

ExpressCluster for Linux Ver3.0

Trekking Tool

2004.10.22
2nd Revision



Revision History

Revision	Revision Date	Description
1	2004/06/30	New manual
2	2004/10/22	5.2.6(1) Description to enter a raw device was eliminated. 5.2.6(1) Description regarding raw device that cannot be registered was added. 5.4.9.1(1) Description of bonding correspondence of floating IP resource was added. 5.4.12 RAW resource detail tab was added. 5.4.13 VxVM disk group resource detail tab was added. 5.4.14 VxVM volume resource detail tab was added. 5.5 Precaution when set group resource as recover object was added. 5.5.6 RAW monitor resource was added. 5.5.11 VxVM volume monitor resource was added. 5.5.12 VxVM daemon monitor resource was added. 8.4 Additional resource and additional monitor resource was added. 8.5.1 8.5.2 The maximum registration number of group resource was changed to 128.

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The latest information on system confirmation, system configuration guide, update, and tracking tool is provided in the following URL.
Please obtain the latest version before configuring the system.

Usage on the NEC Internet:

<http://soreike.wsd.mt.nec.co.jp/>

Usage out of the NEC Internet:

<http://www.ace.comp.nec.co.jp/CLUSTERPRO/>

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1 OVERVIEW

ExpressCluster Trekking Tool can create and reconfigure the cluster configuration data (config, script) for ExpressCluster Ver3.0.

Note:

"Linux version" in this document represents Trekking Tool that can run on Linux browser. "Windows version" represents Trekking Tool that can run on Windows browser.

The followings describe icons for each item in Chapters 4 "MENU DETAILS" and Chapter 5 "PARAMETER DETAILS".
Icons represent the required operations to reflect the changes of items in the cluster.
The table below shows the priorities of required operations in the descending order (High [1] to Low [5]) if you make changes in multiple items.
For details, see 4.1.4(2) "Result of file save".

Icon	Priority	How to reflect	Refer to
ShutdownReboot	1	Shutdown & reboot Cluster	"Maintenance" Guide
StopRestart	2	Stop & resume Cluster daemon	"Maintenance" Guide
SuspendResume	3	Suspend & resume Cluster daemon	"Maintenance" Guide
AStopRestart	4	Stop & resume Alert Log	"Web Manager" Guide
MStopRestart		Stop & resume Web Manager	"Web Manager" Guide
(No icon)	5	Upload only	"Maintenance" Guide

To form a new cluster, see a separate guide "Cluster Installation and Configuration Guide".

2 NOTES AND RESTRICTIONS

2.1 Notes

- (1) The following product's cluster configuration data is not compatible.
 - = Trekking Tools of ExpressCluster other than for Linux Ver3.x
 - = Trekking Tool of ExpressCluster for Windows Value Edition

- (2) When you insert the ExpressCluster CD in your Windows machine, as the result of autorun, you will see an installation menu where you see the Trekking Tool Setup menu. This setup menu is for ExpressCluster for Linux Ver2.x. Do not use this Trekking Tool on ExpressCluster for Linux Ver3.x.

- (3) If you exit from Web browser (by selecting [Exit] from the menu or clicking [X] on the top right-hand corner of window frame), the changes you made will be discarded. Even when you changed the configuration data, no dialog box asks if you need to save the changes.
If you want to save the changes, save them by selecting [File]-[Save the configuration file] from the menu bar on Trekking Tool before you exit.

- (4) If you reload data on Web browser (by selecting [Refresh] from the menu or clicking [Reload] on the tool bar), the changes you made will be discarded. Even when you changed the configuration data, no dialog box asks if you need to save the changes.
If you want to save the changes, save them by selecting [File]-[Save the configuration file] from the menu bar on Trekking Tool before you reload.

- (5) Basically, do not specify a number smaller than 30 seconds for [Screen Data Refresh Interval] in Web Manager tab (See 5.1.8(7) "Tune" for details).
If you have to set a smaller number for this field than the default value, test thoroughly if it works properly before you start the operation.

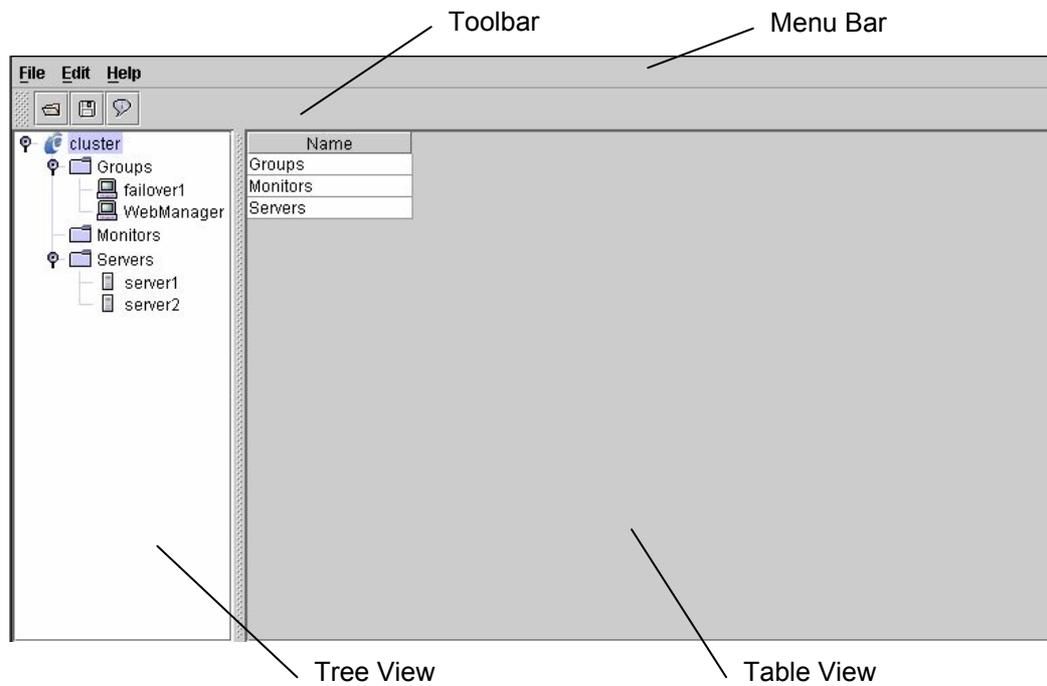
2.2 Restrictions

- (1) If you change the window resolutions while Trekking Tool is running, Java VM stack trace such as "NullPointerException" may be logged into the Java console. However, Trekking Tool can keep running.
- (2) If you press **Esc** while a pulldown menu of your browser is displayed, Java VM stack trace such as "NullPointerException" may be logged into the Java console. However, Trekking Tool can keep running.
- (3) In some cases, the keyboard seems not working because Trekking Tool's keyboard focus is disabled (the focus is on the Web browser). Click on the Trekking Tool window and get the focus back to Trekking Tool.
- (4) When you are using the multi-display function, do not run Trekking Tool on the secondary display. Otherwise, it may not work properly, for example, you may not be able to use the drawing function at all. Run this on the primary display.
- (5) When your browser is working on Linux, depending on the combination with the window manager, the dialog may go behind. Switch the windows with **ALT + TAB**.
- (6) General users cannot handle 1.44-MB FAT (VFAT) formatted floppy disks on Linux, i.e., if you are a general user, you cannot open or save the cluster configuration data on Linux. If you want to use both Trekking Tool working on Windows Web browser and the cluster configuration data, do so as a root user.
- (7) If you set a smaller number than the current one for [Preserve Maximum Alert Record Number] in Alert Log tab (see Section 5.1.9 "Alert Log tab"), all alert logs will be deleted. Take into account the available disk space, and specify the number before you start the operation.

3 SCREEN DETAILS

3.1 Overview

Trekking Tool Screen consists of the followings:
Names of the components in the screen are shown below.



The tree view on the left pane shows the cluster object hierarchy.
If you select an object from the tree view, you see its subordinate objects in the table view on the right pane.

3.2 Tree View

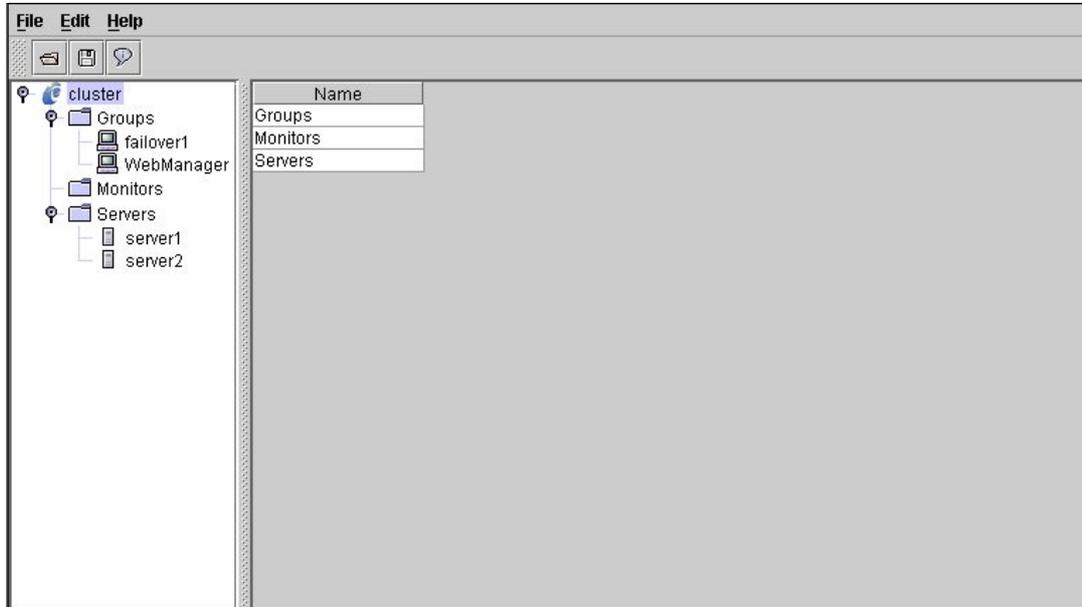
The following types of the objects are provided for displaying on the tree view.

Hierarchy	Object	Contents	Table view to be displayed if selected
1		Represents the cluster.	Displays a table for cluster name selection.
2	 Groups	Represents a set of groups in the clusters	Displays a table for group selection.
3		Represents each group.	Displays a table for group name selection.
2	 Monitors	Represents a set of monitor resources in the clusters	Displays a table for monitor selection.
2	 Servers	Represents a set of servers in the clusters	Displays a table for server selection.
3		Represents each server.	Displays a table for server name selection.

3.3 Table View

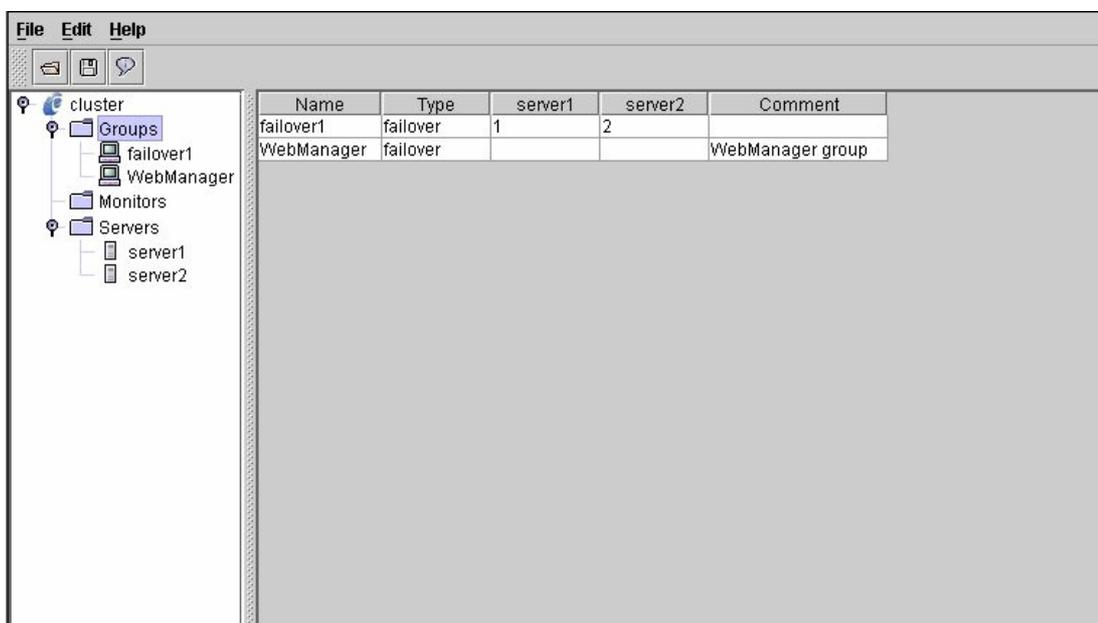
3.3.1 Table for cluster name selection

Objects on the root of hierarchy are listed.



