# FUJITSU Software
# Symfoware Server V12.0.0

# Cluster Operation Guide

Linux

# Preface

**Purpose of This Document**

This document explains the items required to operate Symfoware Server on a cluster system.

**Intended Readers**

This document is aimed at people who install and operate Symfoware Server on a cluster system. Readers of this document are also assumed to have general knowledge of:

- PRIMECLUSTER

- PostgreSQL

- SQL

- Linux

**Structure of This Document**

This document is structured as follows:

```
First edition: November 2013
Second edition: January 2014
```

# Contents

# Chapter 1 Definition of Cluster Operation

This chapter explains the features of a cluster system, the types of cluster operations, and the operation mode.

## 1.1 What Is a Cluster System?

A cluster system is a system that joins multiple systems (hereafter referred to as nodes) to achieve high availability.

### High availability

If one of the nodes in a cluster system fails for any reason, any jobs operating on the node can be taken over by another node, keeping at a minimum the time that a system must be stopped. Because a normally functioning node takes over a job while the failed node is being repaired, recovery can be performed without any interruption to the job.

## 1.2 Cluster Operation Provided by Symfoware Server

The Symfoware Server provide the standby feature of failover operation. The operation mode they support is 1:1 standby.

An overview of failover operation follows.

### Definition of failover operation in Symfoware Server

Failover is a feature in cluster systems to transfer a job operating on a node to another one when an abnormality occurs on the node.

The operation for performing failover is referred to as failover operation.

The presence of failover operation in Symfoware Server allows highly available systems to be constructed.

### Feature of failover operation

Failover operation in Symfoware Server supports the standby feature.

When an abnormality occurs on a node, the standby feature activates the instance that is the standby system at the time of the switch, and transfers the job to it.

### Operation mode of failover operation

The operation mode supported in failover operation in Symfoware Server is 1:1 standby.

1:1 standby is a mode in which one active system or standby system operates on one node. Because failover allows jobs to continue when an abnormality occurs in the active system, this mode allows highly reliable systems to be constructed.

| | Failover Operation |
|---|---|
| | 1:1 Standby |
| **Operation mode** | node 1     node 2<br><br>Active    Standby |
| **Node failure** | node 1     node 2<br><br>Active<br><br>takeover |
| **Feature** | • Failover enables business operation to continue |
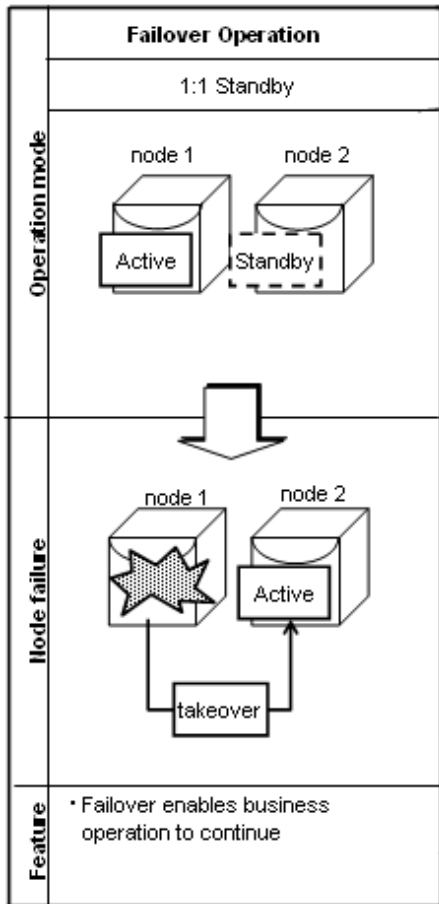
# Chapter 2 Overview of Failover Operation

This chapter provides an overview of failover operation in Symfoware Server.

## 2.1 Definition of Failover Operation

When an abnormality occurs on any of the multiple server devices that make up the cluster system (hereafter referred to as "nodes"), the failover feature transfers a job operating on such a node to another one. Failover can reduce the time for which jobs are stopped when an abnormality occurs, and allows jobs to continue while the node on which the abnormality occurred is recovered.

Figure 2.1 Concept of failover
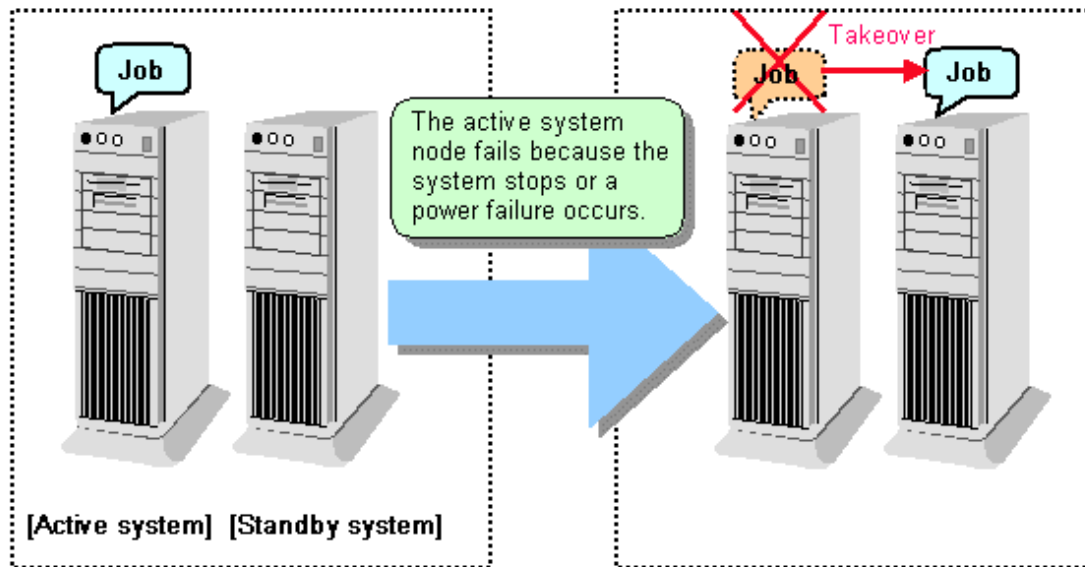


## 2.2 System Configuration of Failover Operation

In the illustration below, the file system is on a GDS volume (shared disk), mounted on node 1 only.

The following Symfoware Server resources are located in this file system:

- Data storage destination directory

- Tablespaces

- Backup data storage destination directory

- Transaction log storage destination directory

A Symfoware Server process waits for connections of user applications that access the database, on a logical IP address activated on node 1 only or on a takeover IP address.
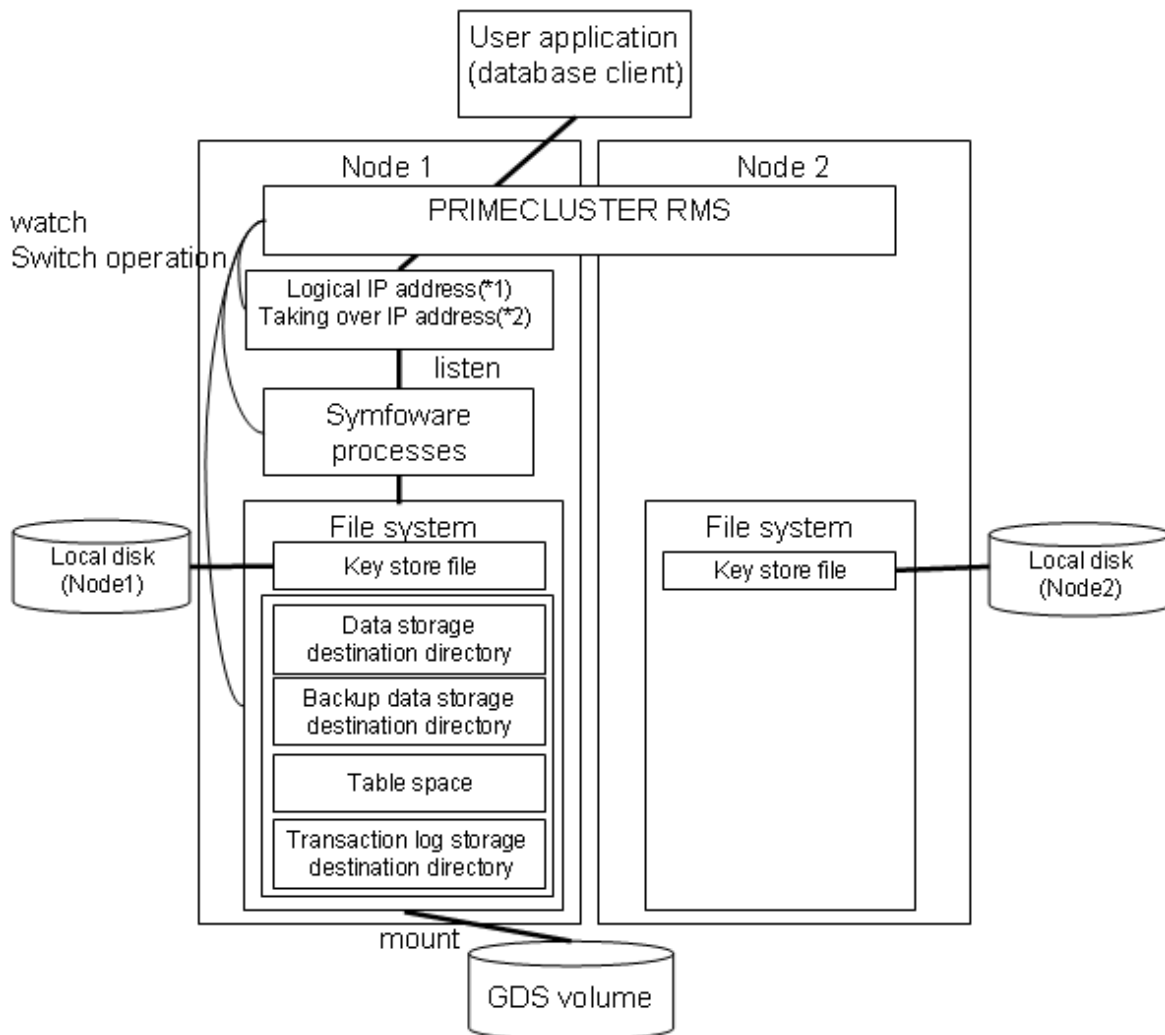
User application
(database client)

Node 1 | Node 2

PRIMECLUSTER RMS

watch
Switch operation

Logical IP address(*1)
Taking over IP address(*2)

listen

Symfoware
processes

Local disk
(Node1)

File system
Key store file

Data storage
destination directory

Backup data storage
destination directory

Table space

Transaction log storage
destination directory

File system
Key store file

Local disk
(Node2)

mount

GDS volume

*1) The function of PRIMECLUSTER GLS(Global Link Services)
*2) The function of PRIMECLUSTER Taking over network resource

