alt>+<SysRq>+<C> key on the console
- When an NMI watchdog timeout occurs
- When a system administrator presses the NMI button of the cluster system

A crash dump will be saved as a file during node startup.
The file is /var/crash/<*number*> (<*number*> indicates an integer of 0 or more).

See

For details on crash dumps, see the "*LKCD Installation Guide*."

Appendix D Messages

This appendix explains the following messages:

- D.1 Messages Related to CF (The reference sections are indicated.)
- D.2 Messages Related to RMS (The reference sections are indicated.)
- D.3 Procedure Resource Messages
- D.4 Failed Resource and Operator Intervention Messages
- D.5 Messages Related to the Settings of the Shutdown Facility

D.1 Messages Related to CF

The message related to Cluster Foundation (CF) are shown below.
You can refer to the corrective action by taking the following steps:

■ Procedure

1. Find the same display format as that of the displayed message.
2. Confirm the relevant table in “Display format” and then derive the columns of “Reference location in CF Configuration and Administration” from the following information that appears.
   - — Operation/state
     Operation/state when the message was displayed
   - — Message details
     “Command name,” ”error code,” “message number,” etc. included in the displayed message
3. Refer to the relevant “Reference location in CF Configuration and Administration” and, once you have confirmed the message, take corrective action.

■ Display format 1

command-name*:*message

command-name:

Command name

message:

Message (condition, message number, reason, and other information are included)

Operation/state		***command-name*:*message***	Reference location in CF Configuration and Administration Guide
Operation	**Command**		
Cluster node configuration	`cfconfig`	cfconfig: *message*	10.1 cfconfig Messages
CIP2.0 start/stop	`cipconfig`	cipconfig: *message*	10.2 cipconfig Messages
Node communication state output	`cftool`	cftool: *message*	10.3 cftool Messages
	`rcqconfig`	rcqconfig: *message*	10.4 rcqconfig Messages
	`rcqquery`	rcqquery: *message*	10.5 rcqquery Messages
CF execution		CF: *message*	10.6 CF Runtime Messages

■ Display format 2

FJSVcluster:*severity*:*program*:*message-number*:*message*

severity:

Indicates the message severity level.

There are 4 message severity levels: Stop (HALT), Information (INFORMATION), Warning (WARNING), Error (ERROR). For details, see the table below.

program:

Indicates the name of the program that outputs this message.

message-number:

Indicates the message number.

message:

Indicates the message text.

details:

Indicates the detailed classification code.

Operation	*message-number*	Reference location in CF Configuration and Administration Guide
Cluster resource management facility	0100, 0101, 0102	10.10.1 HALT Messages
	2100, 2200-5, 3200-6	10.10.2 INFO Messages
	5200	10.10.3 Warning Messages
	????, 6000-10, 6021, 6025, 6200-23, 6226, 6300-1, 6600-4, 6606-8, 6611, 6614-16, 6653, 6661, 6665, 6668, 6675, 6680, 6900-4, 6910-1, 7500-22, 7535-43, 7545-6	10.10.4 Error Messages

■ Display format 3

(SMAWsf,*number1*,*number2*):*message*

number1,*number2*:

Message number

message:

Message

Operation	(*number1*-*number2*)	Reference location in CF Configuration and Administration Guide
Shutdown facility	(10, 2)-(10, 12) (10, 15)-(10, 17), (10, 19), (10, 20) (10, 23), (10, 101) (30, 2)-(30, 10), (30, 12)-(30, 17) (50, 3)-(50, 4), (50, 6), (50, 9)	10.11 Shutdown Facility

■ Display format (others)

If neither of the above display formats is related, refer to the following:

- 10.7 CF Reason Code Table
- 10.8 Error messages for different systems

D.2 Messages Related to RMS

The messages related to RMS are shown below.
You can refer to the corrective action by taking the following steps:

■ Procedure

1. Find the same display format as that of the displayed message.
2. Confirm the relevant table in “Display format” and then derive the “Reference location,” which is included in the RMS Configuration and Administration in this manual, from the following information that is displayed.
   - — Operation/state
     Operation/state that was implemented when the message was displayed
   - — Message details
     “Command name,” “error code,” “message number,” etc. included in the displayed message
3. Refer to the relevant “Reference location” and, once you have confirmed the target message, apply corrective action.

■ Display format 1

FJSVcluster:*security*:*program*:*message-number*:*message*

security:

Indicates the message severity level.
There are four message severity levels: Stop (HALT), Information (INFORMATION), Warning (WARNING), Error (ERROR). For details, see the table below.

program:

Indicates the name of the resource database program that output this message.

message-number:

Indicates the message number.

message:

Indicates the message text.

Operation	*message-number*	Reference location in RMS Configuration and Administration Guide
Failed resource and operator intervention	1421-1423 2620, 2621, 2622, 2700, 2701, 6000-6004, 6009, 6208, 6615, 6616 6651, 6750, 6751-6755	D.4 "Failed Resource and Operator Intervention Messages "

■ Display format 2

(*err-code*, *message-number*):*message*

err-code:

error code

message-number:

Message number

message:

Message

Operation/state	*err-code*	*message-number*	Reference location in RMS Configuration and Administration Guide
switchlog	ADC	1, 2, 3, 4, 5, 15, 17, 18, 20, 25, 27, 30, 31, 32, 33, 34, 35, 37, 38, 39, 41, 43, 44, 45, 46, 47, 48, 49, 57, 58, 59, 60, 61, 62, 63	5.11 Errors in the Switchlog
	ADM	55, 57, 58, 59, 60, 62, 63, 67, 70, 95, 96	
	BM	8, 14, 52, 54, 68	
	CML	11, 12, 17, 18, 19, 20, 21	
	CRT	1, 2, 3, 4	
	CUP	2, 3, 5, 7, 8	
	DET	1, 3, 4, 5, 6, 7, 12, 13, 14, 24, 28, 33	
	GEM	4	
	INI	1, 9	
	QUE	13	
	SCR	8, 20	
	SWT	4, 20, 25, 26, 45	
	SYS	1, 8, 13, 14, 15, 17, 48, 49, 50, 84, 90, 93, 94, 97, 98	
	UAP	1, 5, 6, 7, 8, 9, 15, 16, 19, 21, 22, 23, 24, 27, 28, 29, 32, 33, 35, 41, 42	
	US	5, 6, 31	
	WLT	1, 3	
	WRP	3, 4, 9, 11, 12, 14, 15, 16, 17	
RMS error *	ADC	16, 21	5.12 Fatal Messages
	ADM	1, 2	
	BM	3, 49, 51, 58, 67	
	CML	14	
	CMM	1, 2, 3	
	DET	8, 9, 16	
	HVC	14	
	INI	7	
	MIS	4	
	QUE	1, 2, 5, 6, 11, 12	
	SCR	4, 5, 10, 12, 13, 15, 18	
	SYS	33, 52	
	UAP	36	
	US	1	

* RMS fails to start, or RMS stops during operation when a failure occurs.

■ Display format (others)

If neither of above display formats is related, refer to the following in the "*PRIMECLUSTER RMS Configuration and Administration Guide*:"

- 5.13 Additional error messages

D.3 Procedure Resource Messages

This section explains the messages that may be displayed when a cluster application uses a procedure resource.

The messages are output to syslogd(1M) in the following format:

FJSVcluster:*type*:*program*:*message number*:*message*

type

The message types are as follows:

- INFO – Displays information (numbers 1000 to 1999).
- ERROR – Indicates an error (numbers 6000 to 7999).

program

Identifies the program that produced the message.

message number

Identifies the message by a number.

message

This is the actual message text.

If a message that is not shown in this section is output, see “10.10 Resource Database Messages” in the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*.”

D.3.1 Error Messages

6002 Insufficient disk or system resources. (detail:*code1-code2*)

Corrective action:

The disk or system resources are insufficient for system operation.

code1 and *code2* indicate the information required for troubleshooting.

See the installation guide and check that there is space available in the required directories. If there is insufficient area, delete unnecessary files to secure more area.

If the problem cannot be resolved by this action, collect debugging information, and then contact your Fujitsu system engineer. For details on collecting debugging information, see Appendix C "Troubleshooting."

6617 The specified state transition procedure file does not exist.

Corrective action:

Specify the state transition procedure file correctly, and then re-execute.

If the problem cannot be solved with this corrective action, collect debugging information and then contact your Fujitsu systems engineer (SE). For details on collecting debugging information, see Appendix C "Troubleshooting."

6618 The state transition procedure file could not be written. A state transition procedure file with the same name already exists.

Corrective action:

To overwrite the state transition procedure file, specify the “–o” option and then re-execute.

6619 The state transition procedure file could not be written. There was an error in the

resource class specification.

Corrective action:
Specify the resource class correctly, and then re-execute. The available resource classes are file names under /etc/opt/FJSVcluster/classes.
Confirm that the character string specified as the resource class contains no errors.

6621 Could not perform file operation on state transition procedure file. (detail:*code1-code2*)

Corrective action:
Confirm the disk resource from which the state transition procedure is retrieved or the node resource of the file system is sufficient by executing the “df(1M)” command. Correct the insufficient resource problem or change the location from which the state transition procedure is retried, and do the operation again.
Confirm the disk resource on which the cluster system is installed or the node resource of the file system is sufficient by executing the “df(1M)” command. Correct the insufficient resource problem, and do the operation again.