3.3.2 Table for group selection

Displays the failover priorities for each group.



Name	Type	server1	server2	Comment
failover1	failover	1	2	
WebManager	failover			WebManager group

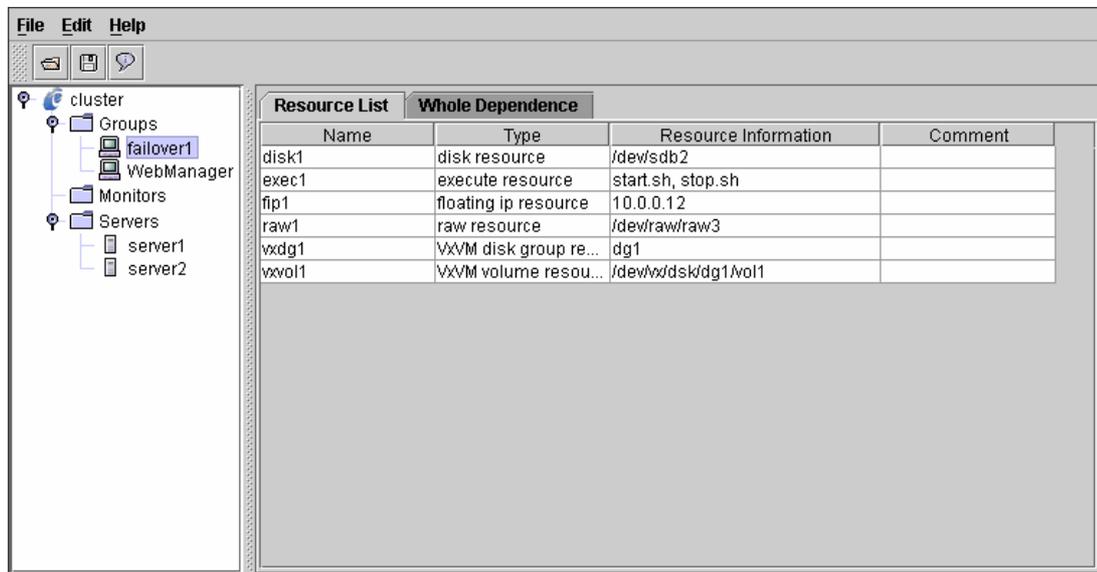
Descriptions:

Column name	Overview
Name	Displays the group name in alphanumerical order.
Type	Displays the type of the group
Server names (The number of row (s) dynamically increase or decrease according to the number of server)	Represents the group's startup orders in the servers on the columns. The top priority is represented with "1". This is blank if the startup priority is in accordance with the server priority. This is blank for Web Manager group.
Comment	Displays comments specified for the group.

3.3.3 Table for group name selection

(1) Resource List

Group resources in a selected group are listed.



Descriptions:

Column name	Overview
Name	Displays the group resource name in alphanumerical order.
Type	Displays a type of the group resource.
Resource Information	Displays objects to be activated/deactivated for the group resource.
Comment	Displays comments specified for the group resource.

(2) Whole Dependency

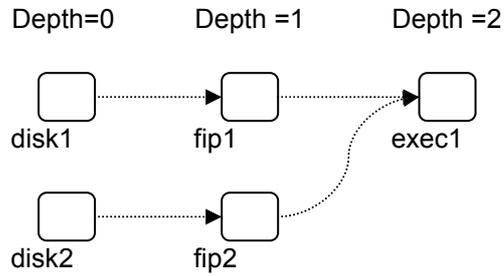
Dependencies of group resource in a selected group are listed.

Depth	Name	Depend on this resources	Type
0	fip1	none	
1	disk1	--	floating ip resource
1	raw1	--	floating ip resource
1	wxdg1	--	floating ip resource
2	vxvol1	--	floating ip resource
		--	VxVM disk group re...
3	exec1	--	disk resource
		--	floating ip resource
		--	nas resource
		--	raw resource
		--	VxVM disk group re...
		--	VxVM volume resou...

Descriptions:

Column name	Overview
Depth	Represents the theoretical activation order of group resource in the name cell. If the group resource depends on no other group resource, this is represented with "0". Group resources are displayed in the order of depth.
Name	Displays the group resource name.
Depend on this resource	Displays the group resource name on which the group resource in the name cell depends. If the group resource depends on no other group resource, this is represented with "none". If in accordance with the default dependencies, this is represented with "--". If the group resource has more than one depending resources, they are represented in as many rows as the depending resources.
Type	Displays the type for the group resource in "Depend on this resource" cell. If in accordance with the default dependencies, the depending type is displayed.

The meaning of depth is illustrated below. Arrows(->) in the illustration represent the group resource activation order.



The dependencies in this illustration are listed below. These are not the default dependencies. They are specified with resource names.

Depth	Names	Depend on this resource	Type
0	disk1	none	
0	disk2	none	
1	fip1	disk1	disk resource
1	fip2	disk2	disk resource
2	exec1	fip1	floating ip resource
		fip2	floating ip resource

3.3.4 Table for monitor selection

Monitor resources are listed

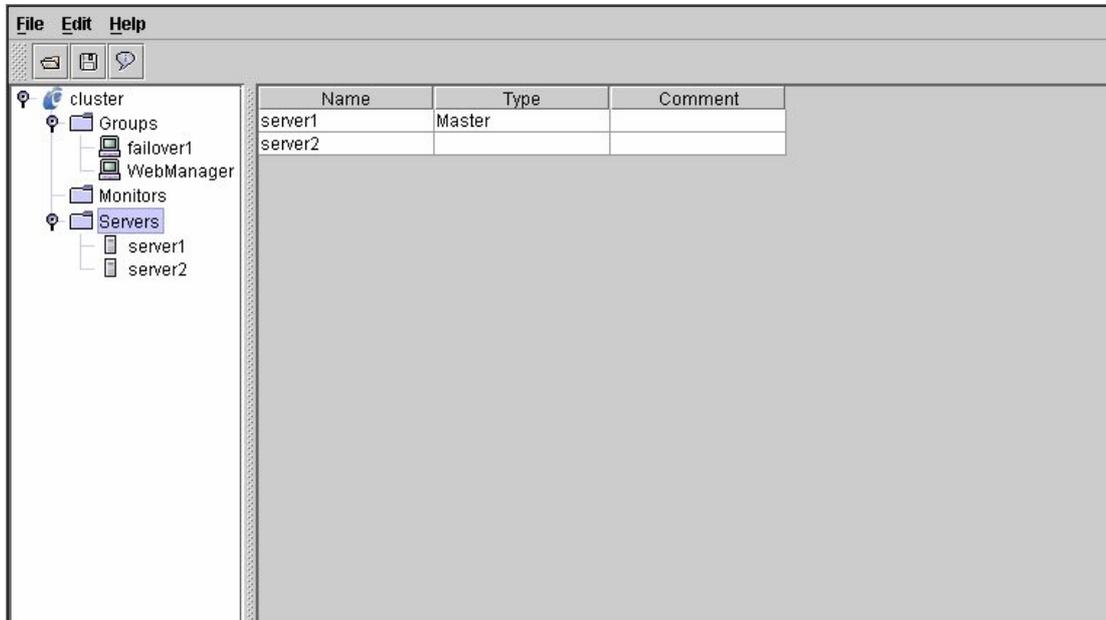
Name	Type	Place to watch	Comment
diskw1	disk monitor	/dev/sdb2	
ipw1	ip monitor	10.0.0.254	
ipw2	ip monitor	10.0.0.254	
raww1	raw monitor	/dev/raw/raw4	
userw	user mode monitor	softdog.o	user mode monitor
vxdw	VxVM daemon moni...	vxprint	VxVM config daemo...
vxvolw1	VxVM volume monitor	/dev/vx/rdskdg1/vol1	

Descriptions:

Column name	Overview
Name	Displays monitor resource names in alphanumerical order.
Type	Displays the type of monitor resource.
Place to watch	Displays the monitor resource object to be monitored.
Comment	Displays comments specified for the monitor resource.

3.3.5 Table for server selection

Servers are listed.

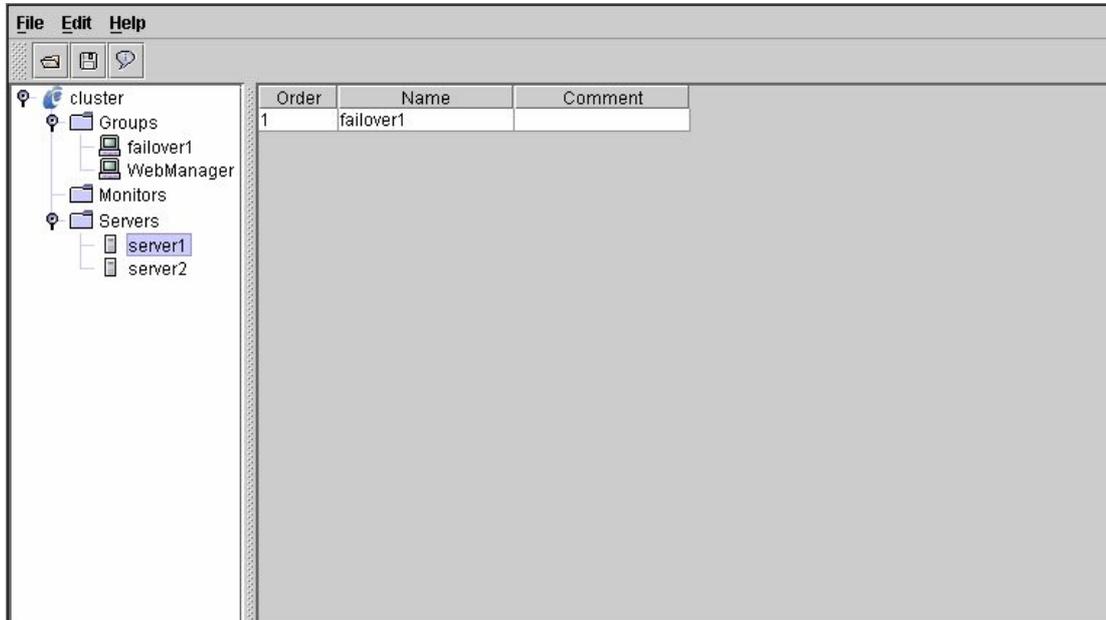


Descriptions:

Column name	Overview
Name	Displays the server name in alphanumerical order.
Type	If the server is specified as the master server, this is represented with "Master".
Comment	Displays comments specified for the server.

3.3.6 Table for server name selection

Groups which are allowed to start on the selected server are listed.



Descriptions:

Column name	Overview
Order	Displays the server priority. The group in the name cell starts on servers in this order. The top priority is represented with "1". This list is in the descending order of priority. This field is blank if the group does not have specific server priorities for startup (if it follows the servers' priorities). Web Manager group is not displayed.
Name	Displays the group name.
Comment	Displays comments specified for the group.

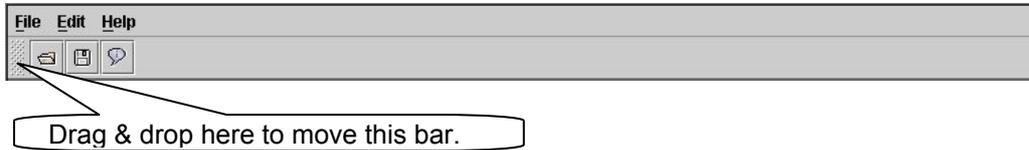
3.4 Pop-Up Menu

Pop-up menus are displayed by right-clicking a tree object or table row.

If you select	Displayed Menu	Refer to
 [No cluster name]	Cluster generation wizard	Not available in this version
	Add cluster	4.2.1 Add
 [a cluster name]	Remove cluster	4.2.2 Remove
	Rename cluster	4.2.3 Rename
	Property	4.2.4 Property
 Servers	Add server	4.2.1 Add
	Property	4.2.4 Property
 [a server name]	Remove server	4.2.2 Remove
	Rename server	4.2.3 Rename
	Property	4.2.4 Property
 Monitors	Add monitor resource	4.2.1 Add
 Groups	Add group	4.2.1 Add
	Add group for WebManager	"Installation and Configuration Guide"
 [a group name]	Add resource	4.2.1 Add
	Remove group	4.2.2 Remove
	Rename group	4.2.3 Rename
	Property	4.2.4 Property
[a group resource name]	Remove resource	4.2.2 Remove
	Rename resource	4.2.3 Rename
	Property	4.2.4 Property
[a monitor resource name]	Remove monitor resource	4.2.2 Remove
	Rename monitor resource	4.2.3 Rename
	Property	4.2.4 Property

3.5 Tool Bar

Trekking Tool provides a tool bar.