When an error is detected on node 1, PRIMECLUSTER mounts the file system on node 2, and activates the logical IP address or the takeover IP address on it. The Symfoware Server process is also started on node 2. Since the logical IP address or the takeover IP address remains unchanged, the user application can access Symfoware Server process on node 2 simply by re-establishing the database connection.
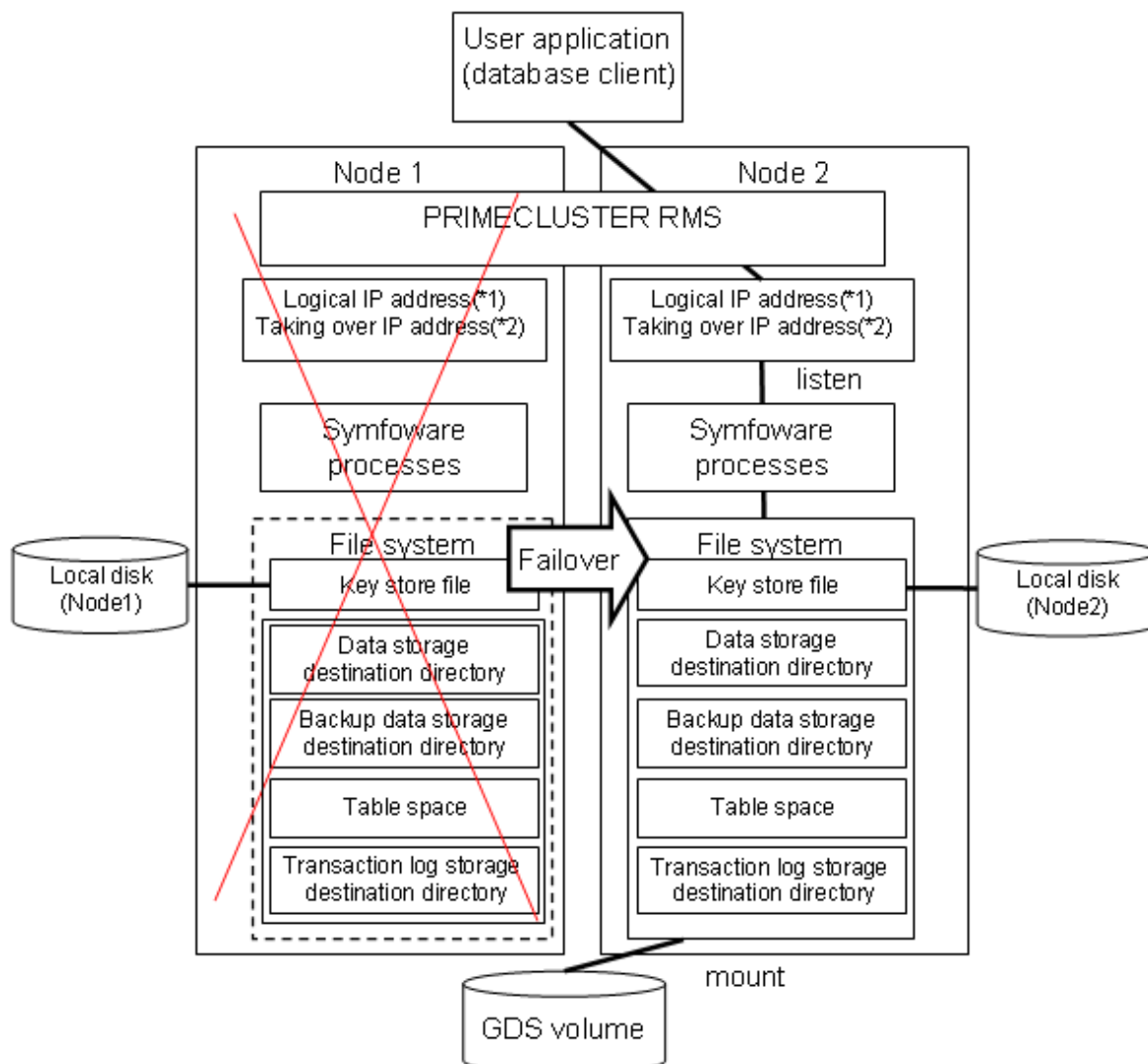
*1) The function of PRIMECLUSTER GLS(Global Link Services)
*2) The function of PRIMECLUSTER Taking over network resource

## 2.3 Setup of Failover Operation

Use the procedure in the table below to perform setup:

| Step | Work item | | See section |
|------|-----------|--|-------------|
| | Active system | Standby system | |
| 1 | Installing PRIMECLUSTER and Symfoware Server | | 2.3.1 |
| 2 | Configuring PRIMECLUSTER | | 2.3.2 |
| 3 | Creating a GDS volume (*1) | | 2.3.3 |
| 4 | Creating a file system (*1) | | 2.3.4 |
| 5 | Creating a user for the operating system to start Symfoware Server | | 2.3.5 |
| 6 | Mounting the file system | | 2.3.6 |
| 7 | Creating a Symfoware database cluster(*1) | | 2.3.7 |
| 8 | Registering resource information for the Symfoware database cluster | | 2.3.8 |

| Step | Work item | | See section |
|---|---|---|---|
| | Active system | Standby system | |
| 9 | Configuring storage data protection using transparent data encryption (*1) | - | 2.3.9 |
| 10 | Unmounting the file system | | 2.3.10 |
| 11 | Creating a cluster application | | 2.3.11 |
| 12 | Checking operation | | 2.3.12 |

*1: Some settings and operations must also be performed on the standby node. Refer to the relevant sections for details.

The sections that follow explain each step.

## 2.3.1 Installing PRIMECLUSTER and Symfoware Server

Refer to the manual for each product, and then install each product.

### See
....................................................................................................

- Refer to the PRIMECLUSTER Installation and Administration Guide for information on how to install PRIMECLUSTER.

- Refer to the "Installation and Setup Guide for Server" for information on how to install Symfoware Server.
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## 2.3.2 Configuring PRIMECLUSTER

Configure the initial settings for the cluster.

If using GLS, configure the GLS settings.

### See
....................................................................................................
Refer to the PRIMECLUSTER Installation and Administration Guide for information on steps required before setup.
....................................................................................................

## 2.3.3 Creating a GDS Volume

Each of the following Symfoware Server resources must be located in a file system on a shared disk:

- Data storage destination directory

- Tablespaces

- Backup data storage destination directory

- Transaction log storage destination directory

### Note
....................................................................................................

- Store data storage destination directories or tablespaces and backup data storage destination directories for these in disk classes with different GDS to guard against file system corruption and the MONITORONLY attribute settings at the time of the GDS resource and Fsystem resource creation.

- It is also recommended that database storage destination directories and transaction log storage destination directories be placed in different disk classes, so that the I/O load is distributed.

- Create a directory for each resource on each node. Ensure that the directories to be mounted have the same path on all nodes.

- The monitoring disk area must be secured if using Fsystem resources. Ensure that the GDS volume to be used as the monitoring disk area has been secured when creating the GDS volume.
....................................................................................................

 **See**

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

- Refer to the PRIMECLUSTER Installation and Administration Guide for information on GDS volume creation.

- Refer to "Preparing Directories to Deploy Resources" in the "Installation and Setup Guide for Server" for information on how to create directories.

- Refer to "Setting Up Fsystem Resources" in the PRIMECLUSTER Installation and Administration Guide for information on configuring the monitoring disk area.

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## 2.3.4  Creating a File System

Create a file system.

 **See**

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- Refer to the PRIMECLUSTER Installation and Administration Guide for information on how to create a file system on a GDS volume.

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### 2.3.4.1  Creating a File System

Select a file system configuration from the configuration menu in the [Global Disk Services] window in the PRIMECLUSTER Web-Based Admin View, and then create a file system.

### 2.3.4.2  Editing Configuration Files

Edit /etc/fstab and /etc/fstab.pcl on each node.

- /etc/fstab

    Add the "ro" attribute to the entries for the file system for monitoring, as follows:

```
# cat /etc/fstab
/dev/sfdsk/class0001/dsk/volume0001 /mnt/swdsk1 ext3 noauto 0 0
/dev/sfdsk/class0001/dsk/volume0002 /mnt/monitor1 ext3 noauto,ro 0 0
/dev/sfdsk/class0001/dsk/volume0003 /mnt/swdsk2 ext3 noauto 0 0
/dev/sfdsk/class0001/dsk/volume0004 /mnt/monitor2 ext3 noauto,ro 0 0
```

- /etc/fstab.pcl

    Copy the entries shown above, and then prefix each line with #RMS#, as follows:

```
# cat /etc/fstab.pcl
#RMS#/dev/sfdsk/class0001/dsk/volume0001 /mnt/swdsk1 ext3 noauto 0 0
#RMS#/dev/sfdsk/class0001/dsk/volume0002 /mnt/monitor1 ext3 noauto,ro 0 0
#RMS#/dev/sfdsk/class0001/dsk/volume0003 /mnt/swdsk2 ext3 noauto 0 0
#RMS#/dev/sfdsk/class0001/dsk/volume0004 /mnt/monitor2 ext3 noauto,ro 0 0
```

 **Note**

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Different files are specified depending on the version of the PRIMECLUSTER. Check the version of PRIMECLUSTER being used and edit appropriate files. Refer to the PRIMECLUSTER Installation and Administration Guide for details.

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### 2.3.4.3  Checking

Start the GDS volume, and ensure that each file system can be mounted on each node.

```
# mount -t ext3 /dev/sfdsk/class0001/dsk/volume0001 /mnt/swdsk1
# mount -t ext3 /dev/sfdsk/class0001/dsk/volume0002 /mnt/monitor1
# mount -t ext3 /dev/sfdsk/class0001/dsk/volume0003 /mnt/swdsk2
```

```
# mount -t ext3 /dev/sfdsk/class0001/dsk/volume0004 /mnt/monitor2
# umount /mnt/swdsk1
# umount /mnt/monitor1
# umount /mnt/swdsk2
# umount /mnt/monitor2
```

## 2.3.5  Creating an Operating System User to Start Symfoware Server

Create an operating system user (an OS user that will become the instance administrator) who is to start Symfoware Server.

### 🔔 Note

Ensure that the name, UID, and GID of the operating system user (an OS user that will become the instance administrator) who is to start Symfoware Server match on all nodes that make up the cluster system.

## 2.3.6  Mounting the File System

1. Start the GDS volume if it has not already started.

2. Mount all file systems containing the resources required to create database clusters, such as for the data storage destination directory, as shown below:

```
# mount -t ext3 /dev/sfdsk/class0001/dsk/volume0001 /mnt/swdsk1
```

### 🔔 Note

Create directories in the file system for storing each resource. Each directory must meet certain conditions to be able to create the Symfoware database cluster. Check the notes in " Preparing Directories to Deploy Resources" in the Installation and Setup Guide for Server.

## 2.3.7  Creating a Symfoware Database Cluster

1. Create the database cluster.

### 🔔 Note

- If the configuration requires password authentication, create a .pgpass file in the home directory of the operating system user who is to start Symfoware Server, and then specify a password for the template1 database as this is required. This will be used when PRIMECLUSTER checks the operation of the Symfoware database server. If authentication fails, a fault will be assumed to have occurred in the database server.

- The value specified for the port parameter in postgresql.conf needs to be set in the /etc/services files on all nodes.

- Since postgresql.conf is stored in the data directory, it becomes a common configuration file for each node in the shared disk. Therefore, it must be taken into account that the path set for postgresql.conf must be valid for the Symfoware Server processes started on each node. For example, if a local directory is specified in the core_directory parameter, that local directory must have been created on all nodes.