If the problem cannot be solved even by applying with the corrective actions, collect debugging information and then contact your Fujitsu systems engineer (SE). For details on debugging information, see Appendix C "Troubleshooting."
code1 indicates debugging information while *code2* indicates error number.

6623 Cannot delete the specified state transition procedure file.

Corrective action:
You can delete only the state transition procedure file that was defined by a user. For information on how to delete it, refer to the manual of the product that provides the state transition procedure file.

6624 The specified resource does not exist in cluster service. (resource:*resource* rid:*rid*)

Corrective action:
A procedure resource that is registered to the cluster application is not in the resource database. This message is not output if the cluster application was registered by using the userApplication Configuration Wizard(GUI) and executing the “hvw(1M)” command. However, if this occurs, collect debugging information and contact your Fujitsu system engineer. For details on collecting debugging information, see Appendix C "Troubleshooting."
If hvw(1M) was used to register the procedure resource to the cluster application by FREECHOICE, check that the procedure resource displayed in the message text is not registered to the resource database by executing the “clgettree(1)” command. For details on the “clgettree(1)” command, see the manual page for clgettree(1M).
If the procedure resource is not registered to the resource database, register the procedure resource displayed in the message to the resource database. See Part 5 “PRIMECLUSTER Products, ”
If the procedure resource is registered to the resource database, collect debugging information and contact your Fujitsu system engineer. For details on collecting debugging information, see Appendix C "Troubleshooting."
Resource indicates the resource name that is not registered to the resource database, and *rid* indicates the resource ID of the resource that is not registered to the resource database.

6680 The specified directory does not exist.

Corrective action:
Specify a correct directory, and then re-execute.

6817 An error occurred during state transition procedure execution. (*error* procedure:*procedure* detail:*code1-code2-code3-code4-code5-code6-code7*)

Corrective action:
Collect debugging information and contact your Fujitsu system engineer. For details on collecting debugging information, see Appendix C "Troubleshooting."
procedure indicates the state transition procedure in which the error occurred. If the state transition procedure indicated by *procedure* was created, see the subsequent information, and correct the state transition procedure.
code1, *code2*, *code3*, *code4*, *code5*, *and code6* indicate the state transition instruction that resulted in an error. *code7* represents debugging information.

code1: the first argument (state transition instruction type)
code2: the second argument (cluster service instance type)
code3: the third argument (state transition instruction timing)
code4: the fourth argument (resource ID)
code5: the fifth argument (state transition event type)
code6: the sixth argument (state transition event detail)

error indicates the error cause. The error causes include the following:

- procedure file exit error

  [Error cause details]

  The possible causes are as follows:

  — The state transition procedure (*procedure*) is not a Bourne shell script.
  — The state transition processes for the individual arguments (*code1* to *code6*) of the state transition procedure (*procedure*) returned an error. The control program of the procedure resource determines the success or failure of the state transition processes based on the exit code (exit function) of the state transition procedure.

    Exit code 0: The control program determines that the state transition process is normal.
    Exit code other than 0: The control program determines that the state transition process failed.

  [Corrective action]

  Take the following actions:

  — Obtain the state transition procedure, and check that the state transition procedure (*procedure*) is a Bourne shell script. If the procedure is not a Bourne shell script, specify the following in the first line of the state transition procedure, and then register the state transition procedure again:

    #!/bin/sh

    To obtain the state transition procedure, execute the “clgetproc(1M)” command. To register the state transition procedure, execute the “clsetproc(1M)” command. For details on each command, see the corresponding manual page.
  — Check the return value of the state transition process for each argument (*code1* to *code6*). If there is no process that sets up an exit code (exit function), you need to add this exit code process. If there is no process, the execution result of the last command in the state transition procedure becomes the return value.

If the problem is not resolved by the above action, contact your Fujitsu system engineer.

D.4 Failed Resource and Operator Intervention Messages

This section explains the messages of the failed resource and operator intervention.
The messages are output to syslogd(1M) in the following format:

FJSVcluster:*type*:*program*:*message number*:*message*

type

The message types are as follows:

- QUESTION - Indicates a message for which operator intervention is required (numbers 1000 to 1999).
- INFO - Indicates a message in which information such as the operation state is shown (numbers 2000 to 3999).
- ERROR - Indicates an error (numbers 6000 to 7999).

program

Indicates the program that has output the message.

message number

Indicates the message number.

message

Indicates the message text.

If a message other than those described in this chapter is output, see “10.10 Resource Database Messages” in the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*.”

D.4.1 Operator Intervention Messages

1421 The userApplication "*userApplication*" did not start automatically because not all of the nodes where it can run are online.

Do you want to force the userApplication online on the SysNode "*SysNode*"?

Message No.:*number*

Do you want to do something? (no/yes)

Warning:Forcing a userApplication online ignores potential error conditions. Used improperly, it can result in data corruption. You should not use it unless you are certain that the userApplication is not running anywhere in the cluster.

Corrective action:

This operator intervention message is displayed when userApplication cannot be online because RMS is inactive on some of the nodes that are designed to execute applications. Use the clreply command to respond from the command prompt. For details on the “clreply” command, see the manual pages.

If you select yes, the operator intervention function will execute the “hvswitch” command and userApplication will go online. Confirm whether userApplication is in the online state by using Cluster Admin or executing the “hvdisp” command. For details on the “hvdisp” command, see the manual pages.
If you select no, the RMS command that is used to change the userApplication state cannot be executed.
userApplication indicates userApplication that is not online in any node.
SysNode indicates SysNode on which userApplication will be online if you select yes.
number indicates a message number.

If this message is output to the console and /var/log/messages, “month day time node name” might be output to the beginning of the second and subsequent lines of the message independently of the text of the message. You can ignore it.

1422 On the SysNode "*SysNode*", the userApplication "*userApplication*"is in the Faulted state due to a fault in the resource "*resource*". Do you want to clear fault?

Message No.:*number*

Do you want to do something? (yes/no)

Corrective action:
Confirm that the resource indicated by *resource* has recovered. If you need to reply from CLI, execute the “clreply” command.
If you select yes, the operator intervention function will execute the “hvutil” command by specifying the clear option in the “hvutil” command and also brings userApplication Offline. Confirm that userApplication has gone Offline by executing the “hvdisp” command.
If you select no, the operator intervention function does not execute the RMS command to bring userApplication Offline.
SysNode indicates the name of SysNode on which the failure occurred. *userApplication* indicates the name of userApplication in which the failure occurred. *resource* indicates the name of the resource that caused a failure in userApplication. *number* indicates a message number.

1423 On the SysNode "SysNode", the userApplication "userApplication"has the faulted resource "resource". The userApplication "userApplication" did not start automatically because not all of the nodes where it can run are online.

Do you want to force the userApplication online on the SysNode "SysNode"?

Message No.:number

Do you want to do something? (no/yes)

Warning:Forcing a userApplication online ignores potential error conditions. Used improperly, it can result in data corruption. You should not use it unless you are certain

that the userApplication is not running anywhere in the cluster.

Corrective action:
Confirm that the resource indicated by *resource* has recovered. If you need to reply from CLI, execute the “clreply” command.
If you select yes, the operator intervention function will execute the “hvswitch” command and userApplication will go Online. Confirm that userApplication has gone Online by executing the “hvdisp” command.
If you select no, the operator intervention function will not execute the RMS command to bring userApplication Online.
SysNode indicates the name of SysNode in which the failure occurred. *userApplication* indicates the name of userApplication in which the failure occurred. *resource* indicates the name of the resource that caused the failure in userApplication. *number* indicates the message number.

If this message is output to the console and /var/log/messages, “month day time node name” might be output to the beginning of the second and subsequent lines of the message independently of the text of the message. You can ignore it.

D.4.2 Information Messages

2620 On the SysNode "*SysNode*", the userApplication "*userApplication*" transitioned to the state *state*. Therefore, message "*number*" has been canceled.

Content:
Since the userApplication state has changed, the message has been cancelled. You do not need to respond to the operator intervention message.
SysNode indicates the name of SysNode in which the userApplication state has been changed. *userApplication* indicates the name of userApplication whose status has been changed. *state* indicates the userApplication state. *number* indicates the message number.

2621 The response to the operator intervention message "*number*" was action.

Content:
The response to the operator intervention message has been made.
number indicates the number of the operator intervention message to which you responded. action indicates with or without response by yes or no.

2622 There are no outstanding operator intervention messages.

Content:
There is no operator intervention messages that have yet to be processed.

2700 The resource fail has recovered.SysNode:SysNode userApplication:*userApplication* Resorce:*resource*

Content:
SysNode indicates the name of SysNode whose resource has been recovered. *userApplication* indicates the name of the userApplication to which the recovered resource belongs. *resource*

indicates the name of the resource that has recovered from the error state.

2701 A failed resource has recovered. SysNode:*SysNode*

Content:
SysNode that was in the Faulted state due to a node panic entered the Online state.
SysNode indicates a recovered SysNode.