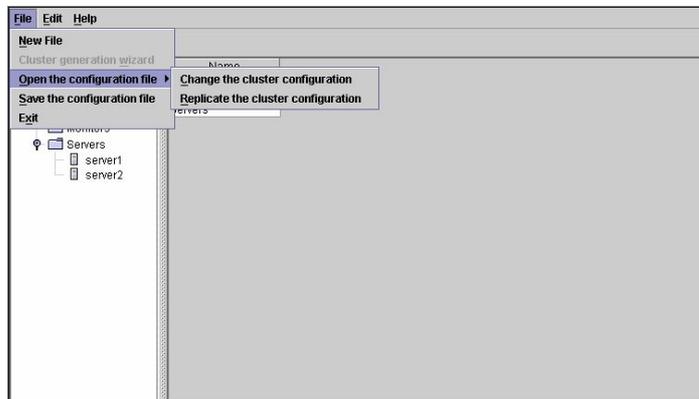


Tool bar provides partly the same functions as pull-down menus.

Button	Function	Refer to
	The same as selecting [File]-[Open the configuration file]-[Change the cluster configuration] from the menu bar	4.1.3(1)
	The same as selecting [File]-[Save the configuration file] from the menu bar	4.1.4
	The same as selecting [Help]-[Version Information] from the menu bar	4.3.1

4 MENU DETAILS

4.1 File Menu



4.1.1 New File

This will discard the cluster configuration data you are editing.

If you made changes in the cluster configuration data, a dialog box asks if you want to save the changes before they are discarded.

Select [Yes] to save the changes. Then, a dialog where you can specify a folder to save the cluster configuration data is displayed. For how to save the data, see Section 4.1.4 "Save the configuration file".



4.1.2 Cluster generation wizard

This is not available in this version.

4.1.3 Open the configuration file

Select this to open the saved cluster configuration data. The read configuration file's tree view is displayed.

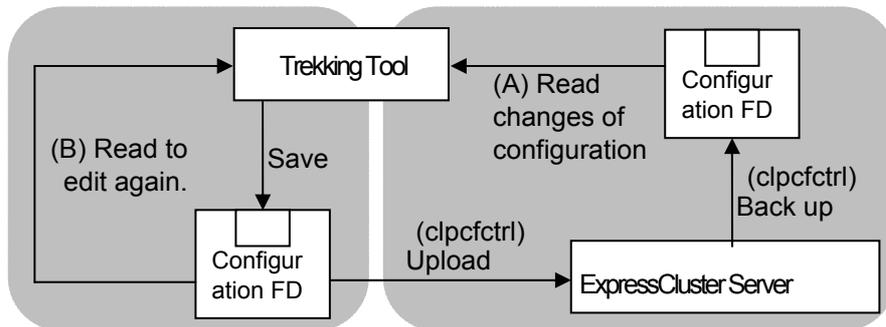
There are two ways to open the file depending on the purpose to edit the cluster configuration data.

(1) Change the cluster configuration

Select this if,

- A. You want to reconfigure an already configured cluster, or
- B. You want to edit a temporarily saved cluster configuration data.

(A) and (B) in the below figure are the cases.

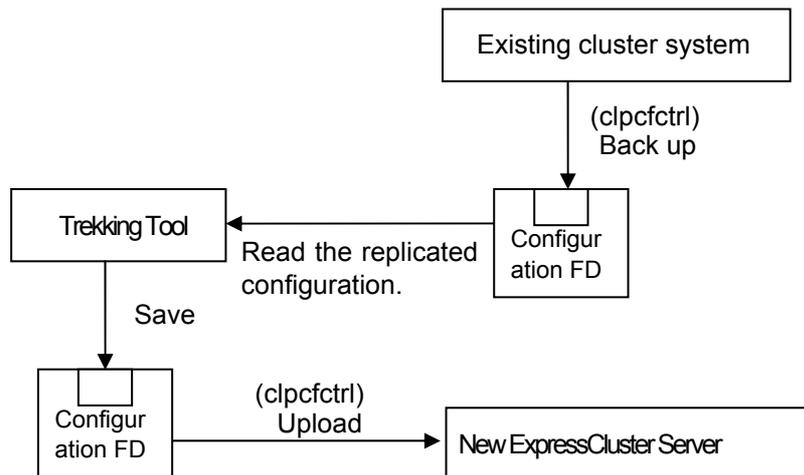


(2) Replicate the cluster configuration

Select this to create a cluster with an existing cluster configuration data.

If you are going to give the new cluster the same configuration as the existing cluster configuration data except for the cluster-specific settings such as the server names and IP addresses, you can make the editing works in Trekking Tool easier by using this function.

The working flow is like:



(3) How to use

A. For Linux



1. Floppy Disk

If your floppy disk contains the cluster configuration data, select [Floppy Disk]. Then, select the floppy disk device from the combo box. If you cannot find it in the combo box, enter the device.

2. For Windows

This is enabled when [Floppy Disk] is selected.

To open a cluster configuration data which was made by Trekking Tool working on Windows browser, select [For Windows].

This function is available only for root users.

Trekking Tool mounts/unmounts the floppy disk.

3. File System

Select this to read a cluster configuration data temporarily saved on the file system. Click [Ok]. Then, you go to the following B “For Windows”.

B. For Windows



Select “clp.conf” in the file name.

4.1.4 Save the configuration file

Select this to save the cluster configuration data you are making changes. This menu becomes available if you have created a cluster configuration data. Save the file in the name of "clp.conf".

- * To save a cluster configuration data, the followings should be satisfied.
 - + The server exists.
 - + LAN heartbeat resource exists.

(1) How to use

A. For Linux



1. Floppy Disk
To save the cluster configuration data in a floppy disk, select [Floppy Disk]. Then, select the floppy disk device from the combo box. If you cannot find it in the combo box, enter the device.
2. For Windows
This is enabled when [Floppy Disk] is selected.
If you want to edit the data also by Trekking Tool working on Windows browser, select [For Windows].
This function is available only for root users.
Trekking Tool mounts/unmounts the floppy disk.
Prepare a Windows FAT (VFAT) formatted 1.44-MB floppy disk.
3. File System
Select this to save the cluster configuration data on the file system. Click [Ok]. Then, you go to the following B "For Windows".

B. For Windows

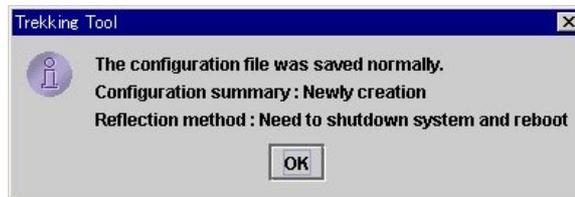


Select “clp.conf” in the file name. The server reads this file by name, “clp.conf”.

(2) **Result of file save**

When you save a cluster configuration data, you will see a message corresponding to what you do for the data.

- A. If you save a cluster configuration data for a new cluster to be created:
You will see the following message if you save a cluster configuration data by
- starting Trekking Tool and creating the cluster configuration data, or
 - selecting [File]-[Create] from the menu bar and creating the cluster configuration data, or
 - selecting [File]-[Open the configuration file]-[Change the cluster configuration] from the menu bar and opening a new cluster’s configuration data, or
 - selecting [File]-[Open the configuration file]-[Replicate the cluster configuration] from the menu bar and opening an existing cluster configuration data.



This message means,

- + This cluster configuration data is for creating a cluster, and
- + You have to shut down and restart each server with the shutdown command after uploading the cluster configuration data to servers.

For details of how to create a cluster, see a separate guide, “Cluster Installation and Configuration Guide”.

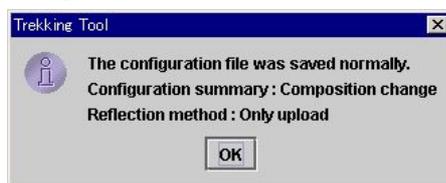
B. If you save an existing cluster's configuration data:
When you open an existing cluster's configuration data by selecting [File]-[Open the configuration file]-[Change the cluster configuration] from the menu bar, you will see a message corresponding to what you change in the data.

1. Level 0

You will see the following message if you make

- no change, or
- changes which do not directly affect Cluster daemon's behaviors, in the cluster configuration data.

Namely, when you change an item(s) marked with **MStopRestart** or **AStopRestart** or item with no icon in this document, you will see the following message.



This message means,

- + This cluster configuration data is for changing an existing cluster configuration data, and
- + You can reflect the changes only by uploading the changed cluster configuration data without stopping Cluster daemon.

For details of how to upload the cluster configuration data to servers and how to reflect the changes of Web Manager and Alert Log settings, see a separate guide, "Web Manager".

2. Level 1

You will see the following message if you make changes,

- Which affect Cluster daemon's behaviors, in the cluster configuration data.

Namely, when you change an item(s) marked with **SuspendResume** in this document, you will see the following message.



This message means,

- + This cluster configuration data is for changing an existing cluster configuration data, and
- + You can reflect the changes by uploading the changed cluster configuration data, then suspending & resuming Cluster daemon.

For details of how to upload the cluster configuration data to servers, and how to suspend and resume Cluster daemon, see a separate guide, "Maintenance".

3. Level 2

You will see the following message if you make changes,

- Which affect Cluster daemon's behaviors, or
- Which affect Cluster daemon more than changes of Level 1, in the cluster configuration data.

Namely, when you change an item(s) marked with **StopRestart** in this document, you will see the following message.



This message means,

- + This cluster configuration data is for changing an existing cluster configuration data,
- + You can reflect the changes by uploading the changed cluster configuration data, then, stopping & restarting Cluster daemon.

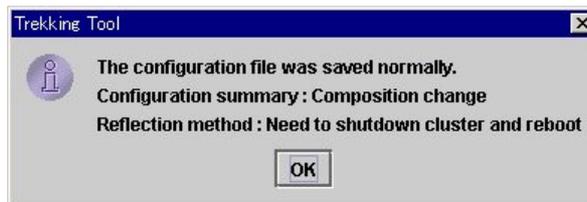
For details of how to upload the cluster configuration data to servers, and how to stop and restart Cluster daemon, see a separate guide, "Maintenance".

4. Level 3

You will see the following message if you make changes,

- Which affect Cluster daemon's behaviors,
- Which affect Cluster daemon more than changes of Level 2, in the cluster configuration data.

Namely, when you change an item(s) marked with **ShutdownReboot** in this document, you will see the following message.



This message means,

- + This cluster configuration data is for changing an existing cluster configuration data, and
- + You can reflect the changes by uploading the changed cluster configuration data, then restarting all servers in the cluster. Use the Cluster shutdown command to shut down all servers in the cluster.

For details of how to upload the cluster configuration data to servers, and how to shut down a cluster, see a separate guide, "Maintenance".

Important!

1. Changes in Web Manager or Alert Log settings

If you have changed settings of Web Manager or Alert Log in Cluster Properties, you have to reflect them in each server after uploading the cluster configuration data to servers.

Web Manager and Alert Log functions work independently from Cluster daemon. Therefore, you can reflect the changes whenever it is convenient for you.

- Change Levels 0, 1, 2

If you have changed settings of Web Manager or Alert Log, follow the respective procedures to reflect them.

For details of how to reflect changes of Web Manager and Alert Log settings, see a separate guide, "Web Manager".

- Change Level 3

By restarting servers, changes of Web Manager and Alert Log are reflected.

2. Change Levels

Change Levels are recorded in the cluster configuration data. To make a new change in the cluster configuration data after you have reflected the data on servers, download the cluster configuration data from a server, then, make changes in that data.

On assumption that you made Level 3 changes in a cluster configuration data, then, opened it by selecting [File]-[Open the configuration file]-[Change the cluster configuration] from the menu bar and made only changes of lower Level than 3, the Change Level of the saved data is still Level 3.

4.1.5 Exit

You exit from Trekking Tool by selecting this. You do not exit from your Web browser.

If you have made any change in the cluster configuration data, a dialog box asks if you want to save the changes.

Select [Yes] to save the changes. Then, you see a dialog box where you can specify a folder to save the file. For how to save the file, see Section 4.1.4 "Save the configuration file".

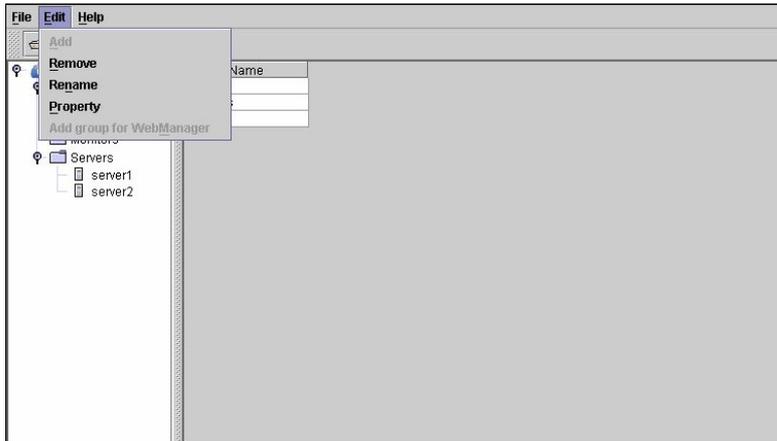
Select [No] if you do not need to save the changes. Then, you exit discarding the changes you made in the cluster configuration data.