- To execute the Symfoware Server commands, you must configure the environment variables on each node.

- Use the initdb command to create a database cluster.

- Specify "off" for the restart_after_crash parameter in postgresql.conf.
  If "on" is specified, or the default value is used for the restart_after_crash parameter, behaviors equivalent to restarting the Symfoware Server, including crash recovery, will be performed when some server processes go down. When linking with PRIMECLUSTER, however, a failover will occur after an error is detected as soon as some server processes go down, and server processes restarting will be forced to stop. This is to inhibit complex behaviors such as processes being canceled in the middle of restarting for no particular meaningful purpose.

2. Check starting, connection, and stopping at each node. The procedure is as follows.

📛 Note

Queries are issued to monitor the Symfoware Server from PRIMECLUSTER. With this connection process, if a password is requested, the monitoring process cannot be continued. For this reason, when checking the connection, ensure that connections can be made without entering a password.

1. Check the starting, connection, and stopping at node 1.

   Use the pg_ctl command to start and stop the node.

   For connection, execute the following to ensure that connections can be made without entering a password:

   ```
   su - OsUser
   psql -d template1 -p portNum [ -U dbUser]
   ```

   *OsUser*: Operating system user to start the Symfoware Server
   *portNum*: Port number specified when the database cluster was created
   *dbUser*: Database superuser

   If the database superuser is specified at the time of executing the initdb command, or if the database superuser has been changed after the initdb command was executed, specify the user for the -U option. If the database superuser is not specified or changed, omit this.

2. Unmount all file systems containing the resources required to create database clusters (such as the data storage destination directory) on node 1, and stop the GDS volume.

3. Start the GDS volume on node 2, and mount all file systems containing the resources required to create database clusters (such as the data storage destination directory).

4. Check starting, connection, and stopping at node 2.

   Perform the same check as step 1.

5. Unmount all file systems containing the resources required to create database clusters (such as the data storage destination directory) on node 2, and stop the GDS volume.

6. Start the GDS volume on node 1, and mount all file systems containing the resources required to create database clusters (such as the data storage destination directory).

📘 See

- Refer to "Using the initdb Command" of "Creating an Instance" in the "Installation and Setup Guide for Server" for information on how to create a database cluster.

- Refer to "The Password File" in "Client Interfaces" in the PostgreSQL Documentation for information on files for which passwords are set.

## 2.3.8 Registering Resource Information for the Symfoware Database Cluster

1. Use the pgx_pclrsc command to register the database cluster in PRIMECLUSTER - the following is the simplest execution example: The database cluster does not need to be started when executing the command.

   ```
   # pgx_pclrsc -a -c databaseClusterName -u OsUser -D pgData -w workDir -n memberNodes
   ```

| Item | Explanation |
|---|---|
| *databaseClusterName* | Specify the Symfoware Server database cluster name. |
| | The database cluster name is case-sensitive. |

| Item | Explanation |
|------|-------------|
| | The database cluster name must be as follows:<br><br>- Up to 16 bytes, and<br><br>- The first byte must be an ASCII letter, and<br><br>- The other bytes must be ASCII alphanumeric characters, or underscores (_). |
| *OsUser* | Specify the operating system user (an OS user that will become the instance administrator) who can start the Symfoware Server database server. |
| *pgData* | Specify the absolute path of the data storage destination directory specified during database cluster creation. |
| *workDir* | Specify the directory for storing the temporary files required for Symfoware resource monitoring and state transition, and for storing the trace logs required in case of problems.<br><br>If a directory that does not exist is specified, create the directory. The newly created directory path assumes the *OsUser* specified with the -u option as the owner, and 0700 as the privilege<br><br>Required directory size is twice the size that is specified in the --trace-max-file-size option. If the default value is specified in the --trace-max-file-size option, 10240 KB x 2 is required for the directory size. |
| *memberNodes* | Specify the names of all nodes that make up the cluster system.<br><br>Use a comma (,) to separate each node name.<br><br>Suffix each cluster node name with the literal "RMS".<br><br>Specification example:<br><br>-n node1RMS,node2RMS |

Other than the above, the following options can be specified:

| Option | Explanation |
|--------|-------------|
| --db-user=name | Specify the Symfoware database superuser. The user specified in the -u option is the default. |
| --response-timeout=seconds | In cluster operations, queries are regularly issued to the server to perform error detection and state monitoring.<br><br>Specify a timeout time for queries issued for the heartbeat monitoring of the Symfoware database server.<br><br>For queries, "SELECT 1" for the database "template1" is used. If 0 is specified, queries will not time out. The default is 0. |
| --timeout-retry-count=count | Specify the upper limit for the number of retries when queries for monitoring time out. |

| Option | Explanation |
|---|---|
| | The default is 6 times. |
| --trace-max-file-size | Specify the maximum size of the trace file. The default is 10240 KB. |
| --watch-interval=seconds | Specify the monitoring interval (the interval with which the queries are issued to the server) for a monitoring program to monitor the Symfoware database server. The default is 3 seconds. |

 See

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Refer to the "Reference" for information on the pgx_pclrsc command.

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## 2.3.9 Configuring Storage Data Protection Using Transparent Data Encryption

If using transparent data encryption , refer to "Protecting Storage Data Using Transparent Data Encryption" in the Operation Guide to configure it. Take note on the following when configuring it:

Location of the keystore file

Do not specify a shared disk for the keystore_location parameter in postgresql.conf. Instead, specify a local directory with the same path on all nodes that comprise the cluster application.

If a shared disk is specified, startup from the cluster application will fail. This is because the keystore.aks file, which is generated when automatic opening of the keystore is enabled, is obfuscated so that it can only be read on the node where it was generated, and therefore it cannot be shared across the shared disk.

Distribution of the keystore file

The master encryption key settings must be common across all nodes. For this reason, configure the master encryption key settings on one node, and then copy the keystore file to each node. Also, if the master encryption key or passphrase is changed, you must also copy the keystore file to each node.

Enabling automatic opening of the keystore

Automatic opening of the keystore must be enabled in all nodes that comprise the cluster application. Note that, when enabling the automatic opening of the keystore, only the directory in which the keystore file is stored will be referenced, therefore tasks such as starting and stopping the GDS volume are not required.

If it is not enabled, then startup from the cluster application will fail. This is because the startup process will not finish, since it waits for the manual input of the passphrase that opens the keystore.

## 2.3.10 Unmounting the File System

1. Unmount all file systems containing the resources required to create database clusters (such as the data storage destination directory).

```
# umount /mnt/swdsk1
```

2. Stop the GDS volume.

## 2.3.11 Creating a Cluster Application

Refer to "Appendix A Creating Resources and Creating/Modifying Cluster Applications".

## 2.3.12 Checking Operation

To ensure that the environment settings have been configured correctly, start, switch, and stop from Web-Based Admin View, and check the behavior.

# Chapter 3 Failover Operation

This chapter explains the procedures involved in failover operation.

## 3.1 Adding Tablespaces

This section explains how to add tablespaces to a new file system.

This procedure is not required when you are adding tablespaces to an existing file system.

Perform the following steps when using a new shared disk class:

- Stop RMS on all nodes.

- Perform setup as described from "2.3.3 Creating a GDS Volume" to "2.3.4 Creating a File System".

- Modify the cluster application (refer to "A.2 Modifying Cluster Applications" for details).

Perform the following steps when not using a new shared disk class:

- Stop RMS on all nodes.

- Perform the setup as described in "2.3.4 Creating a File System".

- Modify the cluster application (refer to "A.2 Modifying Cluster Applications " for details).

## 3.2 Modifying Database Cluster Resources

This section explains the following operations:

- Displaying database cluster resource information

- Modifying database cluster resource content

- Deleting a database cluster resource

### Displaying database cluster resource information

Execute the pgx_pclrsc command as shown below (note that if -c is not specified, the command lists all registered database cluster names):

```
# pgx_pclrsc -p -c databaseClusterName
```

### Modifying database cluster resource content

1. Stop RMS.

2. Execute the pgx_pclrsc command as shown below (this is the simplest example):

```
# pgx_pclrsc -d -c databaseClusterName
# pgx_pclrsc -a -c databaseClusterName -u OsUser -D pgData -w workDir -n memberNodes
```

> **Note**
>
> If you are modifying resource content, first delete the Symfoware resource from the cluster application, and then re-create it.

> **See**
>
> Refer to "Reference" for information on the pgx_pclrsc command.

**Deleting a database cluster resource**

1. Stop RMS.

2. Delete the Symfoware resource from the cluster application.

3. Execute the pgx_pclrsc command as shown below:

```
# pgx_pclrsc -d -c databaseClusterName
```

![Note icon] **Note**

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

The directory specified in the -w option of the pgx_pclrsc command during registration will not be deleted. Use operating system commands to delete it if necessary.

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

# 3.3 Operations under Normal Circumstances

## Starting and stopping

For cluster operations, perform starting and stopping from the cluster application. If starting and stopping are performed by using the pg_ctl command or WebAdmin during failover operation, the cluster application will misjudge that services have gone down, resulting in unexpected behaviors.

## Switching

There are two ways to switch between the active node and the standby node, as shown below.

Under normal circumstances, switch using mutual switch. In an emergency, for example when there is no response from the active node, perform forced switch. Forced switch should only be used in emergency scenarios because the differences in Symfoware stop modes when the active node is offline will cause the statistics to be initialized, and the load will increase as crash recovery is performed after the switch.

- Mutual switch

  Refer to "3.6.2.4 Mutual Switch".

  Symfoware is stopped with the "fast" mode of the pg_ctl command.

- Forced switch

  Right-click the cluster application object, and select [Switch] from the menu. From the switchable nodes displayed in the drop-down menu, select a target node, and switch the cluster application to that node.

  Symfoware is stopped with the "immediate" mode of the pg_ctl command.

# 3.4 Operation at State Transition

The workflow for operation at state transition is shown below.

The activation operation during failover operation will be performed automatically by the Online script.
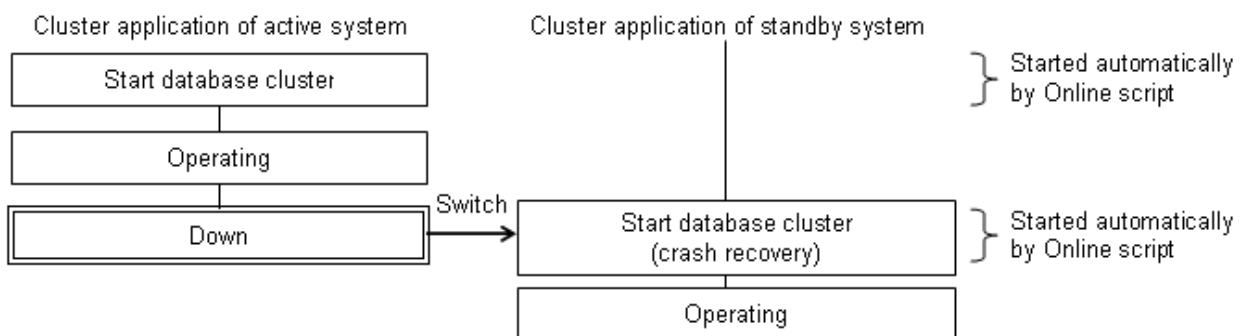
**Non-transferrable feature**

- All transactions being processed by the cluster application on the active system will be rolled back.