D.4.3 Error Messages

6000 An internal error occurred. (function:*function* detail:*code1-code2-code3-code4*)

Content:
An internal error occurred in the program. *function*, *code1*, *code2*, *code3*, and *code4* indicate the debugging information for error diagnosis.
Corrective action:
Collect the debugging information. Then, contact your Fujitsu systems engineer (SE). See "9.3 Collecting troubleshooting information" in the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."
code1, *code2*, *code3*, and *code4* indicate the information that is required by your Fujitsu systems engineer (SE).

6001 Insufficient memory. (detail:*code1-code2*)

Content:
The memory resources of the node are insufficient to output this message. *code1* and *code2* indicate the debugging information.
Corrective action:
Recheck the memory resources. If the problem still cannot be solved, collect debugging information, and then contact your Fujitsu systems engineer (SE). See "9.3 Collecting troubleshooting information" in the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."
code1 and *code2* indicate the debugging information required for your Fujitsu systems engineer (SE).

6002 Insufficient disk or system resources. (detail:*code1-code2*)

Content:
The disk resources or system resources of the node are insufficient to output this message.
code1 and *code2* indicate debugging information.
Corrective action:
Recheck the usable capacity of the disk resource and the system resource. If the problem still cannot be solved, collect debugging information, and then contact your Fujitsu systems engineer (SE). See "9.3 Collecting troubleshooting information" in the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."
code1 and *code2* indicate the debugging information required for Fujitsu systems engineer (SE).

6003 Error in option specification. (option:*option*)

Content:
The specification of the CLI option is disabled.
Corrective action:
Specify a correct option, and then re-execute the command.
option indicates an option of the command.

6004 No system administrator authority.

Corrective action:
Re-execute the command with system administrator authority.

6009 If option *option1* is specified, option *option2* cannot be specified.

Content:
Two options specified with the command conflict.
Corrective action:
Re-execute the command by specifying either one of the options.

6208 Access denied (*target*).

Corrective action:
Collect debugging information and then contact your Fujitsu systems engineer (SE). See "9.3 Collecting troubleshooting information" in the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."
target indicates a command name.

6615 The cluster configuration management facility is not running.(detail:*code1-code2*)

Corrective action:
Reboot the node on which this message is displayed and then reactivate the resource database. If this message appears again, collect debugging information and then contact your Fujitsu systems engineer (SE). See "9.3 Collecting troubleshooting information" in the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."
code1 and *code2* indicate the debugging information required for your Fujitsu systems engineer (SE).

6616 Cluster configuration management facility: error in the communication routine.(detail:*code1-code2*)

Corrective action:
Collect debugging information, and then contact your Fujitsu systems engineer (SE). See "9.3 Collecting troubleshooting information" in the "*PRIMECLUSTER Cluster Foundation Configuration and Administration Guide*."

6651 The specified instruction contains an error.

Content:
This message will not be displayed on a client system on which a browser is active. This message is displayed on the standard output when you respond to the operator intervention message with the CLI command (clreply). If a string other than yes or no is to be entered, this message will be displayed.
Corrective action:
Specify the correct option, and then re-execute the command.

6750 A resource has faulted.SysNode:*SysNode* userApplication:*userApplication* Resorce:*resource*

Corrective action:
Confirm the state of userApplication in which the corrected resource is registered by using the RMS main window or executing the "hvdisp(1M)" command. You can also confirm the

userApplication state by responding to the operator intervention message that is displayed after RMS is started. If userApplication is Faulted, you need to clear the Fault by using the RMS main window or specifying the "-c" option of the "hvutil(1M)" command.
SysNode indicates the name of SysNode in which a resource has failed. *userApplication* indicates the name of userApplication to which the failed resource belongs. *resource* indicates the name of the resource that has failed.

6751 A SysNode has faulted. SysNode:*SysNode*

Corrective action:
Respond to the operator intervention message that is displayed after the node is started or confirm the state of userApplication running on the node in which the failure occurred, by using the RMS main window or executing the "hvdisp(1M)" command. If userApplication is Faulted, you need to clear the Fault by using the RMS main window or specifying the "-c" option of the "hvutil(1M)" command.
SysNode indicates the SysNode in which a failure occurred.

6752 The processing was canceled due to the following error.

Error message from RMS command

Content:
If you execute the RMS command (hvdisp) to enable the history function for the failed resource or the operation intervention function, and this fails, an error message will be displayed. Examine this error message and, after taking an appropriate correction, execute the required processing again.
Corrective action:
Confirm the contents of this message and, after taking the required corrective action, re-execute the processing.

6753 Failed to process the operator intervention message due to the following error.(message number:*number* response:action command:*command*)

Error message from RMS command

Content:
Since the RMS command ended abnormally, the operator intervention function for the message failed.
Corrective action:
Note the contents of this message and, after applying an appropriate correction, re-execute the required processing.
number indicates the operator intervention message for which processing failed. *action* indicates the first response to the message from the operator with either yes or no. *command* indicates the RMS command which ended abnormally. "Error message from RMS command" indicates an error message that the RMS command transmits when a standard error occurs.

6754 The specified message number (*number*) does not exist.

Corrective action:

- This message is output in the following situations:
  The operator specified a nonexistent message number when executing the "clreply" command. This problem can be solved by specifying a message number that is included in the unfinished message list.
- The message for which a response was entered has been canceled. This occurs when

the message gets old since the application state has been changed. You do not have to take any action.

- The operator intervention function has automatically replaced the message for which a response has been entered with other message. For example, when the operator intervention function's message number 1422 is replaced by the message number 1423 and vice versa. In such a case, the operator intervention function responds to the first message, displays another message, and advises a user that the message number has been changed.

number indicates the number of operator intervention messages.

6755 Failed to respond to the operator intervention message due to the SysNode (SysNode) stop.(message number:number response: action)

Content:
Since the node indicated by SysNode has stopped, the response to the operator intervention message failed.
Corrective action:
Reboot the node, and then confirm that RMS is running.
SysNode indicates the SysNode name of the node that is stopped. number indicates the number of the operator intervention messages that failed to respond. action indicates the operator's response by yes or no.

D.5 Messages Related to the Setting of the Shutdown Facility

D.5.1 Notes on the Setting of the Shutdown Facility

■ Notes on installing the LKCD shutdown agent

When you failed to execute the "panicinfo_setup" command and reboot any one of the cluster nodes, you need to confirm that the "/etc/opt/FJSVcllkcd/etc/SA_lkcd.idx" file is MYINDEX –1. If not, reboot the node after editing the file using an editor.

■ Notes related to post-installation of the LKCD shutdown agent

If the LKCD shutdown agent is installed on a node, the panic status of the node will be cleared duing node startup. If the node fails to clear the panic status, the node will start up in single user mode to avoid joining the cluster system.
In such a case, you need to recover the failed node using the following steps:

◆ Operation Procedure

1. Confirm the index value (NODEID) and the disk that notifies the panic status of the node.
   Example)
   ```
   # /sbin/panicinfo -g
   NODEID: 1
   DEVICE: /dev/sdf
   ```
2. Clear the panic status of the local node.
   Example)
   ```
   # /sbin/panicinfo -s -I 1
   ```
3. Shift to the default run level by pressing Ctrl-d.

If the above procedure fails, you must determine the cause of the error, and then go through the procedure again.
Possible causes are as follows:

- A disk that is not the one that notifies the panic status is output with the “/sbin/panicinfo -g” command.
  Corrective action
  Specify a correct device name in the NOTIFY_DEV variable of the "/etc/sysconfig/dump" file.
- The area where the panic status is notified is not initialized.
  Corrective action
  Execute the following command.
  ```
  # /sbin/panicinfo -i -n <the number of cluster nodes>
  ```
- The I/O path of the shared disk is disconnected.
  Corrective action
  Reconnect the I/O path.
- A failure occurs in the disk that notifies the panic status.
  Corrective action
  Disable the LKCD shutdown agent.
  Prepare other disk that notifies the panic status, and then set up the LKCD shutdown agent again.

To boot the node at the default run level even when you cannot determine the cause of the error, you need to disable the LKCD shutdown agent.

◆ Disable the LKCD shutdown agent

If you edit the “/etc/opt/FJSVcllkcd/etc/SA_lkcd.idx” file as MYINDEX -1, you can avoid the panic status clear processing during node startup.

To avoid the above panic status clear processing and, at the same time, continue the cluster operation, edit the “/etc/opt/FJSVcllkcd/etc/SA_lkcd.idx” file as MYINDEX –1 on all other nodes of the cluster system. If any INDEX rows are included, delete them all.

The LKCD shutdown agent will be disabled by editing the “/etc/opt/FJSVcllkcd/etc/SA_lkcd.idx” file as MYINDEX –1 on all the cluster nodes. Then, the crash dump facility is also disabled. However, ongoing operations are never disrupted with the RSB shutdown agent.

◆ Enable the LKCD shutdown agent

Enable the LKCD shutdown agent
To enable the LKCD shutdown agent, execute "Setting up the LKCD shutdown agent" and "Starting up the shutdown agent" in 5.2.2 "Setting Up the Shutdown Facility."

D.5.2 Error Messages

If panicinfo_setup fails, the following messages will be output to the standard error output according to the cause.

ERROR: <*command*> failed

Content:
Execution of the <*command*> command failed.

Corrective action:
Check the command and execute it again.

ERROR: <*command*> failed on <*node*>

Content:
The <*command*> command failed on the <node> node.
Corrective action:
Check the command and execute the <command> command on the <node> node again.