Select [Cancel] to cancel exiting.



4.2 Edit Menu

By selecting [Edit] from the menu, its pull-down menu is displayed.



4.2.1 Add

Select this to add a cluster, server, group, group resource or monitor resource. Then, you see a wizard screen to add one. For details, see a separate guide, “Cluster Installation and Configuration Guide”.

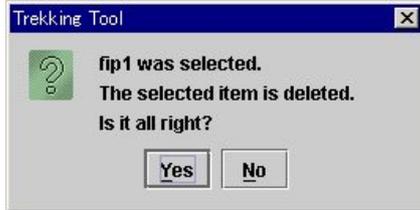
What you can add varies depending on what you select as listed below.

If you select	Object to be added	How to reflect
[no cluster name]	Cluster	ShutdownReboot
Groups	Group	SuspendResume
	Web Manager group	StopRestart
[a group name]	Group resource	For other than mirror disk resources StopRestart For mirror disk resources ShutdownReboot
Monitors	Monitor resource	SuspendResume
Servers	Server	For SE and XE SuspendResume AStopRestart MStopRestart
		For LE ShutdownReboot

4.2.2 Remove

If you select this, a dialog box asks if you want to remove a selected object. Select [Yes] to remove it. Then, the selected cluster, server, group, group resource or monitor resource will be removed. Select [No] if you do not remove it.

To remove a cluster is the same as Section 4.1.1 “New File”.



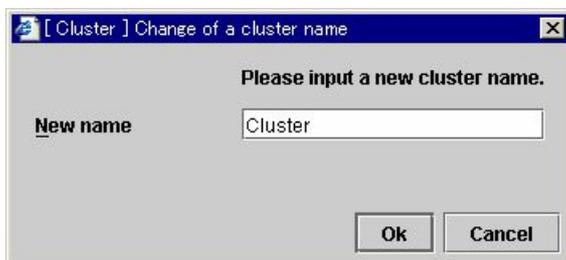
You cannot remove an object if any of the following conditions is met.

If you select	Conditions you cannot remove	How to reflect
Cluster Name	There is no condition.	
Server Name	<ul style="list-style-type: none"> - No other server exists. - This server is the only server where the group can start up. 	For SE and XE SuspendResume For LE ShutdownReboot
Group Name	<ul style="list-style-type: none"> - This is a recovery object of monitor resource^a. - This has a group resource(s). 	StopRestart
Group Resource Name	<ul style="list-style-type: none"> - This is a recovery object of monitor resource^a. - The PID resource for this object is to be monitored^a. - The mirror disk resource for this object is to be monitored monitor^a. - This is the mirror disk resources that uses the resource to be monitored by the mirror disk connect monitor resource^a. - Other group resource(s) in the same group depends on this. 	For other than mirror disk resources StopRestart For mirror disk resources ShutdownReboot
Monitor Resource Name	<ul style="list-style-type: none"> - There is not condition for others than mirror disk monitor resource. - [Auto Mirror Recovery] is selected in [Mirror] tab of [Cluster Property] for mirror disk monitor resource. 	SuspendResume

^a A message asks if you want to delete the specified object's monitor resources. If you select “Yes” (you want to delete them), the specified object's monitor resources will be deleted, then, the object will be deleted.

4.2.3 Rename

By selecting this, you see a dialog box to rename a selected cluster, server, group, group resource and monitor resource.



The followings are restrictions for each object.

If you select	Naming rules	How to reflect
Group Name	+Only alphanumeric hyphen (-), underscore (_) and space are allowed for names. +Case-insensitive +Up to 31 characters (31 bytes) +Names cannot start or end with hyphen (-) or space.	StopRestart
Group Resource Name		For other than mirror disk resources StopRestart For mirror disk resources ShutdownReboot
Cluster Name Monitor Resource Name		SuspendResume
Server Name	+ Naming rules are the same as the host name of TCP/IP that the OS allows. + Case-insensitive + Up to 255 characters (255 bytes) + Neither hyphen (-) nor space can be the first or last letter in names. + A name consisting of only numbers is not allowed.	For SE and XE SuspendResume For LE ShutdownReboot

Names should be unique by category like cluster, server, group, group resource and monitor resource.

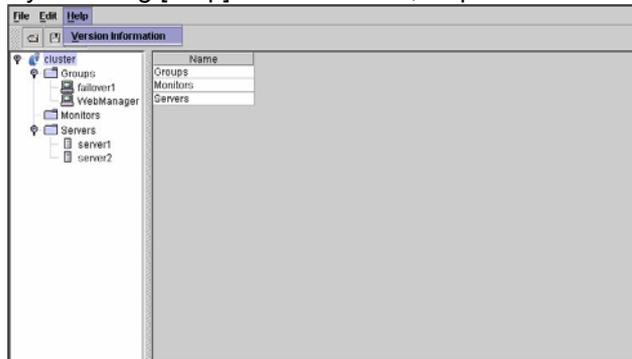
4.2.4 Property

By selecting this, you see properties of a selected cluster, server, group, group resource, or monitor resource.

For details, see Chapter 5 "PARAMETER DETAILS".

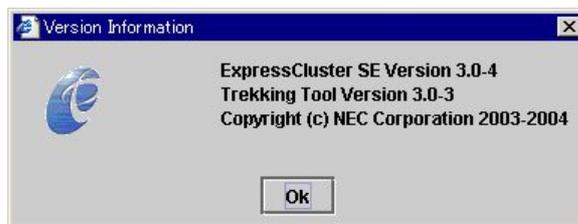
4.3 Help Menu

By selecting [Help] from the menu, its pull-down menu is displayed.



4.3.1 Version Information

By selecting this, you see the version information.



- * **ExpressCluster Version**
After you have defined the cluster, the corresponding edition and version of ExpressCluster itself are displayed.
- * **Trekking Tool Version**
Represents Trekking Tool's version.

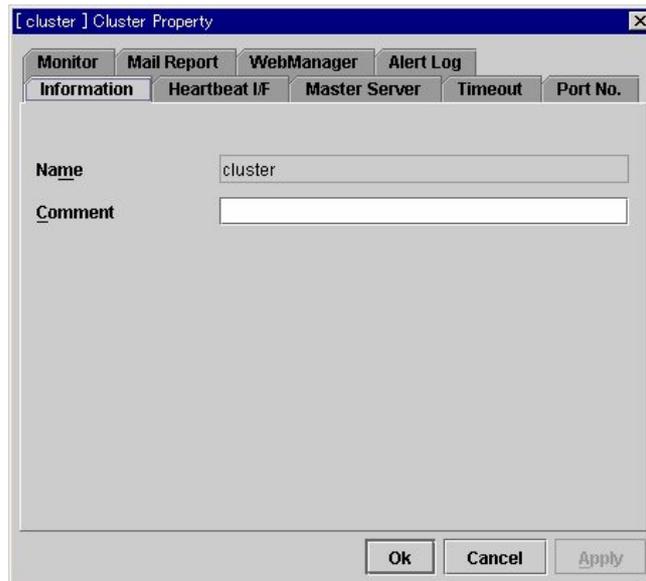
5 PARAMETER DETAILS

5.1 Cluster

In this dialog's tabs, you can view or change the cluster's settings.

5.1.1 Information tab

You can view the cluster name, and enter/change a comment for this cluster.



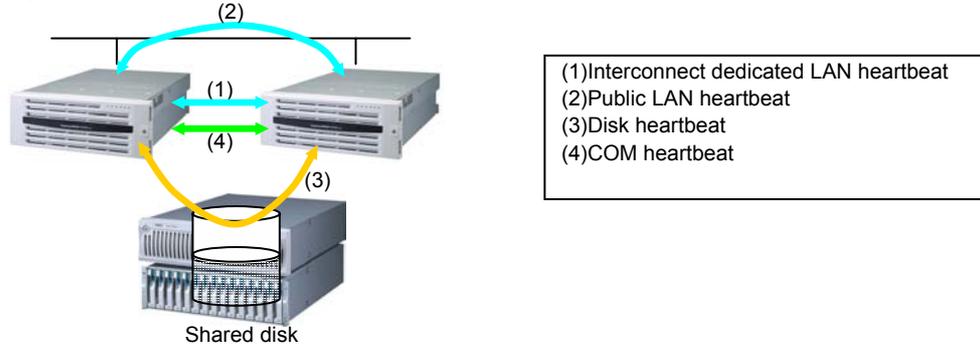
- (1) **Name**
The cluster name is displayed.
You cannot rename here.
- (2) **Comment (up to 127 bytes)**
You can enter a comment for the above cluster.

5.1.2 Heartbeat I/F Tab

You can add/delete/change heartbeat interfaces.

Heartbeat interfaces used by ExpressCluster are listed in [Heartbeat I/F Priority List].
Heartbeat interfaces not in use are listed in [Available interfaces].

- * Types of heartbeat devices are as follows;



- * Heartbeat devices types are displayed in this tab as follows;

Heartbeat device types	Type	How to display in [Available Interfaces] ^a
Interconnect dedicated LAN heartbeat	LAN	Add to "Interconnect LAN I/F" tab in Section 5.2.3.
Public LAN heartbeat		
COM heartbeat	COM	Add to "COM I/F" tab in Section 5.2.5.
Disk heartbeat	DISK	Add to "Disk I/F" tab in Section 5.2.6.

- * If one server or more is defined, you have to define one LAN interface or more in [Heartbeat I/F Priority List].
- * The I/F No. of Interconnect dedicated LAN heartbeat should be higher than the priority of public LAN heartbeat. You can change it by [Up] and [Down] buttons after adding it in [Heartbeat I/F Priority List].
- * Define interfaces for disk heartbeat and COM heartbeat based on the following rules.
 - + For SE

If you use shared disks:	[One server or two] Basically, COM I/F mode and Disk I/F mode [Three or more servers] Disk I/F mode
If you do not use shared disks:	[One server or two] COM I/F mode ^b

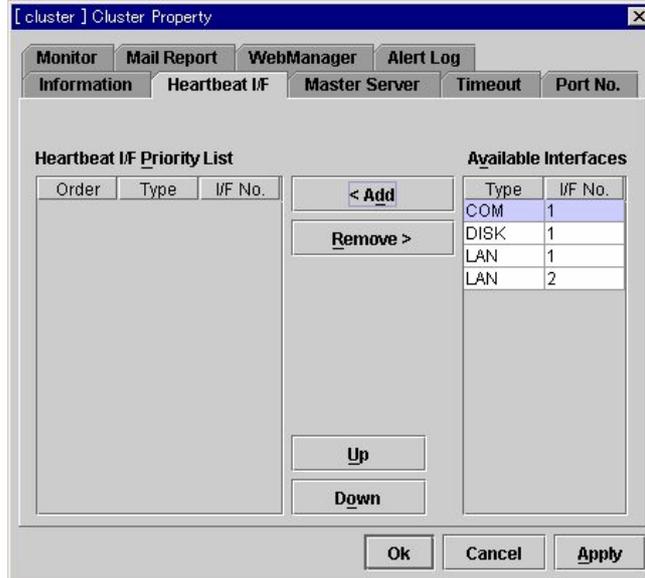
- + For XE
Disk I/F mode
- + For LE
COM I/F mode^b

^a Numbers you see in [I/F No.] cells are those you specified on each tab in Server Property.

^b For servers which do not have COM, multiple LAN I/F connections are recommended.

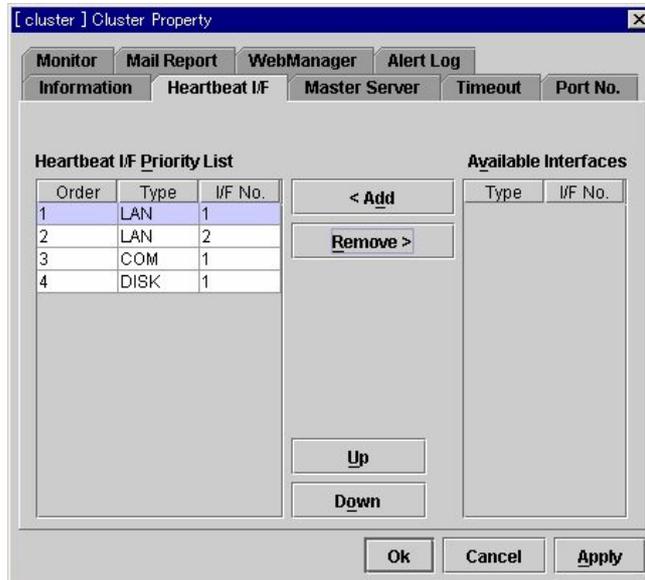
(1) **Add SuspendResume**

Click this to add a heartbeat interface. Select one from [Available interfaces]. Click [Add]. Then, it will be added in [Heartbeat I/F Priority List].