- The statistics Symfoware Server has collected will be initialized.

  The statistics will be initialized in any of the following cases. Refer to the notes outlined in "Starting and Stopping an Instance" in the Operation Guide for details.

    - When the node goes down because of a kernel panic, for example

    - When forced switch is performed

      Statistics are initialized because the "immediate" mode of the pg_ctl command is used to stop Symfoware Server.

      Refer to "3.3 Operations under Normal Circumstances" for details.

    - When an error occurs in the cluster application resources

      Statistics are initialized because the "immediate" mode of the pg_ctl command is used to stop Symfoware Server to perform an immediate switch.

**Errors during state transition**

If an error occurs in a Symfoware Server script during cluster application state transition, the following message will be displayed in the switchlog of Cluster Admin (the registered database cluster name will be displayed in the pgxtest part shown below):

```
2012-05-14 11:08:22.060:(DET, 3): ERROR: FAULT REASON: Resource <Symfoware_pgxtest> transitioned to
a Faulted state due to a script failure.
```

To display the switchlog, select [Tools] >> [View switchlog] in the [Cluster Admin] window.

If the resource displayed in the error message is a Symfoware resource name, a message indicating the cause will be output either before the message above or to the system log.

# 3.5 Notes and Actions to Take When Creating an Application

This section explains notes to be taken when creating an application, and actions for the application when state transition occurs.

**Notes to be taken when creating an application**

To use the IP address when creating an application, use the IP address that was specified when the Gls resource or takeover network resource was created. By doing this, the application can be executed by just re-executing it without any changes made when state transition occurs.

**Actions for the application when state transition occurs**

This section explains the error information that is returned and actions to be taken if an error occurs on the node where Symfoware is operating (while accessing an application running on another node such as an application server).

Table 3.1 JDBC driver

| Status | | Error information (*1) | Action |
|---|---|---|---|
| Node is down or Symfoware Server system is down | Went down during access | 57P01<br><br>08006 | After switch is completed, reestablish the connection, or execute the application again. |
| | Accessed while node/system is down | 08001 | |
| Switch to standby node | Switched during access | 57P01<br><br>08006 | |

| Status | | Error information (*1) | Action |
|---|---|---|---|
| | Accessed while switching | 08001 | |

*1: This is the return value of getSQLState() in SQLException.

Table 3.2 ODBC driver

| Status | | Error information (*1) | Action |
|---|---|---|---|
| Node is down or Symfoware Server system is down | Went down during access | 57P01<br>08S01 | After switch is completed, reestablish the connection, or execute the application again. |
| | Accessed while node/system is down | 08001 | |
| Switch to standby node | Switched during access | 57P01<br>08S01 | |
| | Accessed while switching | 08001 | |

*1: This is the return value of SQLSTATE.

Table 3.3 .NET Data Provider

| Status | | Error information | Action |
|---|---|---|---|
| Node is down or Symfoware Server system is down | Went down during access | 57P01 (*1)<br>Empty string (*1)<br>A NullReferenceException occurs | After switch is completed, reestablish the connection, or execute the application again. |
| | Accessed while node/system is down | Empty string (*1) | |
| Switch to standby node | Switched during access | 57P01 (*1)<br>Empty string (*1)<br>A NullReferenceException occurs | |
| | Accessed while switching | Empty string (*1) | |

*1: This is the return value of the "Code" attribute in NpgsqlException.

Table 3.4 libpq - C library

| Status | | Error information | Action |
|---|---|---|---|
| Node is down or Symfoware Server system is down | Went down during access | PGRES_FATAL_ERROR(*1)<br>57P01(*2)<br>NULL(*2) | After switch is completed, reestablish the connection, or execute the application again. |
| | Accessed while node/system is down | CONNECTION_BAD(*3) | |
| Switch to standby node | Switched during access | PGRES_FATAL_ERROR(*1)<br>57P01(*2) | |

| Status | | Error information | Action |
|---|---|---|---|
| | | NULL(*2) | |
| | Accessed while switching | CONNECTION_BAD(*3) | |

*1: This is the return value of PQresultStatus().

*2: This is the return value of PG_DIAG_SQLSTATE in PQresultErrorField().

*3: This is the return value of PQstatus().

Table 3.5 ECPG - Embedded SQL in C

| Status | | Error information(*1) | Action |
|---|---|---|---|
| Node is down or Symfoware Server system is down | Went down during access | 57P01 57P02 YE000 26000 | After switch is completed, reestablish the connection, or execute the application again. |
| | Accessed while node/system is down | 08001 | |
| Switch to standby node | Switched during access | 57P01 57P02 YE000 26000 | |
| | Accessed while switching | 08001 | |

*1: This is the return value of SQLSTATE.

# 3.6 Maintenance Tasks

When you need to perform tasks such as configuration changes, patch application, and hardware parts replacement that may require restarting, there are two ways of node maintenance. Performing maintenance on both nodes by stopping both active and standby nodes, and performing maintenance on one node at a time by leaving the active node running to perform maintenance on the standby node first, and then switch the active node to perform maintenance on the other node. In this section, the former is referred to as simultaneous stopped node maintenance, whereas the latter is referred to as mutual switch maintenance.

Refer to the tasks outlined below in either "Figure 3.1 Workflow for simultaneous stopped node maintenance" or "Figure 3.2 Workflow for mutual switch maintenance", and perform your maintenance tasks accordingly.

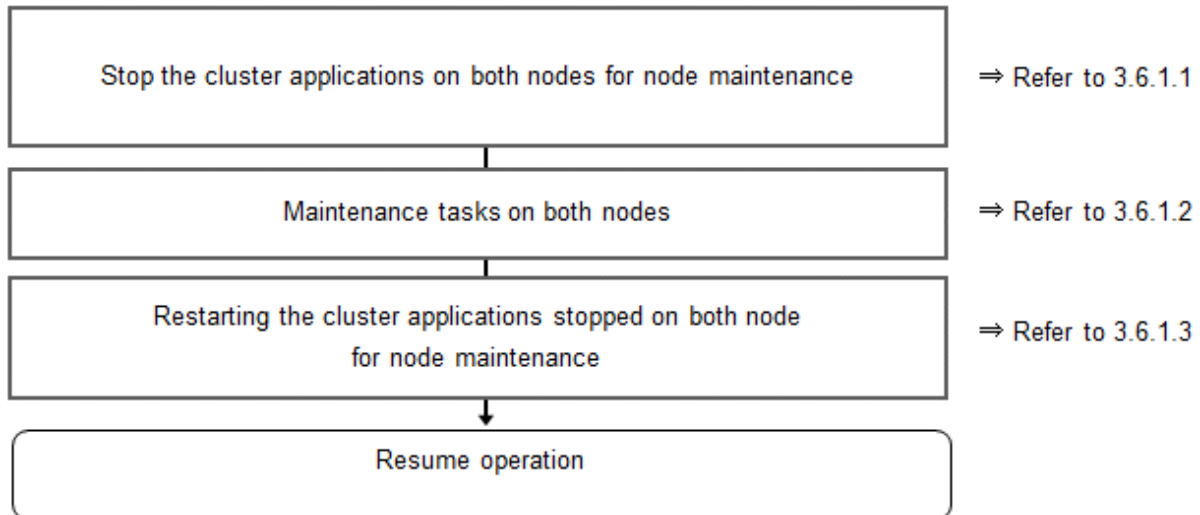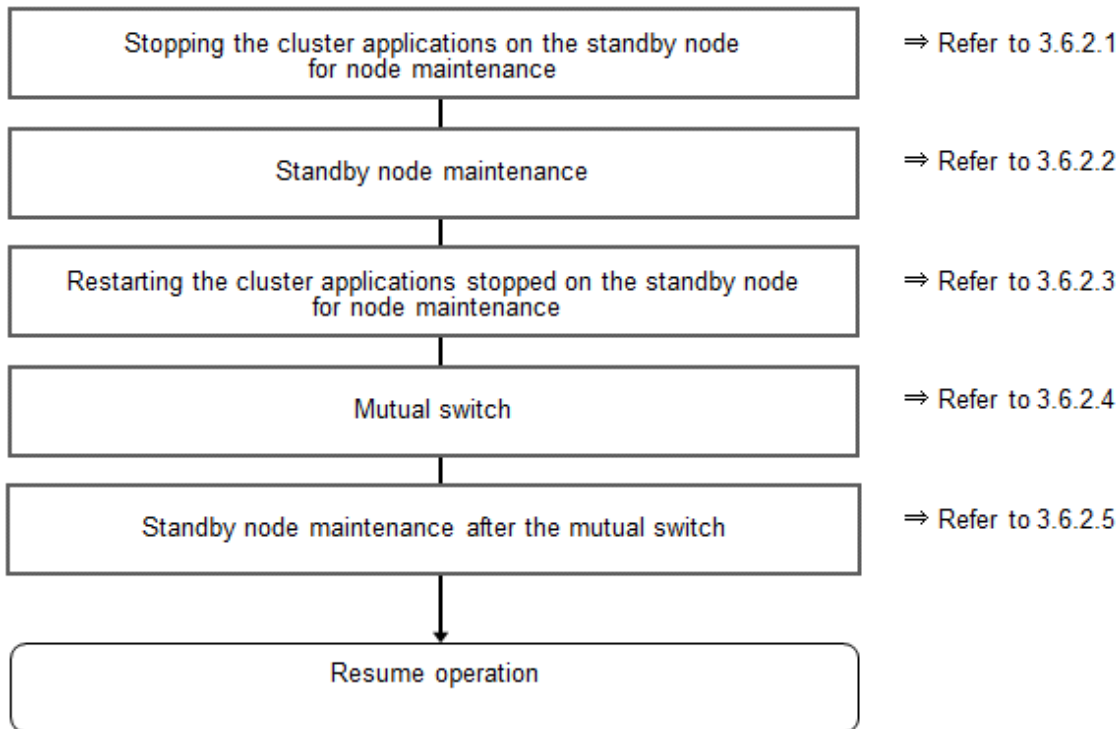Figure 3.1 Workflow for simultaneous stopped node maintenance

```
┌─────────────────────────────────────────────────────────────┐
│   Stop the cluster applications on both nodes for node        │   ⇒ Refer to 3.6.1.1
│   maintenance                                                 │
└─────────────────────────────────────────────────────────────┘
              │
┌─────────────────────────────────────────────────────────────┐
│             Maintenance tasks on both nodes                   │   ⇒ Refer to 3.6.1.2
└─────────────────────────────────────────────────────────────┘
              │
┌─────────────────────────────────────────────────────────────┐
│   Restarting the cluster applications stopped on both node    │   ⇒ Refer to 3.6.1.3
│                  for node maintenance                         │
└─────────────────────────────────────────────────────────────┘
              ↓
╭─────────────────────────────────────────────────────────────╮
│                    Resume operation                           │
╰─────────────────────────────────────────────────────────────╯
```

Figure 3.2 Workflow for mutual switch maintenance

```
┌─────────────────────────────────────────────────────────────┐
│   Stopping the cluster applications on the standby node       │   ⇒ Refer to 3.6.2.1
│                  for node maintenance                         │
└─────────────────────────────────────────────────────────────┘
              │
┌─────────────────────────────────────────────────────────────┐
│                 Standby node maintenance                      │   ⇒ Refer to 3.6.2.2
└─────────────────────────────────────────────────────────────┘
              │
┌─────────────────────────────────────────────────────────────┐
│   Restarting the cluster applications stopped on the standby  │   ⇒ Refer to 3.6.2.3
│   node for node maintenance                                   │
└─────────────────────────────────────────────────────────────┘
              │
┌─────────────────────────────────────────────────────────────┐
│                      Mutual switch                            │   ⇒ Refer to 3.6.2.4
└─────────────────────────────────────────────────────────────┘
              │
┌─────────────────────────────────────────────────────────────┐
│   Standby node maintenance after the mutual switch            │   ⇒ Refer to 3.6.2.5
└─────────────────────────────────────────────────────────────┘
              ↓
╭─────────────────────────────────────────────────────────────╮
│                    Resume operation                           │
╰─────────────────────────────────────────────────────────────╯
```

## 3.6.1  Simultaneous Stopped Node Maintenance

This section explains the procedure to perform maintenance on both active and standby nodes simultaneously.