ERROR: failed to distribute index file to <*node*>

Content:
Distribution of the index file to <*node*> failed.
Corrective action:
Confirm that the CF services (CFSH, CFCP) have started normally.

ERROR: failed to change mode of index file on <*node*>

Content:
Changing of the index file mode on <*node*> failed.
Corrective action:
Confirm that the "chmod" command can be executed normally on <*node*> for the "/etc/opt/FJSVcllkcd/etc/SA_lkcd.idx" file, and then re-execute the command.

ERROR: failed to patch rcsd.cfg on <*node*>

Content:
Updating of rcsd.cfg failed on the <*node*> node.
Corrective action:
Confirm that the "/etc/opt/SMAW/SMAWsf/rcsd.cfg" file is included in the <*node*> node and then, re-execute the command.

ERROR: failed to change owner of index and rcsd.cfg file on <*node*>

Content:
Changing of the owner on the <*node*> node failed.
Corrective action:
Confirm that the chown command can be executed for the "/etc/opt/FJSVcllkcd/etc/SA_lkcd.idx" file and for the "/etc/opt/SMAW/SMAWsf/rcsd.cfg" file on the <*node*> node, and then re-execute the command.

ERROR: failed to change group of index and rcsd.cfg file on <*node*>

Content:
Changing of the owner group on the <*node*> node failed.
Corrective action:
Confirm that the chgrp command can be executed for the "/etc/opt/FJSVcllkcd/etc/SA_lkcd.idx" file and for the "/etc/opt/SMAW/SMAWsf/rcsd.cfg" file on the <*node*> node, and then re-execute the command.

ERROR: internal error, ...

Content:
Internal error.
Corrective action:
Copy this message, and then contact your Fujitsu systems engineer (SE).

Appendix E Registering, Changing, and Deleting State Transition Procedure Resources for PRIMECLUSTER Compatibility

To use a procedure resource in a cluster application, you must register the procedure resource before setting up the cluster application.
This appendix explains how to register, change, and delete procedure resources.

E.1 Registering a Procedure Resource

This section explains how to register a procedure resource.
Take the following steps to register a procedure resource on all nodes where the procedure resource needs to be registered.

◆ **Operation Procedure:**

1. Log in with the system administrator authority to the node in which the procedure resource is to be registered.
2. Execute the "clsetproc(1M)" command to register the state transition procedure.

For details on the "clsetproc(1M)" command, see the manual page.

To register the "/tmp/program" state transition procedure as program (file name) to the BasicApplication class

```
# /etc/opt/FJSVcluster/bin/clsetproc -c BasicApplication -m program /tmp/program
```

To overwrite a state transition procedure that is already registered, specify the -o option.

3. Registering the procedure resource
   Execute the "claddprocrsc(1M)" command to register the procedure resource.

For details on the claddprocrsc(1M) command, see the manual page for claddprocrsc (1M).

When registering a procedure resource, this procedure resource has to meet the following conditions;

- The resource key of the procedure resource is SDISK,
- The procedure name is program,
- This procedure resource uses the state transition procedure registered in the

BasicApplication class,
- The procedure resource is registered in the node (NODE1), and
- The state transition procedure receives the requests of START RUN AFTER and STOP RUN BEFORE

```
# /etc/opt/FJSVcluster/bin/claddprocrsc -k SDISK -m program -c
BasicApplication -s NODE1 -K AFTER -S BEFORE
```

E.2 Changing a Procedure Resource

This section explains how to change a procedure resource.

■ Changing a state transition procedure

Take the following steps to change the state transition procedure on all nodes where it needs to be changed.

◆ Operation Procedure:

1. Log in with the system administrator authority to the node in which the state transition procedure is to be changed.
2. Execute the "clgetproc(1M)" command to retrieve the state transition procedure.

For details on the "clgetproc(1M)" command, see the manual page.

When retrieving a state transition procedure, this procedure resource has to meet the following conditions;
- The state transition procedure is retrieved to the “/tmp” directory.
- The file name registered in the BasicApplication class is program.

```
# /etc/opt/FJSVcluster/bin/clgetproc -c BasicApplication -f
/tmp/program program
```

3. Modifying the state transition procedure
   Using a text editor such as vi(1), modify the state transition procedure that was retrieved in Step 2.
4. Registering the state transition procedure
   For instruction on registering the procedure, see Step 2 of E.1 "Registering a Procedure Resource"

■ Changing registration information of a procedure resource

Take the following steps to change the registration information of the procedure resource on all nodes where the state transition procedure needs to be changed.

◆ Operation Procedure:

1. Log in with the system administrator authority to the node in which the state transition procedure of the procedure resource is to be changed.
2. Execute the "clsetprocrsc(1M)" command to change the registration information of the procedure resource.

For details on the "clsetprocrsc(1M)" command, see the manual page.

Example

When the procedure resource with the following conditions receives a state transition request of START RUN BEFORE in addition to START RUN AFTER and STOP RUN BEFORE;

- The resource key of the procedure resource is SDISK,
- This procedure resource uses the state transition procedure registered in the BasicApplication class, and
- The procedure resource is registered in the node (NODE1)

```
# /etc/opt/FJSVcluster/bin/clsetprocrsc -n SDISK -c
BasicApplication -s NODE1 -K BEFORE,AFTER -S BEFORE
```

E.3 Deleting a Procedure Resource

Take the following steps to delete a procedure resource on all nodes where the procedure resource needs to be changed.

◆ **Operation Procedure:**

1. Log in with the system administrator authority to the node from which the procedure resource is to be deleted.
2. Execute the "cldelprocrsc(1M)" command to delete the procedure resource.

See

For details on the "cldelprocrsc(1M)" command, see the manual page.

Example

When deleting a procedure resource, the procedure resource needs to meet the following conditions;

- The resource key of the procedure resource is SDISK,
- This procedure resource uses the state transition procedure registered in the BasicApplication class, and
- The node identification name is NODE1

```
# /etc/opt/FJSVcluster/bin/cldelprocrsc -n SDISK -c
BasicApplication -s NODE1
```

3. Deleting the state transition procedure
   If a state transition procedure becomes unnecessary after all procedure resources that use that state transition procedure have been deleted, execute the cldelproc(1M) command to delete the state transition procedure.

See

For details on the "cldelproc(1M)" command, see the manual page.

Example

When deleting a procedure resource, the procedure resource needs to meet the following conditions;

- The procedure name is program, and
- This procedure resource uses the state transition procedure registered in the BasicApplication class

```
# /etc/opt/FJSVcluster/bin/cldelproc -c BasicApplication program
```

Appendix F Registering PRIMECLUSTER-compatible Resources

This section explains how to register a resource of the product that supports PRIMECLUSTER.

See

See F.3 "Deleting a Cluster Service" only if the userApplication configuration was changed.

F.1 Registering a Cluster Service

If you use the CUI to set up userApplication, you need to register a cluster service and a cluster service instance resource of the products that support PRIMECLUSTER in the resource database.

Note

- If you used the GUI to set up userApplication, the procedure below is unnecessary.
- If you are using the CUI to set up userApplication of the product that supports PRIMECLUSTER, see the following:
  "/opt/SMAW/SMAWRrms/htdocs.solaris/wizards.en/wizards/CRM.htm"

Register a cluster service and a cluster service instance resource of the product that supports PRIMECLUSTER using the following steps:

◆ Operation Procedure:

Note

Carry out Steps 1 and 2 in any one of the nodes that make up userApplication. The nodes refer to all nodes that were set to "Machines" in "(5)" of "CRM.htm."

1. Log in with the system administrator authority to any node of the cluster system.
2. Execute the "claddrsc(1)" command in the format shown below. If the registration is successful, the resource ID of the cluster service is output to standard output.

   ```
   # /etc/opt/FJSVcluster/sys/claddrsc -c ClusterService -k ApplicationName-of-userApplication (*) -p 0 -t nocontroler -s -1 -d self -e service
   ```

   * For "*ApplicationName-of-userApplication*," specify the application name of the user application that was set to "(4)" of "CRM.htm."

   Example) If the application name of userApplication is "generic."

   ```
   # /etc/opt/FJSVcluster/sys/claddrsc -c ClusterService -k generic -p 0 -t nocontroler -s -1 -d self -e service
   100
   ```

Carry out Steps 3 to 5 in all nodes that make up userApplication.

3. Log in with the system administrator authority to the node.
4. Obtain the node identification number of the local node.
   Execute the clgetnode(1) command in the format shown below, and check the node identification number of the local node. If clgetnode(1) execution is successful, the node identification number of the local node is output to standard output.
   ```
   # /etc/opt/FJSVcluster/bin/clgetnode -i
   ```
   In the following example, the node identification number of the local node is "0."
   ```
   # /etc/opt/FJSVcluster/bin/clgetnode -i
   0
   ```
5. Register the cluster service instance resource.
   Execute the claddrsc(1) command in the format shown below. If the registration is successful, the resource ID of the cluster service instance is output to standard output.
   ```
   # /etc/opt/FJSVcluster/sys/claddrsc -c AndBinding -k
   ApplicationName-of-userApplication (*) -p
   resource-ID-of-cluster-service (**) -t nocontroler -s
   node-identification-number-of-local-node (***) -d self -e service
   ```
   * For "*ApplicationName-of-userApplication*," specify the application name of the user application that was set to "(4)" of "CRM.htm."