(2) **Remove SuspendResume**

Click this to remove a heartbeat interface. Select one from [Heartbeat I/F Priority List]. Click [Remove]. Then, it will be added in [Available Interfaces].

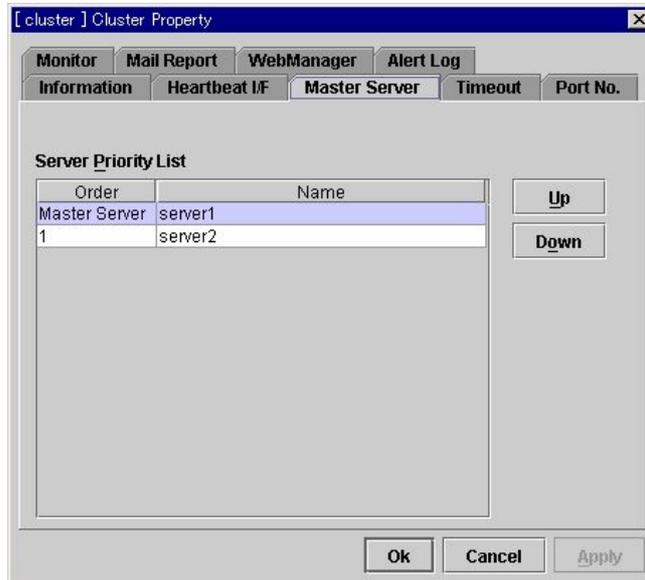


(3) [Up] & [Down] SuspendResume

Click this to change the priority of a selected heartbeat interface. Select one from [Heartbeat I/F Priority List]. Click [Up] or [Down]. Then, the selected row moves accordingly.

5.1.3 Master Server tab

You define the priorities of servers in this tab. All registered servers are listed here. Master Server is the server which contains the master of the cluster configuration data. This is the top priority server.



(1) **[Up] & [Down] SuspendResume**

Click this to change the priority of a selected server. Select a server name whose priority you want to change from [Server Priority List]. Click [Up] or [Down]. Then, the selected row moves accordingly.

5.1.4 Timeout tab

You specify values timeout such as in this tab.

The screenshot shows a dialog box titled "cluster] Cluster Property" with a close button (X) in the top right corner. The dialog has several tabs: "Monitor", "Mail Report", "WebManager", "Alert Log", "Information", "Heartbeat I/F", "Master Server", "Timeout", and "Port No.". The "Timeout" tab is selected. Inside the dialog, there are three input fields with labels and units: "Synchronize Wait Time" with a value of 5 and unit "min"; "Heartbeat Interval" with a value of 3 and unit "sec"; and "Heartbeat Timeout" with a value of 90 and unit "sec". Below these is a "Server Internal Timeout" field with a value of 180 and unit "sec". At the bottom right of the dialog is an "Initialize" button. At the bottom center are three buttons: "Ok", "Cancel", and "Apply".

(1) Synchronize Wait Time (0 to 99)

For the time specified here, the server will wait at startup until other servers have been started.

(2) Heartbeat

Heartbeat interval and heartbeat timeout

A. Interval (1 to 99) **SuspendResume**
Interval of heartbeats

B. Timeout (2 to 9999) **SuspendResume**
Heartbeat timeout

A server down is determined if there has been no response for the time specified here.

- This timeout should be longer than the interval.
- To do the shutdown monitoring (see Section 5.1.6 "Monitor tab"), this timeout should be longer than the time it takes to shut down applications and the operating system.

(3) Server Internal Timeout (1 to 9999) **SuspendResume**

The timeout to be used in ExpressCluster Server internal communications

(4) Initialize

Click this to reset all settings to default.

5.1.5 Port Number tab

You specify TCP port numbers and UDP port numbers.

(For SE and XE)

The screenshot shows the 'Port No.' tab of the '[cluster] Cluster Property' dialog. The 'Port No.' tab is selected, and the 'WebManager' sub-tab is active. The dialog is divided into two sections: TCP and UDP. The TCP section contains three fields: 'Server Internal Port Number' (29001), 'Data Transfer Port Number' (29002), and 'WebManager HTTP Port Number' (29003). The UDP section contains two fields: 'Heartbeat Port Number' (29002) and 'Alert Sync Port Number' (29003). At the bottom right of the dialog is an 'Initialize' button. At the very bottom are 'Ok', 'Cancel', and 'Apply' buttons.

Protocol	Port Name	Port Number
TCP	Server Internal Port Number	29001
	Data Transfer Port Number	29002
	WebManager HTTP Port Number	29003
UDP	Heartbeat Port Number	29002
	Alert Sync Port Number	29003

(For LE)

The screenshot shows the 'Port No.' tab of the '[cluster] Cluster Property' dialog. The 'Port No.' tab is selected, and the 'Mirror' sub-tab is active. The dialog is divided into two sections: TCP and UDP. The TCP section contains five fields: 'Server Internal Port Number' (29001), 'Data Transfer Port Number' (29002), 'WebManager HTTP Port Number' (29003), 'Mirror Agent Port Number' (29004), and 'Mirror Driver Port Number' (29005). The UDP section contains two fields: 'Heartbeat Port Number' (29002) and 'Alert Sync Port Number' (29003). At the bottom right of the dialog is an 'Initialize' button. At the very bottom are 'Ok', 'Cancel', and 'Apply' buttons.

Protocol	Port Name	Port Number
TCP	Server Internal Port Number	29001
	Data Transfer Port Number	29002
	WebManager HTTP Port Number	29003
	Mirror Agent Port Number	29004
	Mirror Driver Port Number	29005
UDP	Heartbeat Port Number	29002
	Alert Sync Port Number	29003

(1) TCP

No port numbers of TCP can collide each other.

For LE, they should not collide with any mirror data port number of any mirror disk resources.

- A. Server Internal Port Number (1 to 65535^a) **SuspendResume** **AStopRestart**
MStopRestart
This port number is used for internal communication
- B. Data Transfer Port Number (1 to 65535^a) **ShutdownReboot**
This port number is used for transactions such as reflecting/backing up the cluster configuration data, sending/receiving the license data and running commands.
- C. Web Manager HTTP Port Number (1 to 65535^a) **MStopRestart**
This port number is used for a browser to communicate with ExpressCluster Server.
- D. Mirror Agent Port Number (1 to 65535^a) **ShutdownReboot**
Mirror Agent is a user mode module for controlling mirror disk resources. Mirror Agent port number is used for Mirror Agent to communicate with servers.
- E. Mirror Driver Port Number (1 to 65535^a) **ShutdownReboot**
The mirror driver is a kernel mode module for mirror disk resources. The mirror driver uses this mirror driver port number for sending/receiving control data between servers. You specify the port to use for sending/receiving mirroring data in mirror disk resource's properties.

(2) UDP

No port numbers of UDP can collide each other.

- A. Heartbeat Port Number (1 to 65535^a) **SuspendResume**
This port number is used for heartbeat.
- B. Alert Sync Port Number (1 to 65535^a) **AStopRestart**
This port number is used for synchronizing alert messages among servers.

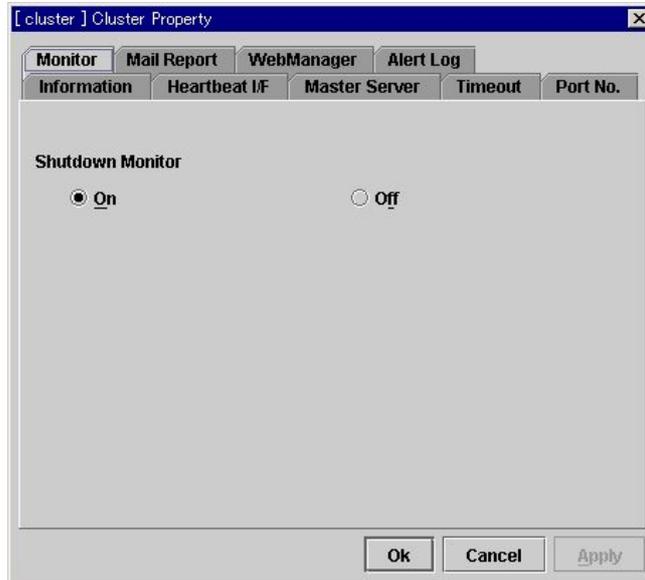
(3) Initialize

Click this to reset all settings on this tab to default.

^a It is strongly recommended not to use well-known ports, especially reserved ports from 1 to 1023.

5.1.6 Monitor tab

You select whether to perform the Shutdown Monitor.



(1) Shutdown Monitor

The shutdown monitoring monitors if the operating system is stalling when an ExpressCluster command to shut down the cluster or servers is run. Cluster daemon forcibly resets the operating system if it determines the OS stall.

[On]

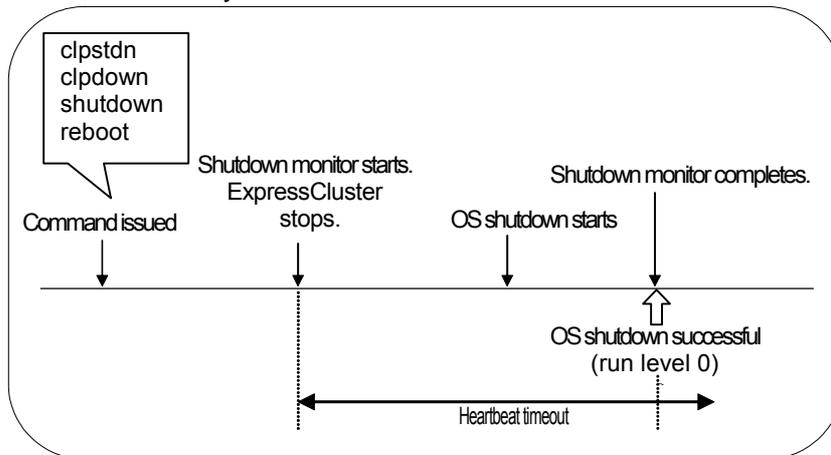
performs the shutdown monitor.

To select this, you have to specify a time for the heartbeat timeout (see Section 5.1.4 "Timeout tab".) longer than required to shut down applications and the operating system. If you use shared disks or mirror disks, it is recommended to select [On].

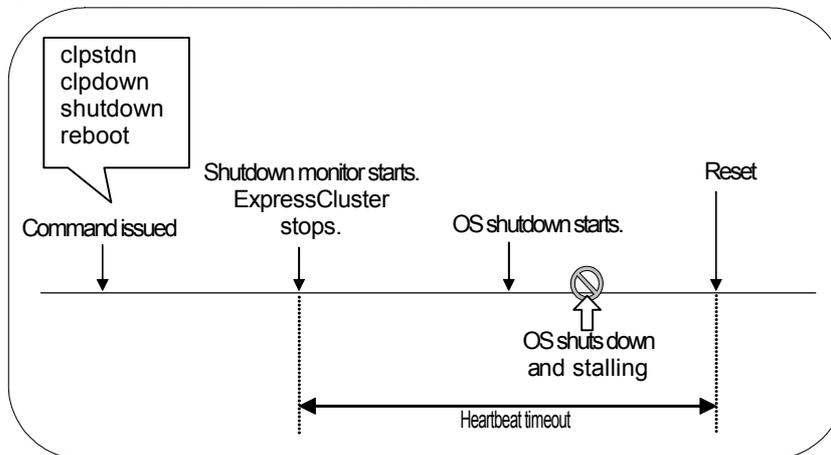
[Off]

does not perform the shutdown monitor.

* When successfully shut down:



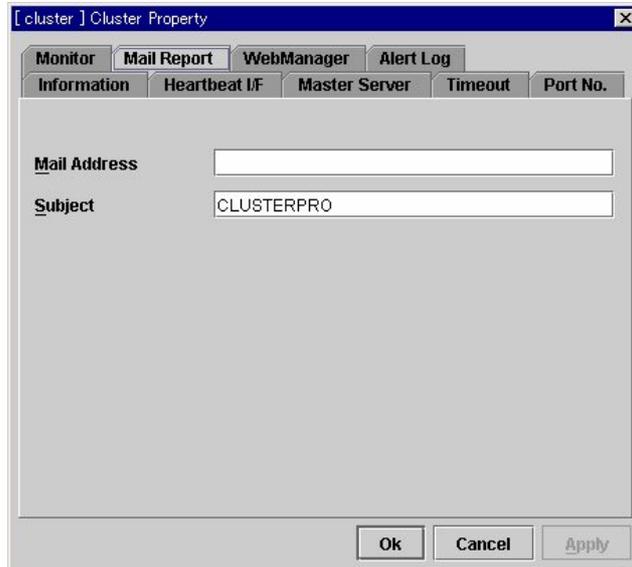
* When a shutdown stall is detected:



5.1.7 Mail Report tab

To use the Mail Report function, you have to specify the mail address.