### 3.6.1.1  Stopping the Cluster Applications on Both Nodes for Node Maintenance

Follow the steps shown below to stop the cluster application on the active and standby nodes:

1. Start the [Cluster Admin] window.

2. Stop the cluster application.

   On the RMS tree in the [Cluster Admin] window, right-click the standby cluster application to be stopped, and select [Offline] from the pop-up menu to stop it.
   Stop the cluster application on both the active and standby nodes.

3. Stop RMS.

   On the RMS tree in the [Cluster Admin] window, right-click the system node where the cluster application to be stopped exists, and select [Shutdown RMS] from the pop-up menu to stop RMS. To perform maintenance without stopping RMS, use the hvutil -d command to change the cluster application to "Deact" state.

   Note

   - If applying the Symfoware Server update patches, RMS on the node (onto which the patches are applied) must be stopped. This is because the Symfoware monitoring process that runs when linked with PRIMECLUSTER must be stopped.

   - By stopping RMS, all cluster applications on the system node where RMS is stopped will stop. When you have multiple cluster applications configured, ensure that stopping all other cluster applications will not cause any problems, before stopping RMS.

## 3.6.1.2 Maintenance Tasks on Both Nodes

Perform maintenance tasks such as configuration changes, patch application, hardware and parts replacement that may require restarting.

## 3.6.1.3 Restarting the Cluster Applications Stopped on Both Nodes for Node Maintenance

Follow the steps shown below to restart the cluster application on the active and standby nodes.

1. Start the [Cluster Admin] window.

2. If RMS has not been started, select [Tools] >> [Start RMS] in the [Cluster Admin] window, and select the node to be started and click [Ok].

   Note that if the cluster applications were stopped for node maintenance using the hvutil -d command, execute the hvutil -a command before starting RMS.

3. Start the cluster application.

   On the RMS tree in the [Cluster Admin] window, right-click the standby cluster application, and from the pop-up menu, if you are starting the node as the active node, select [Online], or if you are starting it as the standby node, select [Standby]. If the state is [Fault], then select [Clear fault].

   This operation is not required if the cluster application has been configured to start automatically when RMS is started.

## 3.6.2 Mutual Switch Maintenance

This section explains the procedure to perform maintenance on the standby node while running the active node at the same time.

## 3.6.2.1 Stopping the Cluster Applications on the Standby Node for Node Maintenance

Follow the steps shown below to stop the cluster application on the standby node only:

1. Edit the /opt/SMAW/SMAWRrms/bin/hvenv.local file, and add "export HV_RCSTART=0".

   If the hvenv.local file does not exist, then create it.

   ```
   # vi /opt/SMAW/SMAWRrms/bin/hvenv.local
   Add export HV_RCSTART=0
   ```

2. On the RMS tree in the [Cluster Admin] window, right-click the cluster application on the standby node to be stopped, and select [Offline] from the pop-up menu to stop it.

3. On the RMS tree in the [Cluster Admin] window, right-click the system node (where the cluster application on the standby node that was stopped exists), and select [Shutdown RMS]. At this stage, select [Keep local Apps] as the option, and stop RMS.

 Note

・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・

- Ensure that the steps up to step 3 have been completed properly before performing the maintenance tasks. If the active node goes down at the point when steps 1 and 2 have been completed, Symfoware will be started on the supposedly stopped standby node, and it becomes the active node instead. As a result, this will compete with the maintenance tasks and unexpected behavior may occur.

- If applying the Symfoware Server update patches, RMS on the node (onto which the patches are applied) must be stopped. This is because the Symfoware monitoring process that runs when linked with PRIMECLUSTER must be stopped.

- By stopping RMS, all cluster applications on the system node where RMS is stopped will stop. When you have multiple cluster applications configured, ensure that stopping all other cluster applications will not cause any problems, before stopping RMS.

・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・

## 3.6.2.2 Standby Node Maintenance

Perform maintenance tasks such as patch application and hardware parts replacement.

## 3.6.2.3 Restarting the Cluster Applications Stopped on the Standby Node for Node Maintenance

Follow the steps shown below to restart the cluster application on the standby node only (that was stopped for maintenance):

1. Edit the /opt/SMAW/SMAWRrms/bin/hvenv.local file, and delete "export HV_RCSTART=0".

```
# vi /opt/SMAW/SMAWRrms/bin/hvenv.local
Delete export HV_RCSTART=0
```

2. Select [Tools]-[Start RMS] in the [Cluster Admin] window, and select the node to be started and click [Ok].

3. On the RMS tree in the [Cluster Admin] window, right-click the cluster application to be started as the standby node, and select [Standby] from the pop-up menu to start it. If the state is [Fault], then select [Clear fault].

## 3.6.2.4 Mutual Switch

To perform mutual switch between the active and standby nodes, perform the steps shown below:

1. Select and right-click the cluster application on the active node, and select [Offline] from the pop-up menu to stop it.

2. Select and right-click the cluster application on the standby node, and select [Online] from the pop-up menu to start it.

3. Select and right-click the cluster application that was previously on the active node, and select [Standby] from the pop-up menu to start it as standby.

## 3.6.2.5 Standby Node Maintenance after the Mutual Switch

To perform maintenance tasks on the new standby node after mutual switch, perform the steps from "3.6.2.1 Stopping the Cluster Applications on the Standby Node for Node Maintenance" to "3.6.2.3 Restarting the Cluster Applications Stopped on the Standby Node for Node Maintenance".

# Chapter 4 Procedures Required after a Failover Error

This chapter explains how to perform recovery when an abnormality occurs during failover operation.

When an error occurs during failover operation, refer to the system log to identify the cause and stop the RMS to perform recovery, separately from the RMS management. Normal operations can be resumed by restarting the RMS once the recovery is completed.

Note that the database cluster may be started or stopped without using cluster applications when performing recovery.

Refer to the tasks outlined below in "Figure 4.1 Operation flow when a failover error occurs", and perform recovery.

Figure 4.1 Operation flow when a failover error occurs
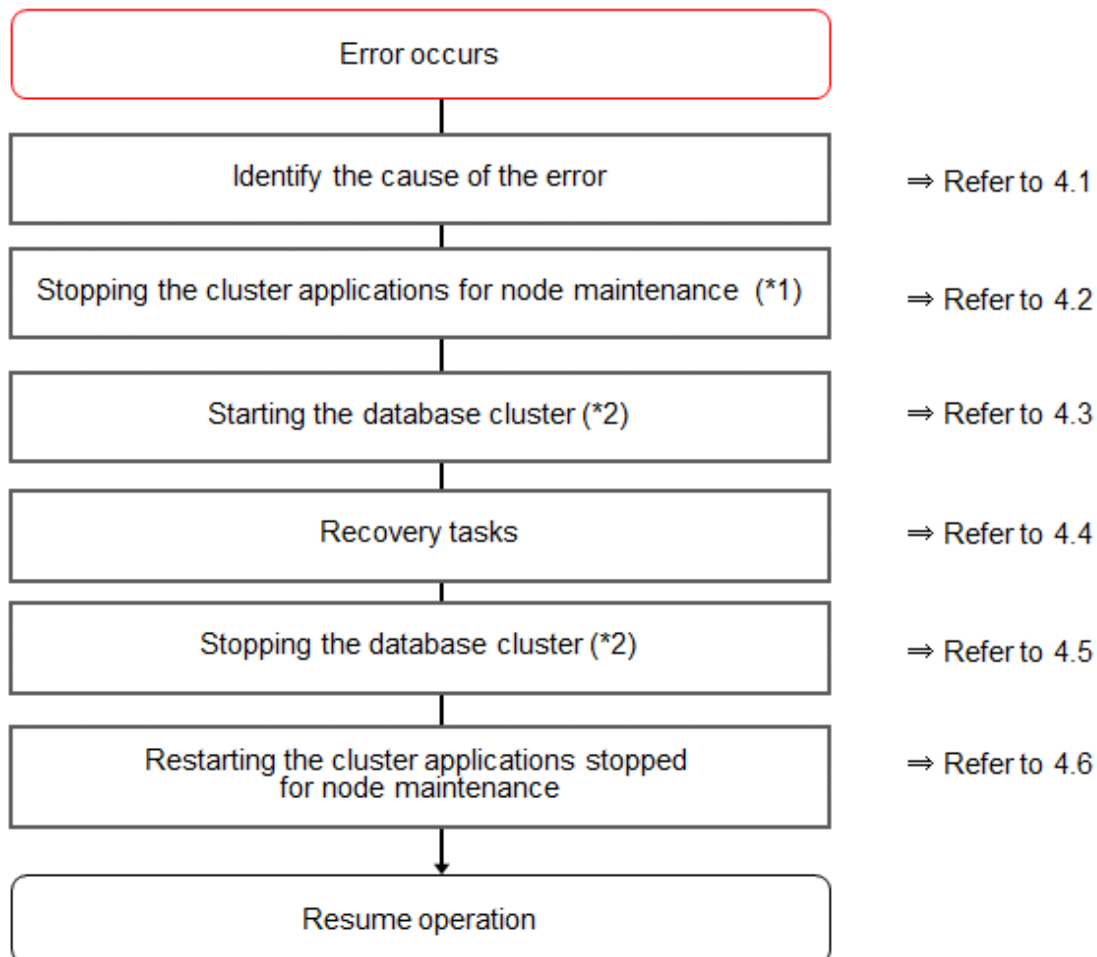


*1) If the machine is already stopped when the error occurred, this step is not necessary.
*2) Depending on the recovery tasks, start or stop the database cluster as required.

## 4.1 Identifying the Cause of an Error

When an error occurs during failover operation, refer to the system log to identify the cause. When cluster applications fail to start, refer to the server.log file to identify the cause.

The server.log file is a file created under the directory specified in the -w option when executing the pgx_pclrsc command. This file has almost the same content as the file specified in the -l option when executing the pg_ctl command to start the database cluster, and errors that are not output to the system log are output to these files, including startup errors.

## 4.2 Stopping the Cluster Applications for Node Maintenance

When an error occurs during failover operation, stop the RMS to perform recovery, separately from the RMS management. Refer to "3.6 Maintenance Tasks" for information on how to stop cluster applications for node maintenance.