   ** For "*resource-ID-of-cluster-service*," specify the resource ID of the cluster service that was registered in Step 2.

   *** For "*node-identification-number-of-local-node*," specify the node identification number that was obtained in Step 4 for the local node.

   Example) If the application name of userApplication is "generic," the resource ID of the cluster service is "100," and the node identification number of the local node is "0."
   ```
   # /etc/opt/FJSVcluster/sys/claddrsc -c AndBinding -k genelic -p 100
   -t nocontroler -s 0 -d self -e service
   101
   ```

Carry out Steps 6 and 7 in any one of the nodes that make up userApplication.

6. Log in with the system administrator authority to any one of the nodes that make up the cluster system.
7. Set up the operation sequence of the cluster service instances.
   Execute the clsetinsorder(1M) command in the format shown below, and set the operation sequence of the cluster service instances.
   ```
   # /etc/opt/FJSVcluster/bin/clsetinsorder -s
   resource-ID-of-cluster-service(*) -r
   resource-ID-of-cluster-service-instance ...(**) -S
   ```
   * For "*resource-ID-of-cluster-service*," specify the resource ID of the cluster service that was registered in Step 2.

   ** For "*resource-ID-of-cluster-service-instance*," specify the resource ID of the cluster service instance that was registered in Step 5 for each node. Specify the resource IDs of the cluster service instances in the "Machines" sequence that was set in "(5)" of "CRM.htm."

Example) If the resource ID of the cluster service is "100," and the Machines sequence is as follows: The resource ID of the cluster service instance in the narcissus node is "101" and the resource ID of the cluster service instance in the sweetpea node is "102."

```
Machines[0]  narcissusRMS
Machines[1]  sweetpeaRMS

# /etc/opt/FJSVcluster/bin/clsetinsorder -s 100 -r 101,102 -S
```

F.2 Associating Resources to a Cluster Service Instance

This section explains how to associate resources with a cluster service instance of the product that supports PRIMECLUSTER.

◆ **Operation Procedure:**

1. Log in with the system administrator authority.
   Log in with the system administrator authority to one of the nodes of the cluster system.

   Perform Step 2 only if userApplication was set up with the CUI and IP address takeover was set during userApplication setup. If userApplication was set up with the GUI or if IP address takeover was not set during userApplication setup, Step 2 is unnecessary.

2. Register the IP address takeover resources.
   — Execute the "clgettree(1)" command in the format shown below, and check the resource IDs of the PublicLAN resources in all nodes that execute IP address takeover. The resource class of PublicLAN resources is "Ethernet."

   ```
   # /etc/opt/FJSVcluster/bin/clgettree
   ```

   Example) In the following case, the resource ID of the PublicLAN resource in the narcissus node is "25" and the resource ID of the PublicLAN resource in the sweetpea node is "26."

   ```
   # /etc/opt/FJSVcluster/bin/clgettree
   Cluster 1 /
             Domain 2 RC9
             Shared 7 SHD_RC9
             Node 3 narcissus ON
                    Psd 21 hme1 ON
                    Psd 22 hme2 ON
                    Ethernet 25 hme0 ON
                    DISK 19 c0t0d0 UNKNOWN
                    SytemState2 40 FJSVndbs UNKNOWN
             Node 5 sweetpea ON
                    Psd 23 hme1 ON
                    Psd 24 hme2 ON
                    Ethernet 26 hme0 ON
                    DISK 20 c0t0d0 UNKNOWN
                    SytemState2 41 FJSVndbs UNKNOWN
   ```

   — Execute the "clcreate-iprsc(1M)" command in the format shown below, and register

the IP address takeover resources.

```
# /etc/opt/FJSVcluster/sys/clcreate-iprsc -p
resource-ID-of-PublicLAN-resource...(*1)
takeover-IP-address(*2)
```

*1 For "*resource-ID-of-PublicLAN-resource...*," specify the resource IDs of the PublicLAN resources of all nodes that were confirmed with the previous "clgettree(1)" command.

*2 For "*takeover-IP-address*," specify the takeover IP address that was specified during userApplication setup.

Example) If the resource IDs of the PublicLAN resources are "25," "26" and the takeover IP address is "192.168.246.1"

```
#/etc/opt/FJSVcluster/sys/clcreate-iprsc -p 25,26 192.168.246.1
```

3. Associate the resources to cluster service instances.

Associate the following resources to cluster service instances:

— IP address takeover resources (*1)

*1 If IP address takeover resources were registered in Step 2, associated them to cluster service instances.

— "Interstage Traffic Director" resources

1) Execute the clgettree(1) command in the format shown below, and check the resource IDs of the resources to be associated to cluster service instances. The resource class of IP address takeover resources is "IP_Address." The resource name of the Interstage Traffic Director resource is "FJSVndbs."

```
# /etc/opt/FJSVcluster/bin/clgettree
```

Example) For the "clgettree(1) command execution example" described below, the resource IDs for the IP address takeover and Interstage Traffic Director resources are as follows:

Node	Resource ID of IP address takeover resource	Resource ID of Interstage Traffic Director resource
narcissus	27	40
sweetpea	28	41

[Execution example of clgettree(1) command]

```
# /etc/opt/FJSVcluster/bin/clgettree
Cluster 1 /
           Domain 2 RC9
           Shared 7 SHD_RC9
                  SHD_Host 29 192.168.246.1 UNKNOWN
                         IP_Address 27 hme0:1 UNKNOWN narcissus
                         IP_Address 28 hme0:1 UNKNOWN sweetpea
           Node 3 narcissus ON
                  Psd 21 hme1 ON
                  Psd 22 hme2 ON
                  Ethernet 25 hme0 ON
                         IP_Address 27 hme0:1 UNKNOWN
                  DISK 19 c0t0d0 UNKNOWN
                  SytemState2 40 FJSVndbs UNKNOWN
           Node 5 sweetpea ON
                  Psd 23 hme1 ON
                  Psd 24 hme2 ON
```

```
Ethernet 26 hme0 ON
       IP_Address 28 hme0:1 UNKNOWN
DISK 20 c0t0d0 UNKNOWN
SytemState2 41 FJSVndbs UNKNOWN
```

2) Using the format shown below, execute the "clrepparent(1M)" command for each node in the userApplication configuration, and associate the IP address takeover and Interstage Traffic Director resource to cluster service instances.

```
#/etc/opt/FJSVcluster/sys/clrepparent -s
resource-IDs-of-IP-address-takeover-and-Interstage-Traffic
Director-resources(*1) -t
resource-ID-of-cluster-service-instance(*2)
```

*1 Specify the resource IDs of the IP address takeover and Interstage Traffic Director resources that were obtained with the clgettree(1) command in each node.

*2

If userApplication was set up with the CUI

Specify the resource ID of the cluster service instance that was registered in each node according to Step 5 "Register the cluster service instance" in F.1 "Registering a Cluster Service."

If userApplication was set up with the GUI

Execute the "clgettree(1)" command in the format shown below, and check the resource ID of the cluster service instance in each node. The resource class for cluster service instances is "AndBinding." The node name to which the cluster service instance belongs is displayed at the end of the line for the "AndBinding" resource class.

```
# /etc/opt/FJSVcluster/bin/clgettree -s
```

In the following example, the resource ID of the cluster service instance in the narcissus node is "101," and the resource ID of the cluster service instance in the sweetpea node is "102."

```
# /etc/opt/FJSVcluster/bin/clgettree -s
Standby 68 Service1 STOP AVAILABLE
   AndBinding 101 Instance1_Of _narcissus STOP STOP(RUN)
narcissus
   AndBinding 102 Instance1_Of _sweetpea STOP STOP(RUN)
sweetpea
```

Example) When the resource ID of the cluster service instance in the narcissus node is "101" and the resource ID of the cluster service instance in the sweetpea node is "102" and the following resources are registered in each node:

Node	Resource ID of IP address takeover resource	Resource ID of Interstage Traffic Director resource
narcissus	27	40
sweetpea	28	41

```
# /etc/opt/FJSVcluster/sys/clrepparent -s 27,40 -t 101
# /etc/opt/FJSVcluster/sys/clrepparent -s 28,41 -t 102
```

F.3 Deleting a Cluster Service

This section describes the procedure to be performed in the following cases:

- If userApplication is deleted

After carrying out the procedure indicated in this section, perform the F.1 "Registering a Cluster Service" and F.2 "Associating Resources to a Cluster Service Instance" operations in the following cases:

- If the number of nodes configuring userApplication is changed
- If the ApplicationName of userApplication is changed
- If a new IP address takeover is to be executed or if an IP address takeover is to be discontinued
- If a takeover IP address is changed

◆ Operation Procedure:

1. Log in with the system administrator authority.
   Log in with the system administrator authority to one of the nodes of the cluster system.
2. Check the resource ID of the cluster service.
   Execute the "clgettree(1)" command in the format shown below, and check the cluster service resource. The resource class of the cluster service is "Standby" or "Scalable." The cluster service is output in the first line.
   # **/etc/opt/FJSVcluster/bin/clgettree -s**