For details about settings of report messages, see a separate guide, "Maintenance".

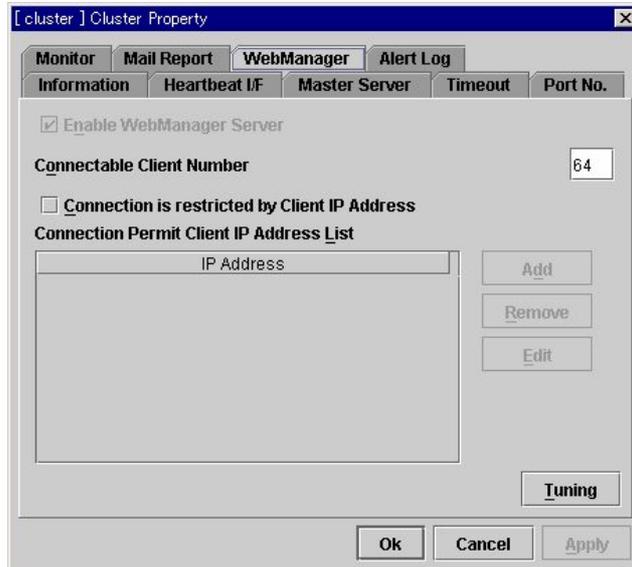


- * ExpressCluster Server uses a mail command for Mail Report function.
Before you start using this function, confirm that you can send mail to the specified mail address with the mail command.

- (1) **Mail Address (up to 255 bytes)**
Enter the mail address which the report is sent to.
- (2) **Subject (up to 127 bytes)**
Enter the subject title for the mail message.

5.1.8 Web Manager Tab

You make settings for Web Manager on this tab.



- (1) **Enable WebManager Server** **MStopRestart**
enables Web Manager Server.
[Enable WebManager Server] is always selected for this version. You cannot deselect this.
- (2) **Connectable Client Number (1 to 999)** **MStopRestart**
Specify how many client machines you allow to connect.

(3) Connection is restricted by Client IP Address **MStopRestart**

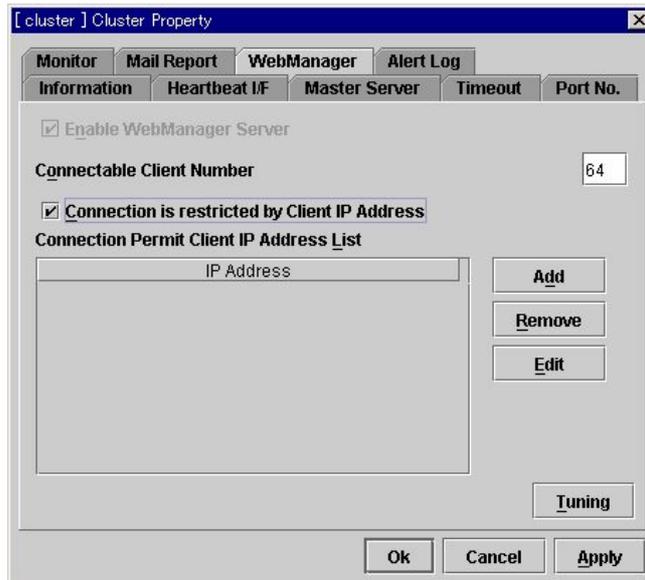
If selected, accesses are controlled by client IP addresses.

When selected:

[Add], [Remove] and [Edit] buttons are enabled.

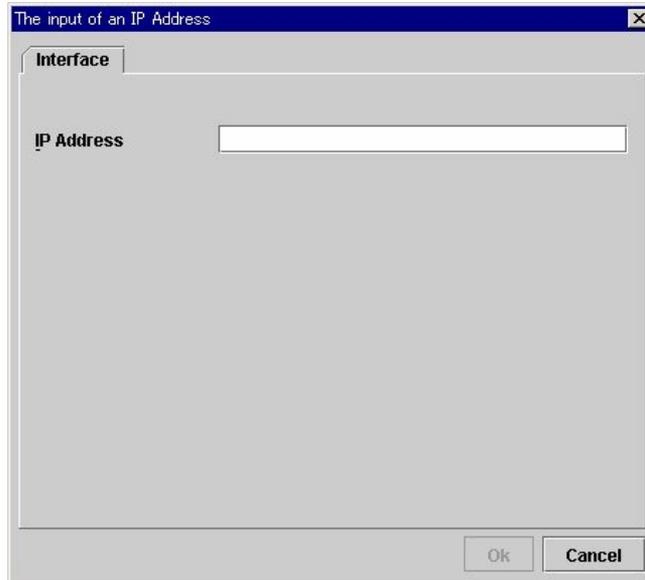
When deselected:

[Add], [Remove] and [Edit] buttons are disabled.



(4) **Add** **MStopRestart**

You use this button to add an IP address in [Connection Permit Client IP Address List]. By clicking [Add], a dialog box is displayed to enter an IP address.



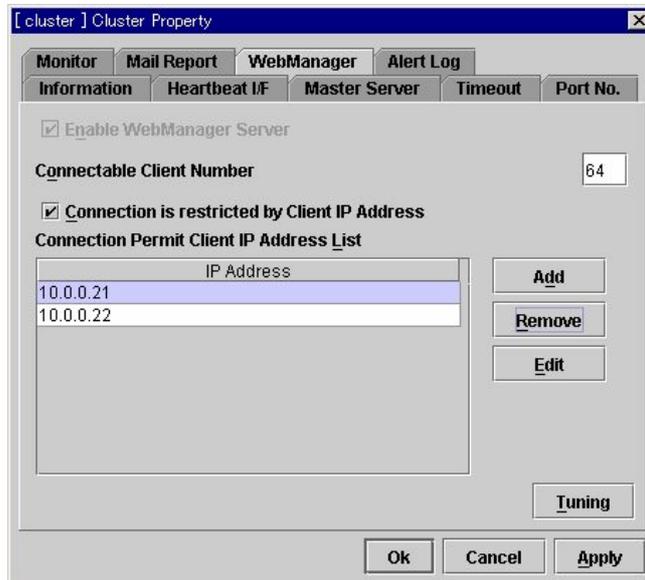
A. IP Address

You specify a client IP address you allow to access.

- To specify an IP address: 10.0.0.21
- To specify a network address: 10.0.1.0/24

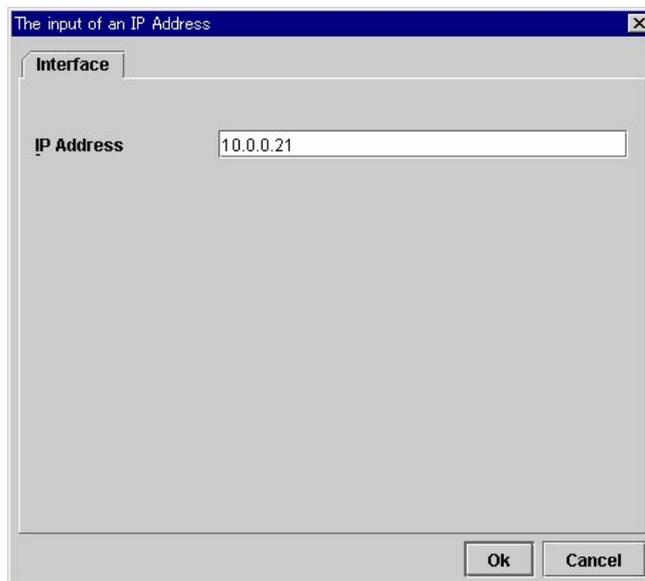
(5) **Remove** **MStopRestart**

You use this button to remove an IP address from [Connection Permit Client IP Address List]. Select an IP address you want to remove in [Connection Permit Client IP Address List]. Then, click [Remove].



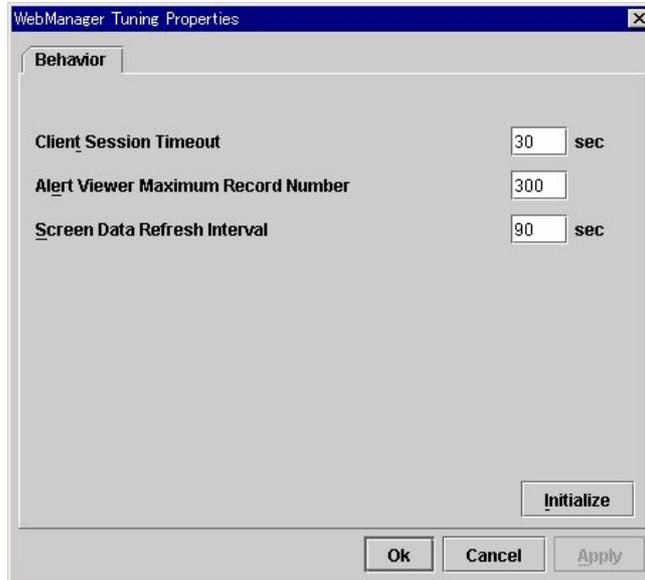
(6) **Edit** **MStopRestart**

You use this button to edit an IP address. Select an IP address you want to edit in [Connection Permit Client IP Address List]. Then, click [Edit]. You see a dialog box where the specified IP address is preset.



(7) Tune

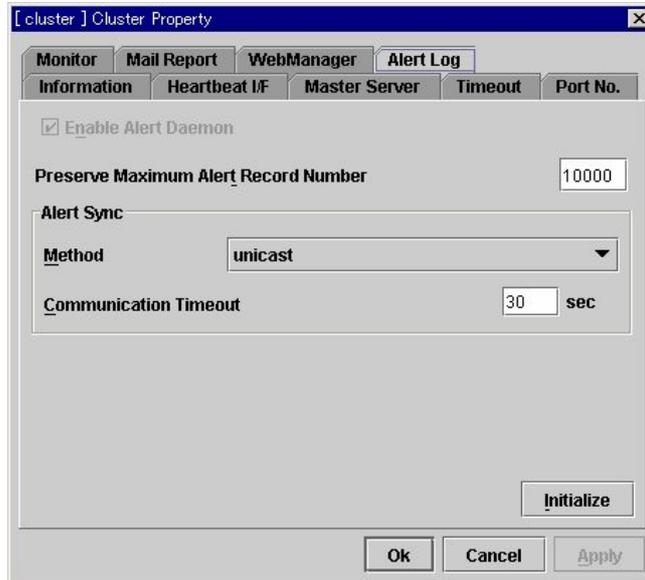
You use this button to tune Web Manager. Click [Tune]. Then, Web Manager Tuning Properties dialog box is displayed.



- A. Client session timeout (1 to 999) **MStopRestart**
Specify a client session timeout. A timeout is determined if the time specified here has elapsed after the last communication between Web Manager Server and Web Manager.
- B. Alert Viewer Maximum Record Number (1 to 999) **MStopRestart**
Specify a maximum number of alert viewer records. You can see up to this number of records in Web Manager's Alert Viewer.
- C. Screen Data Refresh Interval (0 to 999) **MStopRestart**
Specify a window refresh interval. At this time interval, Web Manager's window is refreshed.
- D. Initialize
Click this to reset all settings on this dialog to default.

5.1.9 Alert Log tab

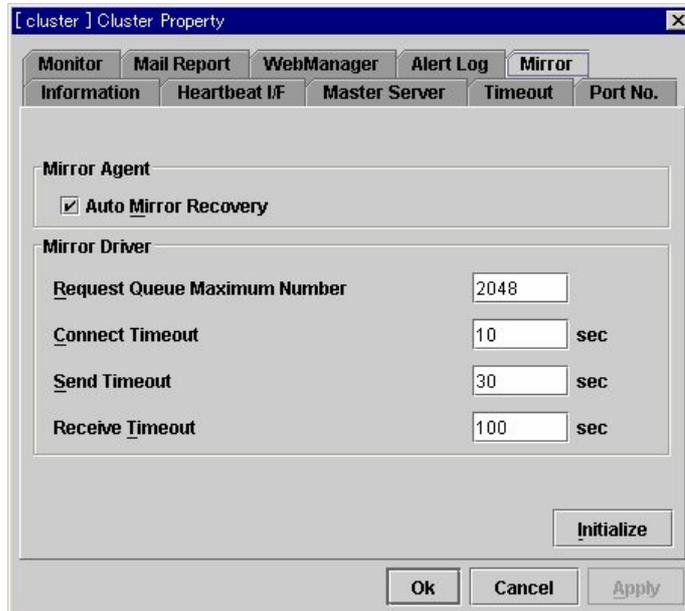
You make settings for Alert Log.