Note that this task is not required in cases such as when the RMS is stopped because the machine is stopped due to an error.

## 4.3 Starting the Database Cluster

To perform recovery when an error occurs, it is necessary to start the Symfoware Server without using cluster applications.

Follow the procedure below to start the database cluster if required.

Check if the database cluster needs to be started by referring to the recovery tasks written in "Actions When an Error Occurs" in the Operation Guide.

1. Start the GDS volume.

2. Mount the necessary file systems such as those where the data storage destination directory is placed.

3. Start the database cluster by using the pg_ctl command. Refer to "Using Server Commands" in "Starting an Instance and Creating a Database" in the Operation Guide for information on how to start the database cluster.

## 4.4 Recovery Tasks

Refer to "Actions When an Error Occurs" in the Operation Guide for information on how to perform recovery. If there are two ways available to perform recovery; using WebAdmin or commands, use commands.

## 4.5 Stopping the Database Cluster

If a database cluster is started, stop the database cluster.

1. Stop the database cluster using the pg_ctl command. Refer to "Using Server Commands" in "Starting an Instance and Creating a Database" in the Operation Guide" for information on how to stop the database cluster.

2. Unmount the file systems such as those where the data storage destination directory is placed.

3. Stop the GDS volume.

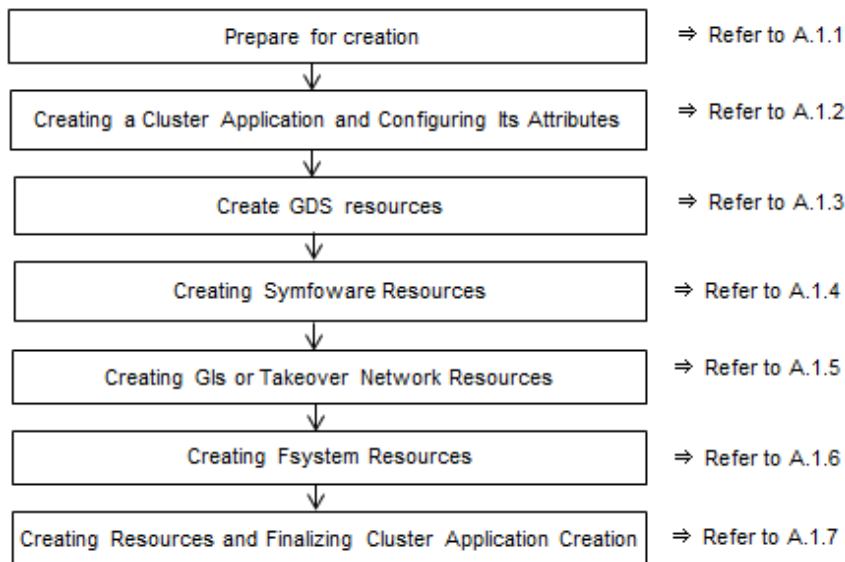## 4.6 Restarting the Cluster Applications Stopped for Node Maintenance

Refer to "3.6 Maintenance Tasks" to restart the cluster applications stopped for node maintenance.

# Appendix A  Creating Resources and Creating/Modifying Cluster Applications

This appendix explains how to create and modify cluster applications that include Symfoware resources in PRIMECLUSTER.

## A.1  Creating Resources and Cluster Applications

Use the following procedure to create resources and a cluster application:

| | |
|---|---|
| Prepare for creation | ⇒ Refer to A.1.1 |
| ↓ | |
| Creating a Cluster Application and Configuring Its Attributes | ⇒ Refer to A.1.2 |
| ↓ | |
| Create GDS resources | ⇒ Refer to A.1.3 |
| ↓ | |
| Creating Symfoware Resources | ⇒ Refer to A.1.4 |
| ↓ | |
| Creating Gls or Takeover Network Resources | ⇒ Refer to A.1.5 |
| ↓ | |
| Creating Fsystem Resources | ⇒ Refer to A.1.6 |
| ↓ | |
| Creating Resources and Finalizing Cluster Application Creation | ⇒ Refer to A.1.7 |

## A.1.1  Preparing for Creation

1. Execute the hvgdsetup command for all shared disk classes to be used by all file systems to be registered in the cluster application.

```
# /usr/opt/reliant/bin/hvgdsetup -a class0001
```

2. From the Web-Based Admin View, stop RMS on all nodes.

3. Execute the hvw command.

```
# /opt/SMAW/SMAWRrms/bin/hvw
```

📖 See
..........................................................................................................
Refer to the PRIMECLUSTER Installation and Administration Guide for information on the hvgdsetup command.
..........................................................................................................

## A.1.2  Creating a Cluster Application and Configuring Its Attributes

1. Select [Application-Create].

```
pcl-vm13: Main configuration 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: 3
```

2. Select [STANDBY].

```
Creation: Application type selection menu:
1) HELP                             7) SCALABLE
2) QUIT                             8) STANDBY
3) RETURN
4) OPTIONS
5) DEMO
6) GENERIC
Application Type: 8
```

3. Select [Machines+Basics].

   Specify any application name that is within the scope of the PRIMECLUSTER constraints.

```
Settings of turnkey wizard "STANDBY" (APP1:not yet consistent)
1) HELP                             4) REMOVE+EXIT
2) NO-SAVE+EXIT                     5) ApplicationName=APP1
3) SAVE+EXIT                        6) Machines+Basics(-)
Choose the setting to process: 6
```

4. Select [AdditionalMachine].

```
Machines+Basics (app1:consistent)
 1) HELP                           14) (AutoStartUp=no)
 2) -                              15) (AutoSwitchOver=No)
 3) SAVE+EXIT                      16) (PreserveState=no)
 4) REMOVE+EXIT                    17) (PersistentFault=0)
 5) AdditionalMachine              18) (ShutdownPriority=)
 6) AdditionalConsole              19) (OnlinePriority=)
 7) Machines[0]=pcl-vm13RMS        20) (StandbyTransitions=)
 8) (PreCheckScript=)              21) (LicenseToKill=no)
 9) (PreOnlineScript=)             22) (AutoBreak=yes)
10) (PostOnlineScript=)            23) (AutoBreakMaintMode=no)
11) (PreOfflineScript=)            24) (HaltFlag=no)
12) (OfflineDoneScript=)           25) (PartialCluster=0)
13) (FaultScript=)                 26) (ScriptTimeout=)
Choose the setting to process: 5
```

5. Select a standby node.

```
1) HELP
2) RETURN
3) pcl-vm13RMS
4) pcl-vm14RMS
Choose a machine for this application: 4
```

6. Ensure that all nodes that make up the cluster application are displayed in [Machines]. Note that the item displayed in Machines[0] needs to be the operation node, and Machines[1] to be the standby node. If these are not set correctly, modify the setting.

```
Machines+Basics (app1:consistent)
 1) HELP                           15) (AutoStartUp=no)
 2) -                              16) (AutoSwitchOver=No)
 3) SAVE+EXIT                      17) (PreserveState=no)
 4) REMOVE+EXIT                    18) (PersistentFault=0)
 5) AdditionalMachine              19) (ShutdownPriority=)
 6) AdditionalConsole              20) (OnlinePriority=)
 7) Machines[0]=pcl-vm13RMS        21) (StandbyTransitions=)
 8) Machines[1]=pcl-vm14RMS        22) (LicenseToKill=no)
```

```
 9) (PreCheckScript=)                23) (AutoBreak=yes)
10) (PreOnlineScript=)               24) (AutoBreakMaintMode=no)
11) (PostOnlineScript=)              25) (HaltFlag=no)
12) (PreOfflineScript=)              26) (PartialCluster=0)
13) (OfflineDoneScript=)             27) (ScriptTimeout=)
14) (FaultScript=)
Choose the setting to process:
```

7. Configure attributes for cluster applications from step 8.

   Refer to the PRIMECLUSTER Installation and Administration Guide for information on the attributes for cluster applications.

   Configure the attributes as shown below:

| Attribute | Value |
|---|---|
| AutoStartUp<br><br>(Automatically starts cluster applications when the RMS is started.) | Yes |
| AutoSwitchOver<br><br>(Automatically switches nodes when a fault occurs in cluster applications.) | - HostFailure<br><br>- ResourceFailure<br><br>- ShutDown |
| PersistentFault<br><br>(Selects whether to keep the Faulted state of the cluster application after restarting the RMS.) (*1) | 0 or 1 |
| OnlinePriority<br><br>(Selects whether to use the same online nodes as those used before all clusters were restarted or follow the configured order for nodes, when all clusters were restarted.) (*2) | 0 or 1 |
| StandbyTransitions<br><br>(Timing to perform standby state transition.) | - ClearFaultRequest<br><br>- StartUp<br><br>- SwitchRequest |
| HaltFlag<br><br>(Selects whether to terminate the node forcibly when another error occurs during the Fault process.) | Yes |

   *1: If 0 is specified, the Faulted state is automatically canceled when the RMS is started. If 1 is specified, the Faulted state is kept.

   *2 If 0 is specified and the placement differs from the initial configuration due to reasons, such as switching, cluster applications are restarted using the placement from the initial configuration. If 1 is specified, cluster applications are restarted using the placement from before the restart.

8. Select [AutoStartUp].

```
Machines+Basics (app1:consistent)
 1) HELP                             15) (AutoStartUp=no)
 2) -                                16) (AutoSwitchOver=No)
 3) SAVE+EXIT                        17) (PreserveState=no)
 4) REMOVE+EXIT                      18) (PersistentFault=0)
 5) AdditionalMachine                19) (ShutdownPriority=)
 6) AdditionalConsole                20) (OnlinePriority=)
 7) Machines[0]=pcl-vm13RMS          21) (StandbyTransitions=)
 8) Machines[1]=pcl-vm14RMS          22) (LicenseToKill=no)
```

```
 9) (PreCheckScript=)                 23) (AutoBreak=yes)
10) (PreOnlineScript=)                24) (AutoBreakMaintMode=no)
11) (PostOnlineScript=)               25) (HaltFlag=no)
12) (PreOfflineScript=)               26) (PartialCluster=0)
13) (OfflineDoneScript=)              27) (ScriptTimeout=)
14) (FaultScript=)
Choose the setting to process: 15
```

9. Select [yes].

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

10. Select [AutoSwitchOver].

```
Machines+Basics (app1:consistent)
 1) HELP                              15) (AutoStartUp=yes)
 2) -                                 16) (AutoSwitchOver=No)
 3) SAVE+EXIT                         17) (PreserveState=no)
 4) REMOVE+EXIT                       18) (PersistentFault=0)
 5) AdditionalMachine                 19) (ShutdownPriority=)
 6) AdditionalConsole                 20) (OnlinePriority=)
 7) Machines[0]=pcl-vm13RMS           21) (StandbyTransitions=)
 8) Machines[1]=pcl-vm14RMS           22) (LicenseToKill=no)
 9) (PreCheckScript=)                 23) (AutoBreak=yes)
10) (PreOnlineScript=)                24) (AutoBreakMaintMode=no)
11) (PostOnlineScript=)               25) (HaltFlag=no)
12) (PreOfflineScript=)               26) (PartialCluster=0)
13) (OfflineDoneScript=)              27) (ScriptTimeout=)
14) (FaultScript=)
Choose the setting to process: 16
```