   Example) In the example below, the resource ID of the cluster service is "68."
   # **/etc/opt/FJSVcluster/bin/clgettree -s**
   Standby 68 Service1 STOP AVAILABLE
   AndBinding 101 Instance1_Of _narcissus STOP STOP(RUN) narcissus
   AndBinding 102 Instance1_Of _sweetpea STOP STOP(RUN) sweetpea

3. Delete the cluster service resource.
   Execute the "cldelrsc(1M)" command in the following format, and delete the cluster service resource.
   # **/etc/opt/FJSVcluster/bin/cldelrsc -r** *resource-ID-of-cluster-service*(*1)
   *1 For "*resource-ID-of-cluster-service*," specify the resource ID of the cluster service that was obtained in Step 2.
   Example) To delete the cluster service that has resource ID "68."
   # **/etc/opt/FJSVcluster/bin/cldelrsc -r 68**

4. Delete the IP address takeover resources.
   — Execute the "clgettree(1)" command in the format shown below, and check the resource IDs of the IP address takeover resources. The resource classes of the IP address takeover resources are "SHD_Host" and "IP_Address." If resources of the "SHD_Host" and "IP_Address" resource classes are not output, the execution of the subsequent steps is unnecessary because there are no IP address takeover resources.
   # **/etc/opt/FJSVcluster/bin/clgettree**

   Example) In the following case, the resource IDs of the IP address takeover resources are "29," "27" and "28."
   # **/etc/opt/FJSVcluster/bin/clgettree**

```
Cluster 1 /
           Domain 2 RC9
           Shared 7 SHD_RC9
                  SHD_Host 29 192.168.246.1 UNKNOWN
                        IP_Address 27 hme0:1 UNKNOWN narcissus
                        IP_Address 28 hme0:1 UNKNOWN sweetpea
           Node 3 narcissus ON
                  Psd 21 hme1 ON
                  Psd 22 hme2 ON
                  Ethernet 25 hme0 ON
                        IP_Address 27 hme0:1 UNKNOWN
                  DISK 19 c0t0d0 UNKNOWN
                  SytemState2 40 FJSVndbs UNKNOWN
           Node 5 sweetpea ON
                  Psd 23 hme1 ON
                  Psd 24 hme2 ON
                  Ethernet 26 hme0 ON
                        IP_Address 28 hme0:1 UNKNOWN
                  DISK 20 c0t0d0 UNKNOWN
                  SytemState2 41 FJSVndbs UNKNOWN
```

— If the previous procedure indicates that there is an IP address takeover resource, execute the "cldelrsc(1)" command in the format shown below, and delete the IP address takeover resource. Execute this step only if there is an IP address takeover resource.

```
# /etc/opt/FJSVcluster/bin/cldelrsc -r
resource-ID-of-IP-address-takeover-resource(*1)
```

*1 For "resource-ID-of-IP-address-takeover-resource," specify all resource IDs of IP address takeover resources that were obtained with the previous "clgettree(1)" command.

Example) If the resource IDs of the IP address takeover resources are "29," "27" and "28."

```
# /etc/opt/FJSVcluster/bin/cldelrsc -r 29,27,28
```

Glossary

AC

See *Access Client*.

Access Client

GFS kernel module on each node that communicates with the Meta Data Server and provides simultaneous access to a shared file system.
See also *Meta Data Server*.

API

See *Application Program Interface*.

application (RMS)

A resource categorized as userApplication used to group resources into a logical collection.

Application Program Interface

A shared boundary between a service provider and the application that uses that service.

application template (RMS)

A predefined group of object definition value choices used by RMS Application Wizards to create object definitions for a specific type of application.

Application wizards

See *RMS Application Wizards*.

attribute (RMS)

The part of an object definition that specifies how the base monitor acts and reacts for a particular object type during normal operations.

automatic configuration (GDS)

Function that automatically recognizes the physical connection configuration of shared disk units and registers the units to the resource database.

automatic power control

This function is provided by the Enhanced Support Facility (ESF), and it automatically switches the PRIMEPOWER power on and off.

automatic switchover (RMS)

The procedure by which RMS automatically switches control of userApplication over to another host after specified conditions are detected.
See also *directed switchover*, *failover*, *switchover*, and *symmetrical switchover*.

availability

Availability describes the need of most enterprises to operate applications via the Internet 24 hours a day, 7 days a week. The relationship of the actual to the planned usage time determines the availability of a system.

base cluster foundation (CF)

This PRIMECLUSTER module resides on top of the basic OS and provides internal interfaces for the CF (Cluster Foundation) functions that the PRIMECLUSTER services use in the layer above.
See also *Cluster Foundation*.

BM (base monitor)(RMS)

The RMS module that maintains the availability of resources. The base monitor is supported by daemons and detectors. Each host being monitored has its own copy of the base monitor

Cache Fusion

The improved interprocess communication interface in Oracle 9i that allows logical disk blocks (buffers) to be cached in the local memory of each node. Thus, instead of having to flush a block to disk when an update is required, the block can be copied to another node by passing a message on the interconnect, thereby removing the physical I/O overhead.

ccbr.conf

The environment configuration file that is used backup and restore operations, and is placed in the “/opt/SMAW/ccbr” directory. This file is used in the “$CCBRHOME” variable setting. For details, see the manual pages for the “cfbackup(1M)” and “cfrestore(1M)” commands and the comments in the “ccbr.conf” file.

ccbr.gen

The file that stores the generation number and is placed in the “/opt/SMAW/ccbr” directory. A value of 0 or higher is stored in this file. For details, see the manual pages for the “cfbackup(1M)” and “cfrestore(1M)” commands.

CCBRHOME variable

The variable that identifies the directory in which backup data is stored. The initial value is the “/var/spool/pcl4.1/ccbr” directory. This variable can be set only in the “ccbr.conf” file.

CF

See Cluster Foundation.

child (RMS)

A resource defined in the configuration file that has at least one parent. A child can have multiple parents, and can either have children itself (making it also a parent) or no children (making it a leaf object).
See also *resource*, *object*, *parent*, and *leaf object*.

class (GDS)

See *disk class*.

cluster

A set of computers that work together as a single computing source. Specifically, a cluster performs a distributed form of parallel computing.
See also *RMS configuration*.

Cluster Foundation

The set of PRIMECLUSTER modules that provides basic clustering communication services.
See also *base cluster foundation*.

cluster interconnect (CF)

The set of private network connections used exclusively for PRIMECLUSTER communications.

Cluster Join Services (CF)

This PRIMECLUSTER module handles the forming of a new cluster and the addition of nodes.

Cluster Resource Management facility

Facility that manages hardware units that are shared among multiple nodes.

concatenated virtual disk

Concatenated virtual disks consist of two or more pieces on one or more disk drives. They correspond to the sum of their parts. Unlike simple virtual disks where the disk is subdivided into small pieces, the individual disks or partitions are combined to form a single large logical

disk. (Applies to transitioning users of existing Fujitsu Siemens products only.)
See also *mirror virtual disk, simple virtual disk, striped virtual disk, virtual disk*.

concatenation (GDS)
The linking of multiple physical disks. This setup allows multiple disks to be used as one virtual disk that has a large capacity.

configuration file (RMS)
The RMS configuration file that defines the monitored resources and establishes the interdependencies between them. The default name of this file is config.us.

console
See *single console*.

custom detector (RMS)
See *detector*.

custom type (RMS)
See *generic type*.

daemon
A continuous process that performs a specific function repeatedly.

database node (SIS)
Nodes that maintain the configuration, dynamic data, and statistics in a SIS configuration.
See also *gateway node*, *service node*, *Scalable Internet Services*.

detector (RMS)
A process that monitors the state of a specific object type and reports a change in the resource state to the base monitor.

directed switchover (RMS)
The RMS procedure by which an administrator switches control of userApplication over to another host.
See also *automatic switchover*, *failover*, *switchover*, and *symmetrical switchover*.

disk class (GDS)
Collection of SDX objects. The shared type disk class is also a resource unit that can be used by the PRIMECLUSTER system. A disk class is sometimes simply called a "class."

disk group (GDS)
A collection of disks or low-order groups that become the unit for mirroring, striping, or concatenation. Disk and low-order groups that belong to the same disk group are mutually mirrored, striped, or concatenated according to the type attribute (mirror, stripe, or concatenation) of that disk group.
A disk group is sometimes simply called a "group."

DOWN (CF)
A node state that indicates that the node is unavailable (marked as down). A LEFTCLUSTER node must be marked as DOWN before it can rejoin a cluster.
See also *UP*, *LEFTCLUSTER*, *node state*.

ENS (CF)
See *Event Notification Services*.

environment variable (RMS)
Variables or parameters that are defined globally.

error detection (RMS)
The process of detecting an error. For RMS, this includes initiating a log entry, sending a

message to a log file, or making an appropriate recovery response.

Ethernet

LAN standard that is standardized by IEEE 802.3. Currently, except for special uses, nearly all LANs are Ethernets. Originally the expression Ethernet was a LAN standard name for a 10 megabyte per second type LAN, but now it also used as a general term that includes high-speed Ethernets and gigabyte Ethernets.