- (1) **Enable Alert Daemon** **AStopRestart**
You select if you want to start the Server's Alert daemon.
[Enable Alert Daemon] is always selected for this version. You cannot deselect this.
- (2) **Preserve Maximum Alert Record Number (1 to 99999)** **AStopRestart**
Specify a maximum number of retainable alert records. Server's Alert daemon can retain up to this number of alert messages.
- (3) **Alert synchronization: Mode** **AStopRestart**
This communication mode is used for Alert Log synchronization.
Only unicast is available in [Method] list box for this version.
- (4) **Alert synchronization: communication timeout (1 to 300)** **AStopRestart**
Specify a communication timeout. A communication timeout is determined if the time specified here has elapsed after the last communication between Alert daemon and servers.
- (5) **Initialize**
Click this to reset all settings on this tab to default.

5.1.10 Mirror Tab ~ For LE ~

You make settings for Mirror Agent and Mirror Driver.



(1) Mirror Agent

You make settings for Mirror Agent.

A. Auto Mirror Recovery

When this is selected, the mirror recovery is automatically performed if there is any difference between mirror disks on both servers.

In some cases, you cannot perform the auto-mirror recovery even if this is selected. For details, see a separate guide, "Maintenance".

When selected:

The mirror recovery is automatically performed.

When deselected:

The mirror recovery is not automatically performed.

(2) **Mirror Driver**

You make settings for Mirror Driver.

- A. Request Queue Maximum Number (256 to 65535) **ShutdownReboot**
Specify a maximum number of request queues. Mirror Disk Driver can queue up to this number of I/O requests from request issuers.
The greater this number, the better the performance, but the more the consumed physical memory.
The smaller this number, the fewer the consumed physical memory, but possibly the lower the performance.
A basic guideline is as follows;
- = You can expect a higher performance by specifying a larger number for this if the following conditions are met.
 - The server has a lot of physical memories, i.e., enough free memories.
 - Disk I/O performance is good
 - = A smaller number is recommended for this if the following conditions are met.
 - The server does not have enough physical memories.
 - Disk I/O performance is not good.
 - "alloc_pages: 0-order allocation failed (gfp=0x20/0)" is logged in syslog of the operating system.
- B. Connect timeout (5 to 99) **ShutdownReboot**
Specify a connection timeout.
- C. Send timeout (10 to 99) **ShutdownReboot**
Specify a timeout for sending data to be written.
- D. Receive timeout (30 to 500) **ShutdownReboot**
Specify a timeout for receiving a confirmation that data is written.

(3) **Initialize**

Click this to reset all settings on this tab to default.

5.2 Server

From Server properties, you add, remove and edit interfaces such as IP address and device that are used on each server in a cluster.

Make settings for the same number of interfaces (hereinafter referred to as I/F) on each server.

I/F No. represents the registration order by Trekking Tool. This is irrelevant to the number set by the OS.

* From the aspect of network environment, IP addresses have the following restrictions;

= One server cannot have more than one IP addresses that belong to the same network address.

Likewise, containment is not allowed. For example,

- IP address: 10.1.1.10, Subnet mask: 255.255.0.0

- IP address: 10.1.2.10, Subnet mask: 255.255.255.0

5.2.1 Each server's interfaces

If two or more servers are defined, Trekking Tool tries to give the same number of interfaces for each server. Click [Ok] or [Apply]. Then, Trekking Tool tries to confirm the number of interfaces, and works as follows;

(1) When an interface was added:

Trekking Tool automatically adds the interface of the same type and number to the other server(s).

On the other server(s), the settings are all blank.

(2) When an interface was removed:

The following message is displayed for confirmation.

If you have removed a public LAN interface on a server, you see the following message. If you have removed another type of interface, you see the corresponding message.



+ When [Yes] was clicked:

From the other server(s), the interface of the same type and the last number will automatically be removed so that all servers have the same number of interfaces.

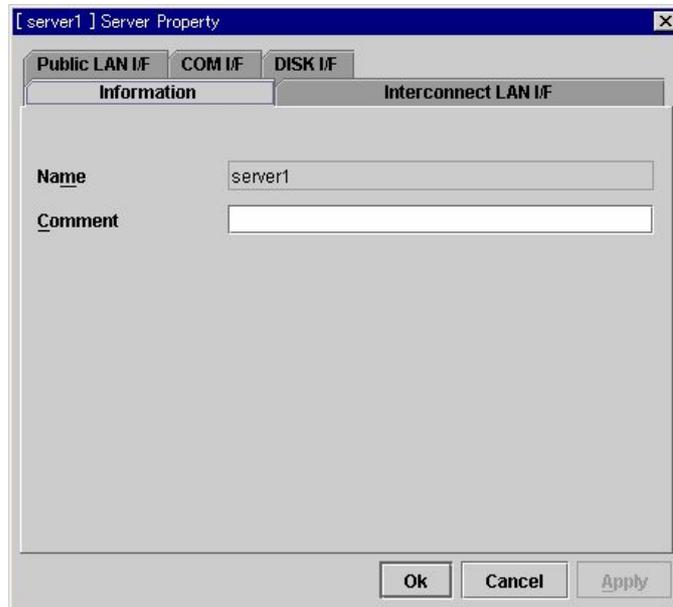
+ When [No] was clicked:

From the other server(s), the interface of the same type and the last number will not be removed.

On the server where you have removed an interface, its I/F No. will not be removed, but set to blank.

5.2.2 Information tab

You can enter or change a comment for the displayed server.



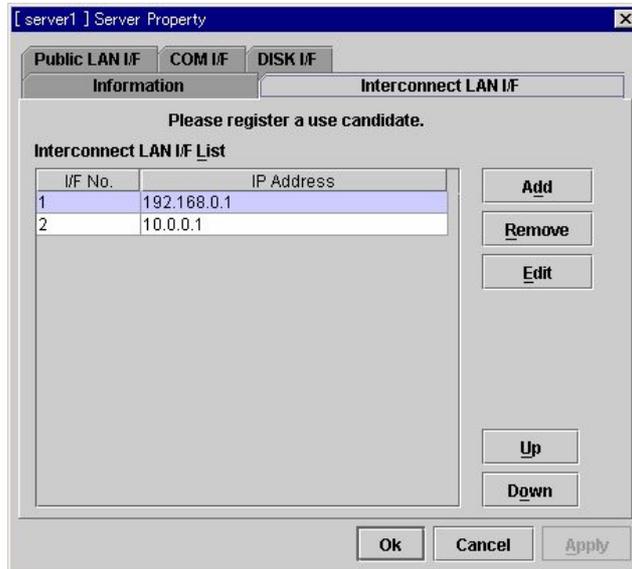
- (1) **Name**
The selected server's name is displayed.
You cannot rename this here.
- (2) **Comment (up to 127 bytes)**
You specify a comment for the above server.

5.2.3 Interconnect LAN I/F tab

You can add/remove and edit an interconnect LAN interface to be used for Interconnect LAN heartbeat.

Registered I/F No. and IP addresses are listed in [Interconnect LAN I/F List].

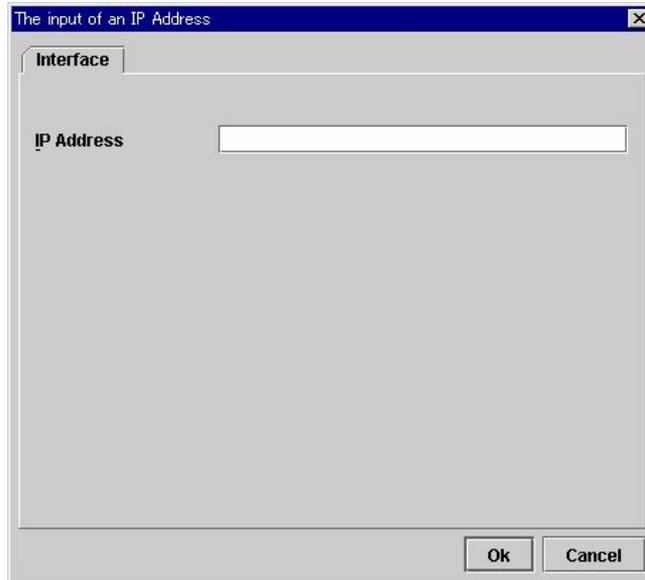
You have to specify one interconnect LAN interface or more.



For LE, see also Section 5.2.7 "Mirror Connect I/F tab ~ For LE ~".
If there are two or more Interconnect LAN interfaces, take into account the IP adders to be used for mirror disk connect interface, and specify the interconnect LAN interface.

(1) **Add** **SuspendResume**

You use this button to add an interface. Click [Add]. Then, you see a dialog box where you can enter an IP address.



- A. IP address
Enter a real IP to be used for interconnect LAN.

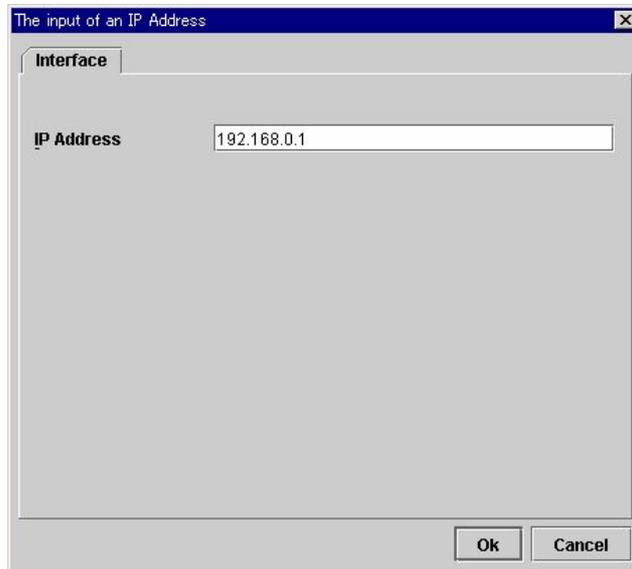
(2) **Remove** **SuspendResume**

You use this button to remove an interface. Select an interface you want to remove from the interface list. Then, click [Remove].

However, you cannot remove the I/F No. specified for the heartbeat interface. To remove it, change the heartbeat interface setting first.

(3) Edit SuspendResume

You use this button to remove an IP address. Select an interface you want to edit from the interface list. Then, click [Edit]. You see a dialog box where the selected IP address is preset and you can change it.

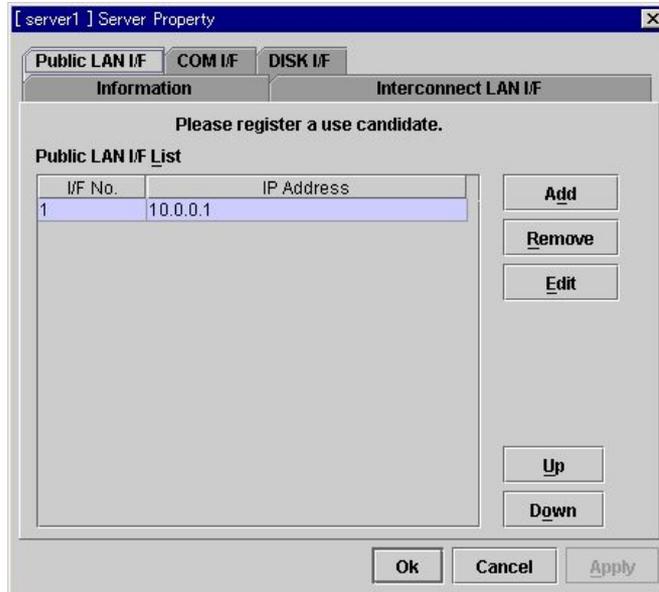


(4) [Up] & [Down] SuspendResume

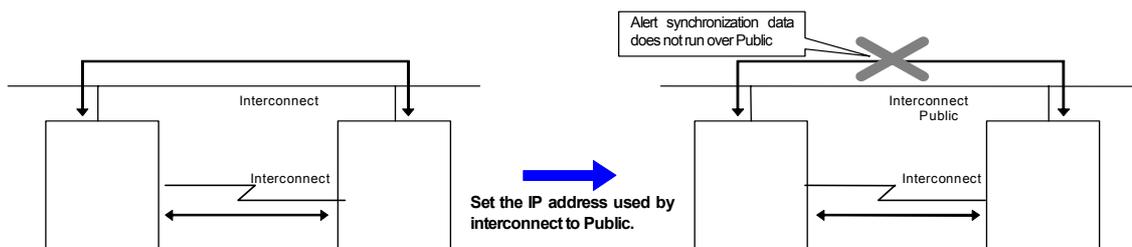
You use this button to change I/F No. Select an interface from the interface list. Click [Up] or [Down]. Then, the selected row moves accordingly.