11. Select [HOSTFAILURE], then [RESOURCEFAILURE], then [SHUTDOWN], and then select [SAVE+RETURN] when the following window is displayed:

```
Set flags for AutoSwitchOver:  Currently set: HOSTFAILURE,RESOURCEFAILURE,SHUTDOWN (HRS)
1) HELP                  4) DEFAULT              7) NOT:RESOURCEFAILURE(R)
2) -                     5) NO(N)                8) NOT:SHUTDOWN(S)
3) SAVE+RETURN           6) NOT:HOSTFAILURE(H)
Choose one of the flags: 3
```

12. Select [PersistentFault].

```
Machines+Basics (app1:consistent)
 1) HELP
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) AdditionalMachine
 6) AdditionalConsole
 7) Machines[0]=pcl-vm13RMS
 8) Machines[1]=pcl-vm14RMS
 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)
24) (AutoBreakMaintMode=no)
25) (HaltFlag=no)
26) (PartialCluster=0)
27) (ScriptTimeout=)
Choose the setting to process: 18
```

13. Select [0] or [1] (the example below selects [1]).

```
1) HELP
2) RETURN
3) 0
4) 1
Enable persistent fault feature for this application: 4
```

14. Select [OnlinePriority].

```
Machines+Basics (app1:consistent)
 1) HELP
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) AdditionalMachine
 6) AdditionalConsole
 7) Machines[0]=pcl-vm13RMS
 8) Machines[1]=pcl-vm14RMS
 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=1)
19) (ShutdownPriority=)
20) (OnlinePriority=)
21) (StandbyTransitions=)
22) (LicenseToKill=no)
23) (AutoBreak=yes)
24) (AutoBreakMaintMode=no)
25) (HaltFlag=no)
26) (PartialCluster=0)
27) (ScriptTimeout=)
Choose the setting to process: 20
```

15. Select [0] or [1] (the example below selects [1]).

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

16. Select [StandbyTransitions].

```
Machines+Basics (app1:consistent)
 1) HELP
```

```
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) AdditionalMachine
 6) AdditionalConsole
 7) Machines[0]=pcl-vm13RMS
 8) Machines[1]=pcl-vm14RMS
 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=1)
19) (ShutdownPriority=)
20) (OnlinePriority=1)
21) (StandbyTransitions=)
22) (LicenseToKill=no)
23) (AutoBreak=yes)
24) (AutoBreakMaintMode=no)
25) (HaltFlag=no)
26) (PartialCluster=0)
27) (ScriptTimeout=)
Choose the setting to process: 21
```

17. Select [CLEARFAULTREQUEST], then [STARTUP], then [SWITCHREQUEST], and then select [SAVE+RETURN] when the following window is displayed:

```
Set flags for StandbyTransitions: Currently set: ClearFaultRequst,StartUp,SwitchRequest (CTW)
1) HELP                                    5) NOT:CLEARFAULTREQUEST(C)
2) -                                       6) NOT:STARTUP(T)
3) SAVE+RETURN                             7) NOT:SWITCHREQUEST(W)
4) NO(N)
Choose one of the flags: 3
```

18. Select [HaltFlag].

```
Machines+Basics (app1:consistent)
 1) HELP
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) AdditionalMachine
 6) AdditionalConsole
 7) Machines[0]=pcl-vm13RMS
 8) Machines[1]=pcl-vm14RMS
 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=1)
19) (ShutdownPriority=)
20) (OnlinePriority=1)
21) (StandbyTransitions=ClearFaultRequest|StartUp|SwitchRequest)
22) (LicenseToKill=no)
```

```
23) (AutoBreak=yes)
24) (AutoBreakMaintMode=no)
25) (HaltFlag=no)
26) (PartialCluster=0)
27) (ScriptTimeout=)
Choose the setting to process: 25
```

19.  Select [yes].

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

20.  Ensure that all attributes are displayed as set in the previous steps, and then select [SAVE+EXIT].

```
Machines+Basics (app1:consistent)
 1) HELP
 2) -
 3) SAVE+EXIT
 4) REMOVE+EXIT
 5) AdditionalMachine
 6) AdditionalConsole
 7) Machines[0]=pcl-vm13RMS
 8) Machines[1]=pcl-vm14RMS
 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=1)
19) (ShutdownPriority=)
20) (OnlinePriority=1)
21) (StandbyTransitions=ClearFaultRequest|StartUp|SwitchRequest)
22) (LicenseToKill=no)
23) (AutoBreak=yes)
24) (AutoBreakMaintMode=no)
25) (HaltFlag=yes)
26) (PartialCluster=0)
27) (ScriptTimeout=)
Choose the setting to process: 3
```

21.  The following window will be displayed:

```
Settings of turnkey wizard "STANDBY" (APP1:not yet consistent)
 1) HELP                            9) Procedure:BasicApplication(-)
 2) -                              10) Symfoware(-)
 3) SAVE+EXIT                      11) Procedure:SystemState3(-)
 4) -                              12) Procedure:SystemState2(-)
 5) ApplicationName=APP1           13) Gls:Global-Link-Services(-)
 6) Machines+Basics(app1)          14) IpAddresses(-)
 7) CommandLines(-)                15) LocalFileSystems(-)
 8) Procedure:Application(-)       16) Gds:Global-Disk-Services(-)
Choose the setting to process:
```

## A.1.3 Creating GDS Resources

1. Select [Gds:Global-Disk-Services].

```
Settings of turnkey wizard "STANDBY" (APP1:not yet consistent)
 1) HELP                            9) Procedure:BasicApplication(-)
 2) -                              10) Symfoware(-)
 3) SAVE+EXIT                      11) Procedure:SystemState3(-)
 4) -                              12) Procedure:SystemState2(-)
 5) ApplicationName=APP1           13) Gls:Global-Link-Services(-)
 6) Machines+Basics(app1)          14) IpAddresses(-)
 7) CommandLines(-)                15) LocalFileSystems(-)
 8) Procedure:Application(-)       16) Gds:Global-Disk-Services(-)
Choose the setting to process: 16
```

2. Select [AdditionalDiskClass].

```
Volume management (Gds_APP1:not yet consistent)
1) HELP                4) REMOVE+EXIT          7) (StandbySupport=no)
2) -                   5) AdditionalDiskClass  8) (AutoRecover=no)
3) SAVE+EXIT           6) (ClassNameFilter=)   9) (Timeout=1800)
Choose the setting to process: 5
```

3. Select a disk class.

```
1) HELP
2) RETURN
3) FREECHOICE
4) class0001
Choose the disk class: 4
```

4. Follow the steps above for all shared disk classes to be used by all file systems to be registered in the cluster application. When doing so, configure the MONITORONLY attribute as shown in the following table:

| Purpose of file system | MONITORONLY attribute |
|---|---|
| Data storage destination directory | No |
| Backup data storage destination directory | Yes |
| Table space | No |
| Transaction log storage destination directory | No |

5. To configure the disk class, select [StandbySupport] and specify "no" - this means that upon failure, the disk will switch according to the purpose of the disk class.

```
Volume management (Gds_APP1:consistent)
 1) HELP                            6) DiskClasses[0]=class0001
 2) -                               7) (ClassNameFilter=)
 3) SAVE+EXIT                       8) (StandbySupport=no)
 4) REMOVE+EXIT                     9) (AutoRecover=no)
 5) AdditionalDiskClass            10) (Timeout=1800)
Choose the setting to process: 8
```

6. Select [SAVE+EXIT].

```
Volume management (Gds_APP1:consistent)
 1) HELP                            6) DiskClasses[0]=class0001
 2) -                               7) (ClassNameFilter=)
 3) SAVE+EXIT                       8) (StandbySupport=no)
 4) REMOVE+EXIT                     9) (AutoRecover=no)
```

```
 5) AdditionalDiskClass                  10) (Timeout=1800)
Choose the setting to process: 3
```

## A.1.4  Creating Symfoware Resources

1. Select [Symfoware].

```
Settings of turnkey wizard "STANDBY" (APP1:consistent)
 1) HELP                              9) Procedure:BasicApplication(-)
 2) -                               10) Symfoware(-)
 3) SAVE+EXIT                        11) Procedure:SystemState3(-)
 4) -                               12) Procedure:SystemState2(-)
 5) ApplicationName=APP1             13) Gls:Global-Link-Services(-)
 6) Machines+Basics(app1)            14) IpAddresses(-)
 7) CommandLines(-)                  15) LocalFileSystems(-)
 8) Procedure:Application(-)         16) Gds:Global-Disk-Services(Gds_APP1)
Choose the setting to process: 10
```

2. Select [AdditionalResource].

```
Resource (Symfoware_APP1:not yet consistent)
1) HELP                             4) REMOVE+EXIT
2) -                                5) AdditionalResource
3) SAVE+EXIT
Choose the setting to process: 5
```

3. Select the database cluster name specified in the pgx_pclrsc command in "2.3.8 Registering Resource Information for the Symfoware Database Cluster".

```
1) HELP
2) RETURN
3) FREECHOICE
4) pgxtest
Choose the resource: 4
```

4. Select [SAVE+EXIT].

```
Resource (Symfoware_APP1:consistent)
 1) HELP                              6) ResourceName[0]=pgxtest
 2) -                                7) Flags[0]=T900
 3) SAVE+EXIT                         8) OnlineTimeout[0]=3600
 4) REMOVE+EXIT                       9) OfflineTimeout[0]=1800
 5) AdditionalResource               10) FaultScript[0]=''
Choose the setting to process: 3
```

## A.1.5  Creating Gls or Takeover Network Resources

Create Gls or takeover network resources to use takeover network resources. This section provides an example for configuring Gl resources.

### See
..................................................................................................

- Refer to the PRIMECLUSTER Installation and Administration Guide for information on creating takeover network resources.

- Refer to the PRIMECLUSTER Installation and Administration Guide for information on creating Gl resources.
..................................................................................................

1. Select [Gls:Global-Link-Services].

```
Settings of turnkey wizard "STANDBY" (APP1:consistent)
 1) HELP                              9) Procedure:BasicApplication(-)
 2) -                               10) Symfoware(Symfoware_APP1)
 3) SAVE+EXIT                        11) Procedure:SystemState3(-)
```

```
 4) -                              12) Procedure:SystemState2(-)
 5) ApplicationName=APP1           13) Gls:Global-Link-Services(-)
 6) Machines+Basics(app1)          14) IpAddresses(-)
 7) CommandLines(-)                15) LocalFileSystems(-)
 8) Procedure:Application(-)       16) Gds:Global-Disk-Services(Gds_APP1)
Choose the setting to process: 13
```

2. Select [AdditionalTakeoverIpaddress].

```
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. Select a takeover IP.

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

4. Select [SAVE+RETURN].

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

5. Select [SAVE+EXIT].

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

# A.1.6  Creating Fsystem Resources

1. Select [LocalFileSystem].