Event Notification Services (CF)

This PRIMECLUSTER module provides an atomic-broadcast facility for events.

failover (RMS, SIS)

The process by which a user application automatically transfers processes and data inherited from an operating system to a standby system because some failure has occurred.
With SIS, this process switches a failed node to a backup node. With RMS, this process is known as switchover.
See also *automatic switchover*, *directed switchover*, *switchover*, *symmetrical switchover*.

fault tolerant network

A network with the ability to withstand faults (fault tolerant). Fault tolerant is the ability to maintain and continue normal operation even if a fault occurs in part of the computer system. A fault tolerant network is therefore a network that can continue normal communication even if a flat occurs in part of the network system.

gateway node (SIS)

Gateway nodes have an external network interface. All incoming packets are received by this node and forwarded to the selected service node, depending on the scheduling algorithm for the Service.
See also *service node*, *database node*, *Scalable Internet Services*.
See *disk group*.

GDS

See *Global Disk Services*.

generation number

Data generation management is enabled in the PRIMECLUSTER backup and restore operations. The current generation number is added as part of the backup and restore data name. Integers of 0 or higher are used as generation numbers, and the generation number is incremented each time backup is successful. The generation number is stored in the “ccbr.gen” file and can be specified as an optional argument in the “cfbackup(1M)” and “cfrestore(1M) ” commands.
For details, see the manual pages for the “cfbackup(1M)” and “cfrestore(1M)” commands.

generic type (RMS)

An object type which has generic properties. A generic type is used to customize RMS for monitoring resources that cannot be assigned to one of the supplied object types.
See also *object type*.

GFS

See *Global File Services*.

GFS local file system

A local file system that features high-speed file access and file system switchover after a system failure. High-speed file access is available through the serial block allocation to file data, and file system switchover is assured through a file system consistency recovery function.
A GFS local file system is used by one node or by two nodes, in which case the file system is used as a switchover file system.

GFS shared file system

A shared file system that allows simultaneous access from multiple Solaris OE systems that are connected to shared disk units, while maintaining data consistency, and allows processing performed by a node to be continued by other nodes even if the first node fails.
A GFS shared file system can be mounted and used concurrently from multiple nodes.

Global Disk Services

This optional product provides volume management that improves the availability and manageability of information stored on the disk unit of the Storage Area Network (SAN).

Global File Services

This optional product provides direct, simultaneous accessing of the file system on the shared storage unit from two or more nodes within a cluster.

Global Link Services

This PRIMECLUSTER optional module provides network high availability solutions by multiplying a network route.

GLS

See *Global Link Services*.

graph (RMS)

See *system graph*.

graphical user interface

A computer interface with windows, icons, toolbars, and pull-down menus that is designed to be simpler to use than the command-line interface.

group (GDS)

See *disk group*.

GUI

See *graphical user interface*.

high availability

This concept applies to the use of redundant resources to avoid single points of failure.

highest-order group (GDS)

Group that does not belong to another group. A volume can be created in the highest-order group.

hub

Star-type wiring device used for LAN or fibre channels.

interconnect (CF)

See *cluster interconnect*.

Internet Protocol address

A numeric address that can be assigned to computers or applications.
See also *IP aliasing*.

internode communication facility

Communication function between cluster nodes that are used by PRIMECLUSTER CF. Since this facility is designed especially for communication between cluster nodes, the overhead is less than that of TCP/IP, and datagram communication services that also guarantee the message arrival sequence can be carried out.

IP address

See *Internet Protocol address*.

IP aliasing

This enables several IP addresses (aliases) to be allocated to one physical network interface. With IP aliasing, the user can continue communicating with the same IP address, even though the application is now running on another host.
See also *Internet Protocol address*.

JOIN (CF)

See *Cluster Join Services*.

keyword (reserved words)

A word that has special meaning in a programming language. For example, in the configuration file, the keyword node identifies the kind of definition that follows.

LAN

See *public LAN*.

latency (RMS)

Time interval from when a data transmission request is issued until the actual response is received.

leaf object (RMS)

A bottom object in a system graph. In the configuration file, this object definition is at the beginning of the file. A leaf object does not have children.

LEFTCLUSTER (CF)

A node state that indicates that the node cannot communicate with other nodes in the cluster. That is, the node has left the cluster. The purpose for the intermediate LEFTCLUSTER state is to avoid the network partition problem.

See also *UP*, *DOWN*, *network partition*, *node state*.

link (RMS)

Designates a child or parent relationship between specific resources.

local area network

See *public LAN*.

local host

The host from which a command or process is initiated.
See also *remote host*.

local MAC address

MAC address that the system administrator of a local area network (LAN) system guarantees to be unique within that system.

log file

The file that contains a record of significant system events or messages. The base monitor, wizards, and detectors can have their own log files.

logical volume (GDS)

General term for a virtual disk device that the user can access directly. The user can access a logical volume in the same way as accessing a physical disk slice (partition). A logical volume is sometimes simply called a "volume."low-order group (GDS)
Group that belongs to another group. A volume cannot be created in a low-order group.

MAC address

Address that identifies the office or node that is used by the MAC sublayer of a local area network (LAN).

MDS

See Meta Data Server.

message

A set of data transmitted from one software process to another process, device, or file.

message queue

A designated memory area which acts as a holding place for messages.

Meta Data Server

GFS daemon that centrally manages the control information of a file system (meta-data).

mirrored disk (RCFS)

A set of disks that contain the same data. If one disk fails, the remaining disks of the set are still available, preventing an interruption in data availability. (Applies to transitioning users of existing Fujitsu Siemens products only.)

See also *mirrored piece*.

mirrored piece (RCFS)

Physical pieces that together comprise a mirrored virtual disk. These pieces include mirrored disks and data disks. (Applies to transitioning users of existing Fujitsu Siemens products only.)

See also *mirrored disk*.

mirrored volume (GDS)

A volume that is created in a mirror group. Data redundancy is created by mirroring.

mirror group (GDS)

A disk group of the mirror type. This a collection of mutually mirrored disks or low-order groups.

mirroring (GDS)

A setup that maintains redundancy by writing the same data to multiple slices. Even if an error occurs in some of the slices, this setup allows access to the volume to continue as long as a normal slice remains.

mirror virtual disk (VM)

Mirror virtual disks consist of two or more physical devices, and all output operations are performed simultaneously on all of the devices. (Applies to transitioning users of existing Fujitsu Siemens products only.)

See also *concatenated virtual disk, simple virtual disk, striped virtual disk,* and *virtual disk*.

mixed model cluster

A cluster system that is built from different PRIMEPOWER models. For example, one node is a PRIMEPOWER 1000 machine, and another node is a PRIMEPOWER 200 machine.

The models are divided into two groups, which are represented by the PRIMEPOWER 200, 400, and 600 machines and the PRIMEPOWER 800, 1000, and 2000 machines.

monitoring agent

Component that monitors the state of a remote cluster node and immediately detects if that node goes down. This component is separate from the SA function.

mount point

The point in the directory tree where a file system is attached.

multihosting

Same disk via multiple controllers. (Applies to transitioning users of existing Fujitsu Siemens products only.)

native operating system

The part of an operating system that is always active and translates system calls into activities.

network adapter

A LAN network adapter.

network interface card

See *network adapter*.

network partition (CF)

This condition exists when two or more nodes in a cluster cannot communicate over the interconnect; however, with applications still running, the nodes can continue to read and write to a shared device, compromising data integrity.

NIC switching mode

LAN duplexed mode that is provided by GLS. The duplexed NIC is used exclusively, and LAN monitoring between the Solaris OE server and the switching HUB, and switchover if an error is detected are implemented.

node

A host which is a member of a cluster. A computer node is a computer.

node state (CF)

Every node in a cluster maintains a local state for every other node in that cluster. The node state of every node in the cluster must be either UP, DOWN, or LEFTCLUSTER.
See also *UP*, *DOWN*, *LEFTCLUSTER*.

object (RMS)

In the configuration file or a system graph, this is a representation of a physical or virtual resource.
See also *leaf object*, *object definition*, *node state*, *object type*.

object definition (RMS)

An entry in the configuration file that identifies a resource to be monitored by RMS. Attributes included in the definition specify properties of the corresponding resource. The keyword associated with an object definition is object.
See also *attribute*, *object type*.

object type (RMS)

A category of similar resources monitored as a group, such as disk drives. Each object type has specific properties, or attributes, which limit or define what monitoring or action can occur. When a resource is associated with a particular object type, attributes associated with that object type are applied to the resource.
See also *generic type*.

online maintenance

The capability of adding, removing, replacing, or recovering devices without shutting or powering off the host.

operating system dependent (CF)

This module provides an interface between the native operating system and the abstract, OS-independent interface that all PRIMECLUSTER modules depend upon.

OPS

See *Oracle Parallel Server*.

Oracle Parallel Server

Oracle Parallel Server allows access to all data in the database to users and applications in a clustered or MPP (massively parallel processing) platform.

OSD (CF)

See *operating system dependent*.

parent (RMS)

An object in the configuration file or system graph that has at least one child.
See also *child*, *configuration file*, and *system graph*.

patrol diagnosis

A function that periodically diagnoses hardware faults.

physical IP address

IP address that is assigned directory to the interface (for example, hme0) of a network interface card. See also *logical IP address*. For information about the logical interface, see the explanation of logical interface in ifconfig(1M).

primary host (RMS)

The default host on which a user application comes online when RMS is started. This is always the hostname of the first child listed in the userApplication object definition.