```
Settings of turnkey wizard "STANDBY" (APP1:consistent)
 1) HELP                          9) Procedure:BasicApplication(-)
 2) -                            10) Symfoware(Symfoware_APP1)
 3) SAVE+EXIT                    11) Procedure:SystemState3(-)
 4) -                            12) Procedure:SystemState2(-)
 5) ApplicationName=APP1         13) Gls:Global-Link-Services(Gls_APP1)
 6) Machines+Basics(app1)        14) IpAddresses(-)
 7) CommandLines(-)              15) LocalFileSystems(-)
 8) Procedure:Application(-)     16) Gds:Global-Disk-Services(Gds_APP1)
Choose the setting to process: 15
```

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. Select all mount points allocated for the data storage destination directory, backup data storage destination directory, tablespace, and transaction log storage destination directory, as well as the mount point for the file systems used to monitor these areas.

   Note that settings for the mount point for file systems used for monitoring must be configured before those of the mount point for file systems that will be used for the job. Accordingly, to register multiple file systems for monitoring, repeat Steps 3 and 4 before proceeding to configure settings for file systems used for the job.

```
1) HELP                          5) /mnt/monitor1
2) RETURN                        6) /mnt/monitor2
3) FREECHOICE                    7) /mnt/swdsk1
4) ALL                           8) /mnt/swdsk2
Choose a mount point: 5
```

4. Select [SAVE+RETURN].

```
Set flags for mount point: /mnt/monitor1 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 the mount point of the file system that is used for a job.

   If registering multiple file systems to be used for a job, repeat Steps 5 to 7.

```
1) HELP                          5) /mnt/monitor1
2) RETURN                        6) /mnt/monitor2
3) FREECHOICE                    7) /mnt/swdsk1
4) ALL                           8) /mnt/swdsk2
Choose a mount point: 7
```

6. Configure the MONITORONLY attribute.

| Purpose of the file system | MONITORONLY attribute |
|---|---|
| Data storage destination directory | No |
| Backup data storage destination directory | Yes |
| Table space | No |
| Transaction log storage destination directory | No |

Select MONITORONLY to specify Yes to the MONITORONLY attribute.

```
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: 8
```

7. Select [SAVE+RETURN].

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

8. After configuring all mount points, select [SAVE+EXIT].

```
File systems (Lfs_APP1:consistent)
 1) HELP                              7) MountPoints[1]=LA:/mnt/monitor2
 2) -                                 8) MountPoints[2]=LA:/mnt/swdsk1
 3) SAVE+EXIT                         9) MountPoints[3]=LA:/mnt/swdsk2
 4) REMOVE+EXIT                      10) (Filter=)
 5) AdditionalMountPoint             11) (Timeout=180)
 6) MountPoints[0]=LA:/mnt/monitor1
Choose the setting to process: 3
```

9. Select [SAVE+EXIT].

```
Settings of turnkey wizard "STANDBY" (APP1:consistent)
 1) HELP                              9) Procedure:BasicApplication(-)
 2) -                                10) Symfoware(Symfoware_APP1)
 3) SAVE+EXIT                        11) Procedure:SystemState3(-)
 4) -                                12) Procedure:SystemState2(-)
 5) ApplicationName=APP1             13) Gls:Global-Link-Services(Gls_APP1)
 6) Machines+Basics(app1)           14) IpAddresses(-)
 7) CommandLines(-)                  15) LocalFileSystems(Lfs_APP1)
 8) Procedure:Application(-)         16) Gds:Global-Disk-Services(Gds_APP1)
Choose the setting to process: 3
```

## See
················································································
Refer to the PRIMECLUSTER Installation and Administration Guide for information on creating Fsystem resources.
················································································

# A.1.7  Creating Resources and Finalizing Cluster Application Creation

1. Select [Configuration-Generate].

```
pcl-vm13: Main configuration 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: 7
```

2. Select [Configuration-Activate].

```
pcl-vm13: Main configuration 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: 8
```

3. Select [QUIT].

```
pcl-vm13: Main configuration 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: 2
```

# A.2  Modifying Cluster Applications

Follow the steps shown below to add a new file system to a cluster application. Refer to the PRIMECLUSTER Installation and Administration Guide for information on other modifications on cluster applications. Stop the RMS on all nodes when modifying cluster applications.

| Move to the cluster application edit window | ⇒ Refer to A.2.1. |
| Add a created shared disk class to the cluster application | ⇒ Refer to A.2.2. |
| Add a created file system to the cluster application | ⇒ Refer to A.2.3. |
| Reflect the modifications made to the cluster application | ⇒ Refer to A.2.4. |
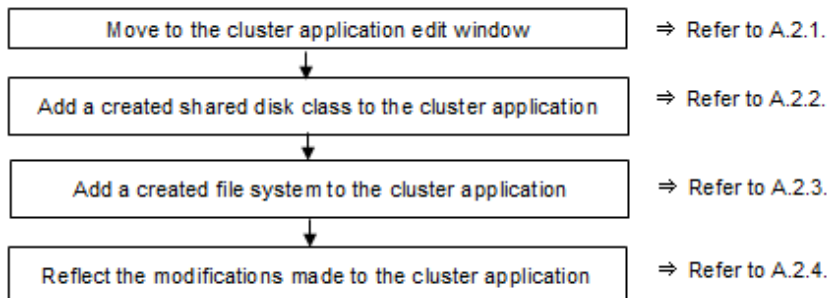
## A.2.1  Moving to the Cluster Application Edit Window

1. Execute the hvw command.

```
# hvw
```

2. Select [Application-Edit].

```
pcl-vm13: Main configuration 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
```

3. Select the user application to be used.

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

```
5) APP1
Application Name: 5
```

## A.2.2  Adding a Created Shared Disk Class to the Cluster Application

1. Select [Gds:Global-Disk-Services].

```
Settings of turnkey wizard "STANDBY" (APP1:consistent)
 1) HELP                          9) Procedure:BasicApplication(-)
 2) READONLY                     10) Symfoware(Symfoware_APP1)
 3) SAVE+EXIT                    11) Procedure:SystemState3(-)
 4) -                            12) Procedure:SystemState2(-)
 5) ApplicationName=APP1         13) Gls:Global-Link-Services(Gls_APP1)
 6) Machines+Basics(app1)        14) IpAddresses(-)
 7) CommandLines(-)              15) LocalFileSystems(Lfs_APP1)
 8) Procedure:Application(-)     16) Gds:Global-Disk-Services(Gds_APP1)
Choose the setting to process: 16
```

2. Select [AdditionalDiskClass].

```
Volume management (Gds_APP1:consistent)
 1) HELP                          6) DiskClasses[0]=class0001
 2) NO-SAVE+EXIT                  7) (ClassNameFilter=)
 3) SAVE+EXIT                     8) (StandbySupport=no)
 4) REMOVE+EXIT                   9) (AutoRecover=no)
 5) AdditionalDiskClass          10) (Timeout=1800)
Choose the setting to process: 5
```

3. Select the class of the created disk.

```
1) HELP
2) RETURN
3) FREECHOICE
4) class0001
5) class0002
Choose the disk class: 5
```

4. Select [SAVE+EXIT].

```
Volume management (Gds_APP1:consistent)
 1) HELP                          7) DiskClasses[1]=class0002
 2) NO-SAVE+EXIT                  8) (ClassNameFilter=)
 3) SAVE+EXIT                     9) (StandbySupport=no)
 4) REMOVE+EXIT                  10) (AutoRecover=no)
 5) AdditionalDiskClass         11) (Timeout=1800)
 6) DiskClasses[0]=class0001
Choose the setting to process: 3
```

5. Select [SAVE+EXIT] to quit or [LocalFileSystems] to add local file systems.

```
Settings of turnkey wizard "STANDBY" (APP1:consistent)
 1) HELP                          9) Procedure:BasicApplication(-)
 2) -                            10) Symfoware(Symfoware_APP1)
 3) SAVE+EXIT                    11) Procedure:SystemState3(-)
 4) -                            12) Procedure:SystemState2(-)
 5) ApplicationName=APP1         13) Gls:Global-Link-Services(Gls_APP1)
 6) Machines+Basics(app1)        14) IpAddresses(-)
 7) CommandLines(-)              15) LocalFileSystems(Lfs_APP1)
 8) Procedure:Application(-)     16) Gds:Global-Disk-Services(Gds_APP1)
Choose the setting to process:
```

## A.2.3 Adding a Created File System to the Cluster Application

1. Select [LocalFileSystems].

```
Settings of turnkey wizard "STANDBY" (APP1:consistent)
 1) HELP                             9) Procedure:BasicApplication(-)
 2) -                               10) Symfoware(Symfoware_APP1)
 3) SAVE+EXIT                        11) Procedure:SystemState3(-)
 4) -                               12) Procedure:SystemState2(-)
 5) ApplicationName=APP1             13) Gls:Global-Link-Services(Gls_APP1)
 6) Machines+Basics(app1)           14) IpAddresses(-)
 7) CommandLines(-)                 15) LocalFileSystems(Lfs_APP1)
 8) Procedure:Application(-)        16) Gds:Global-Disk-Services(Gds_APP1)
Choose the setting to process: 15
```

2. Select [AdditionalMountPoint].

```
File systems (Lfs_APP1:consistent)
 1) HELP                             7) MountPoints[1]=LA:/mnt/monitor2
 2) NO-SAVE+EXIT                     8) MountPoints[2]=LA:/mnt/swdsk1
 3) SAVE+EXIT                        9) MountPoints[3]=LA:/mnt/swdsk2
 4) REMOVE+EXIT                     10) (Filter=)
 5) AdditionalMountPoint            11) (Timeout=180)
 6) MountPoints[0]=LA:/mnt/monitor1
Choose the setting to process: 5
```

3. After registering the file systems to be used and the file system for the areas for monitoring them, select [SAVE+EXIT].

```
File systems (Lfs_APP1:consistent)
 1) HELP                             8) MountPoints[2]=LA:/mnt/swdsk1
 2) NO-SAVE+EXIT                     9) MountPoints[3]=LA:/mnt/swdsk2
 3) SAVE+EXIT                       10) MountPoints[3]=LA:/mnt/monitor3
 4) REMOVE+EXIT                     10) MountPoints[3]=LA:/mnt/swdsk3
 5) AdditionalMountPoint            11) (Filter=)
 6) MountPoints[0]=LA:/mnt/monitor1 12) (Timeout=180)
 7) MountPoints[1]=LA:/mnt/monitor2
Choose the setting to process:
```

## A.2.4 Reflecting Modifications Made to the Cluster Application

1. Select [SAVE+EXIT].

```
Settings of turnkey wizard "STANDBY" (APP1:consistent)
 1) HELP                             9) Procedure:BasicApplication(-)
 2) -                               10) Symfoware(Symfoware_APP1)
 3) SAVE+EXIT                        11) Procedure:SystemState3(-)
 4) -                               12) Procedure:SystemState2(-)
 5) ApplicationName=APP1             13) Gls:Global-Link-Services(Gls_APP1)
 6) Machines+Basics(app1)           14) IpAddresses(-)
 7) CommandLines(-)                 15) LocalFileSystems(Lfs_APP1)
 8) Procedure:Application(-)        16) Gds:Global-Disk-Services(Gds_APP1)
Choose the setting to process: 3
```

2. Select [RETURN].

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

3. Select [Configuration-Generate].

```
pcl-vm13: Main configuration 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: 7
```

4. Select [Configuration-Activate].

```
pcl-vm13: Main configuration 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: 8
```

5. Select [QUIT].

```
pcl-vm13: Main configuration 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
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