PRIMECLUSTER services (CF)

Service modules that provide services and internal interfaces for clustered applications.

private network address

Private network addresses are a reserved range of IP addresses specified by RFC1918. They may be used internally by any organization but, because different organizations can use the same addresses, they should never be made visible to the public internet.

private resource (RMS)

A resource accessible only by a single host and not accessible to other RMS hosts.
See also *resource*, *shared resource*.

public LAN

The local area network (LAN) by which normal users access a machine.
See also *Administrative LAN*.

queue

See *message queue*.

quorum

State in which integrity is maintained among the nodes that configure the cluster system. Specifically, the CF state in all nodes that configure the cluster system is either UP or DOWN (there is no LEFCLUSTER node).

redundancy

This is the capability of one object to assume the resource load of any other object in a cluster, and the capability of RAID hardware and/or RAID software to replicate data stored on secondary storage devices.

Reliant Monitor Services (RMS)

The package that maintains high availability of user-specified resources by providing monitoring and switchover capabilities.

remote console connection unit

Device that converts an RS232C interface and a LAN interface. This device allows another device (personal computer) that is connected to the LAN to use the TTY console functions through the Telnet function.

remote host

A host that is accessed through a telecommunications line or LAN.
See also *local host*.

remote node

See *remote host*.

reporting message (RMS)

A message that a detector uses to report the state of a particular resource to the base monitor.

resource (RMS)

A hardware or software element (private or shared) that provides a function, such as a mirrored disk, mirrored disk pieces, or a database server. A local resource is monitored only by the local host.

See also *private resource*, *shared resource*.

resource database (RMS)

Database that manages information on hardware units that are shared among multiple nodes. The resource database is managed by the cluster resource management facility.

resource definition (RMS)

See *object definition*.

resource label (RMS)

The name of the resource as displayed in a system graph.

resource state (RMS)

Current state of a resource.

RMS

See *Reliant Monitor Services*.

RMS Application Wizards

RMS Application Wizards add new menu items to the RMS Wizard Tools for a specific application.

See also *RMS Wizard Tools*, *Reliant Monitor Services*.

RMS command

Commands that enable RMS resources to be administered from the command line.

RMS configuration

A configuration in which two or more nodes are connected to shared resources. Each node has its own copy of operating system and RMS software, as well as its own applications.

RMS wizard

Software tool that creates confirmation definitions for RMS operation. The RMS wizard consists of the RMS Wizard Tools and the RMS Application Wizards.

See also *RMS Wizard Tools*, *RMS Application Wizards*.

RMS Wizard Tools

A software package composed of various configuration and administration tools used to create and manage applications in an RMS configuration.

See also *RMS Application Wizards*, *Reliant Monitor Services*.

route

In the PRIMECLUSTER Concept Guide, this term refers to the individual network paths of the redundant cluster interfaces that connect the nodes to each other.

SAN

See *Storage Area Network*.

scalability

The ability of a computing system to dynamically handle any increase in work load. Scalability is especially important for Internet-based applications where growth caused by Internet usage

presents a scalable challenge.

Scalable Internet Service (SIS)

Scalable Internet Services is a TCP connection load balancer, and dynamically balances network access loads across cluster nodes while maintaining normal client/server sessions for each connection.

scope (GDS)

The range of nodes that can share objects in the shared type disk class.

script (RMS)

A shell program executed by the base monitor in response to a state transition in a resource. The script may cause the state of a resource to change.

SDX disk (GDS)

General term for disks that GDS manages. Depending on its use, a SDX disk may be called a single disk, a keep disk, a spare disk, or an undefined disk. An SDS disk is sometimes simply called a "disk."

SDX object (GDS)

General term for resources that GDS manages. The resources include classes, groups, SDX disks, and volumes.

service node (SIS)

Service nodes provide one or more TCP services (such as FTP, Telnet, and HTTP) and receive client requests forwarded by the gateway nodes.
See also *database node*, *gateway node*, and *Scalable Internet Services*.

shared disk connection confirmation

Function that checks whether that all shared disk units are turned on and all cable connections are correct when a node is started.

shared resource

A resource, such as a disk drive, that is accessible to more than one node.
See also private resource, resource.

Shutdown Facility

A facility that forcibly stops a node in which a failure has occurred. When PRIMECLUSTER decides that system has reach a state in which the quorum is not maintained, it uses the Shutdown Facility (SF) to return the cluster system to the quorum state.

shutdown request

Instruction that forcibly stops the specified node so that the quorum is restored.

simple virtual disk

Simple virtual disks define either an area within a physical disk partition or an entire partition.
See also *concatenated virtual disk*, *striped virtual disk*, and *virtual disk*.

single console

The workstation that acts as the single point of administration for hosts being monitored by RMS. The single console software, SCON, is run from the single console.

single disk (GDS)

SDX disk that does not belong to a group and can be used to create a single volume.

single volume (GDS)

A volume that is created in a single disk that not belong to a group. There is no data redundancy.

SIS

See *Scalable Internet Services*.

spare disk (GDS)

A spare disk for restoring the mirroring state in place of a failed disk.

state

See *resource state*.

state transition procedure

The state transition procedure receives a state transition instruction from the cluster control and controls activation and deactivation of the resource (start and stop of the application).

Storage Area Network

The high-speed network that connects multiple, external storage units and storage units with multiple computers. The connections are generally fiber channels.

striped group (GDS)

A disk group of the stripe type. This is a collection of disks or low-order groups that become striping units.

striped virtual disk

Striped virtual disks consist of two or more pieces. These can be physical partitions or further virtual disks (typically a mirror disk). Sequential I/O operations on the virtual disk can be converted to I/O operations on two or more physical disks. This corresponds to RAID Level 0 (RAID0).

See also *concatenated virtual disk*, *mirror virtual disk*, *simple virtual disk*, *virtual disk*.

striped volume (GDS)

A volume that is created in a striped group. Striping allows the I/O load to be distributed among multiple disks. There is no data redundancy.

stripe width (GDS)

The size is which data is divided when striping takes place.

striping (GDS)

Dividing data into fixed-size segments, and cyclically distributing and writing the data segments to multiple slices. This method distributes I/O data to multiple physical disks and issues I/O data at the same time.

switching mode

LAN duplexing mode presented by GLS.

switchover

The process by which a user application transfers processes and data inherited from an operating node to a standby node, based on a user request.

switchover (RMS)

The process by which RMS switches control of userApplication over from one monitored host to another.

See also *automatic switchover*, *directed switchover*, *failover*, and *symmetrical switchover*.

symmetrical switchover (RMS)

This means that every RMS host is able to take on resources from any other RMS host.

See also *automatic switchover*, *directed switchover*, *failover*, and *switchover.*

synchronized power control

When the power of one node is turned in the cluster system configured with PRIMEPOWER, this function turns on all other powered-off nodes and disk array unit that are connected to nodes

through RCI cables.

system disk (GDS)

The disk in which the operating Solaris OE is installed. This term refers to the entire disk, including slices that are currently operating as one of the following file systems or swap area:

/, /usr, /var, or swap area

system graph (RMS)

A visual representation (a map) of monitored resources used to develop or interpret the configuration file.

See also *configuration file*.

template

See *application template*.

type

See *object type*.

UP (CF)

A node state that indicates that the node can communicate with other nodes in the cluster.

See also *DOWN*, *LEFTCLUSTER*, *node state*.

user group

A group that limits the environment setup, operation management, and other operations presented by Web-Based Admin View and the Cluster Admin GUI. There are four user groups: wvroot, clroot, cladmin, and clmon. Each user ID is registered in an appropriate user group by the operation system administrator of the management server.

virtual interface (VIP)

Virtual IP address or host name that SIS uses to make multiple nodes of the cluster appear as a single-system image.

volume (GDS)

See *logical volume (GDS)*.

watchdog timer monitoring

Timer value that measures operating system hangs and boot failures.

Web-Based Admin View

This is a common base enabling use of the Graphic User Interface of PRIMECLUSTER. This interface is in Java.

Wizard (RMS)

An interactive software tool that creates a specific type of application

Abbreviations

AC
Access Client

API
application program interface

BM
base monitor

CF
Cluster Foundation or Cluster Framework

CIM
Cluster Integrity Monitor

CIP
Cluster Interconnect Protocol

CLI
command-line interface

CRM
Cluster Resource Management

DLPI
Data Link Provider Interface

EE
Enterprise Edition

ENS
Event Notification Services

GDS
Global Disk Services

GFS
Global File Services

GLS
Global Link Services

GUI
graphical user interface

HA
high availability

ICF
Internode Communication Facility

I/F
Interface

I/O
input/output

JOIN
cluster join services module

LAN
local area network

MA
Monitoring Agents

MDS
Meta Data Server

MIB
Management Information Base

NIC
network interface card

NSM
Node State Monitor

OPS
Oracle Parallel Server

OSD
operating system dependent

PAS
Parallel Application Services

PS
Parallel Server

RAO
RMS-Add on

RCI
Remote Cabinet Interface

RMS
Reliant Monitor Services

SA
Shutdown Agent

SAN
Storage Area Network

SC
Scalability Cluster

SCON
single console software

SD
Shutdown Daemon

SF
Shutdown Facility

SIS
Scalable Internet Services

VIP

Virtual Interface Provider

WK

Wizard Kit

WT

Wizard Tools

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