5.2.4 Public LAN I/F Tab

You can add/remove and edit a public LAN interface
Registered I/F No. and IP addresses are listed in [Public LAN I/F List].

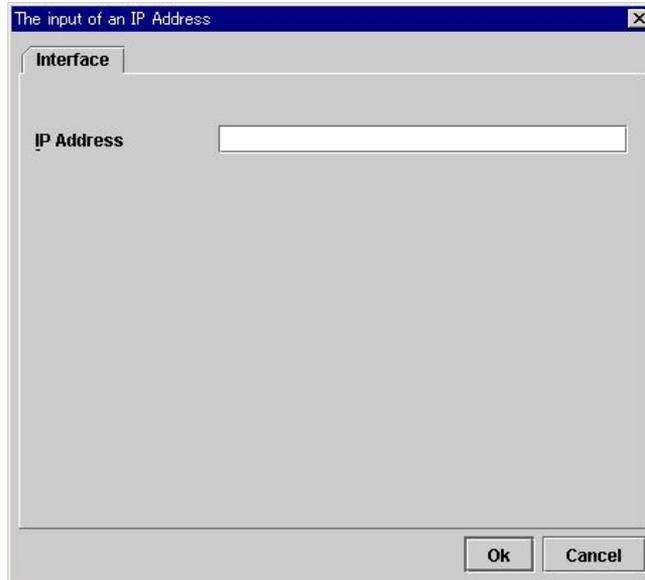


- * The alert synchronization communication data is circulated through interfaces that are not registered in the public LAN interface. Take into account the network traffics.
- * You can specify the same IP address for both interconnect LAN and public LAN interfaces. However, if you do so, the alert synchronization communication data cannot run.



(1) **Add** **SuspendResume**

You use this button to add an interface. Click [Add]. Then, you see a dialog box where you can enter an IP address.



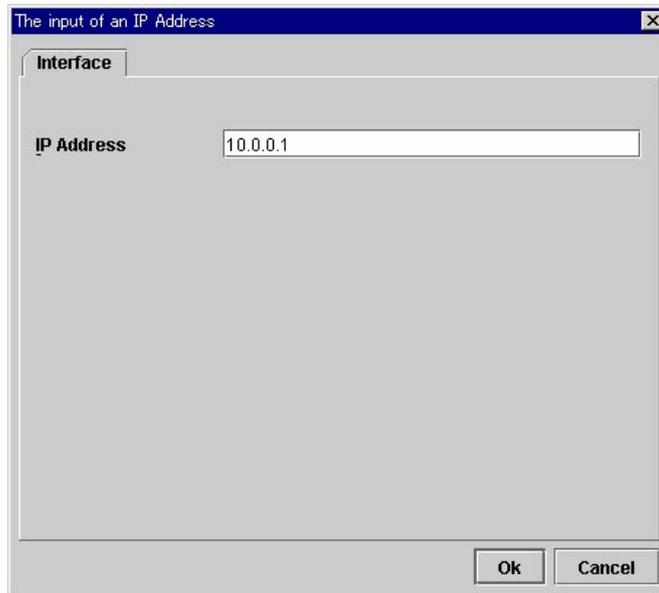
- A. IP address
Enter a real IP to be used for the public LAN.

(2) **Remove** **SuspendResume**

You use this button to remove an interface. Select an interface you want to remove from the interface list. Then, click [Remove].

(3) **Edit** **SuspendResume**

You use this button to remove an IP address. Select an interface you want to edit from the interface list. Then, click [Edit]. You see a dialog box where the selected IP address is preset and you can change it

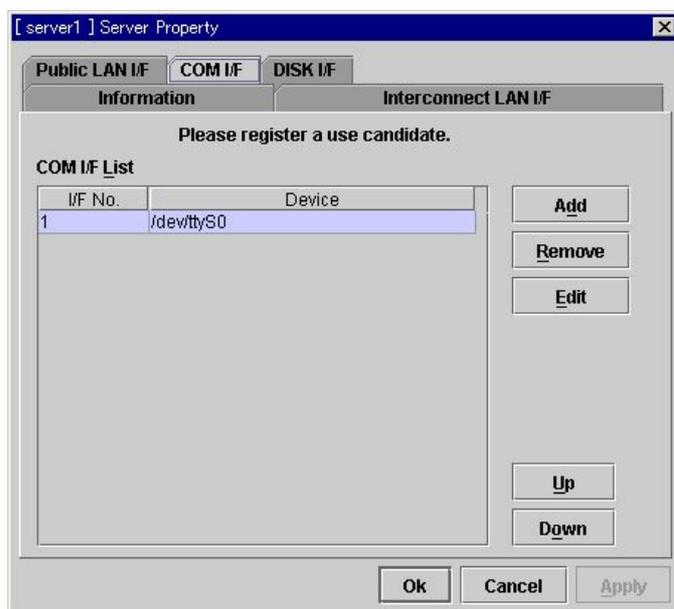


(4) **[Up] & [Down]** **SuspendResume**

You use this button to change I/F No. Select an interface from the interface list. Click [Up] or [Down]. Then, the selected row moves accordingly.

5.2.5 COM I/F tab

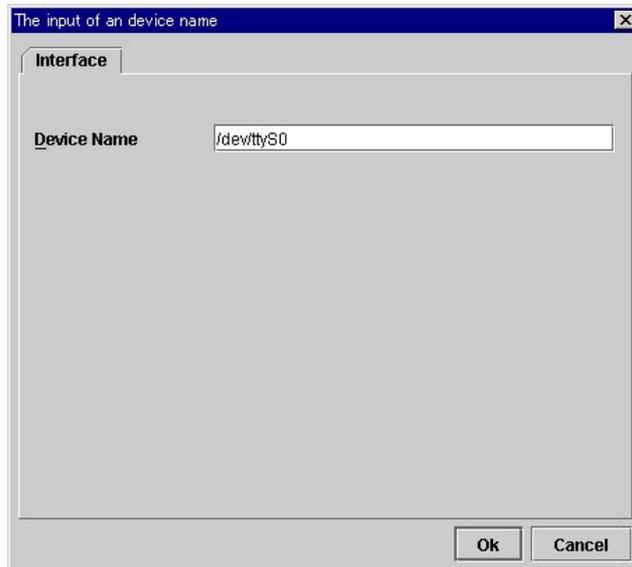
You can add/remove and edit a COM interface to be used for COM heartbeat. Registered I/F No. and devices are listed in [COM I/F List]. This is used for 2-node cluster (except for XE).



(1) **Add** **SuspendResume**

You use this button to add an interface. Click [Add]. Then, you see a dialog box where you can enter a COM device.

The default device name is preset.



A. Device Name (up to 1023 bytes)

Enter a real device name for the COM port. You cannot register a device name that has been registered in [COM I/F List].

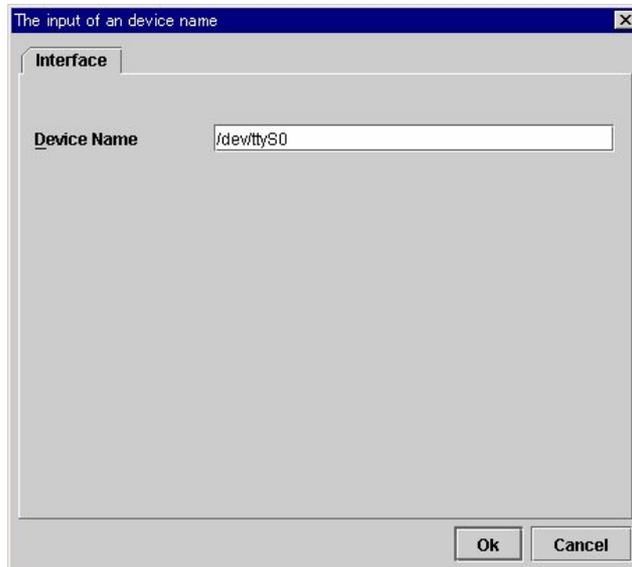
The name should begin with "/".

(2) **Remove** **SuspendResume**

You use this to edit a device. Select a device you want to edit from the interface list. Click [Edit]. You see a dialog box where the name of selected COM device is preset and you can change it.

(3) Edit SuspendResume

You use this to edit a device. Select a device you want to edit from the interface list. Click [Edit]. You see a dialog box where the name of selected COM device is preset and you can change it.

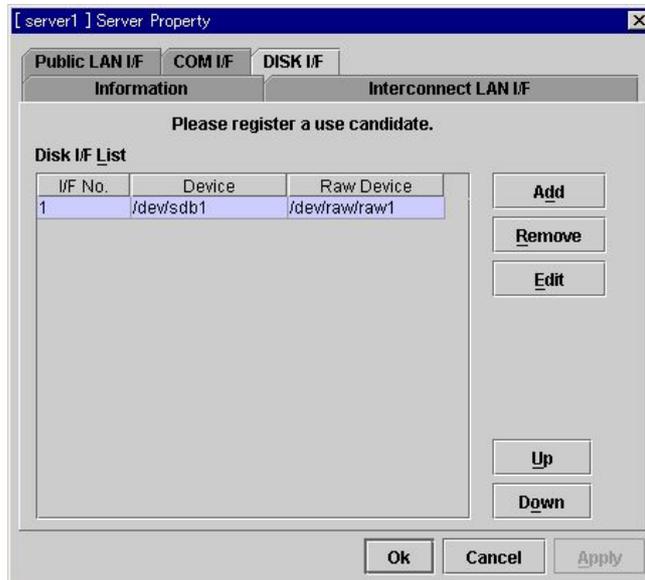


(4) [Up] & [Down] SuspendResume

You use this button to change I/F No. Select an interface from the interface list. Click [Up] or [Down]. Then, the selected row moves accordingly.

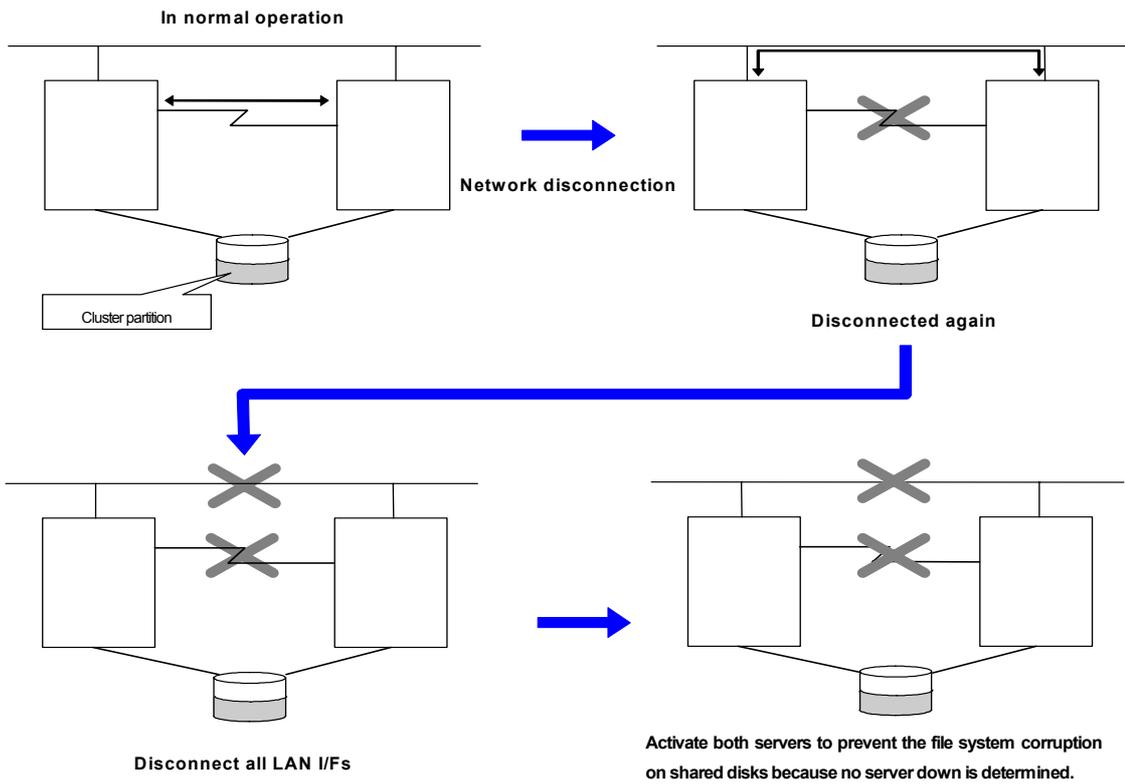
5.2.6 Disk I/F tab ~ For SE and XE ~

You can add/remove and edit a disk interface to be used for the disk heartbeat. Registered I/F No., device names and Raw devices are listed in [Disk I/F List].



* CLUSTER partition:

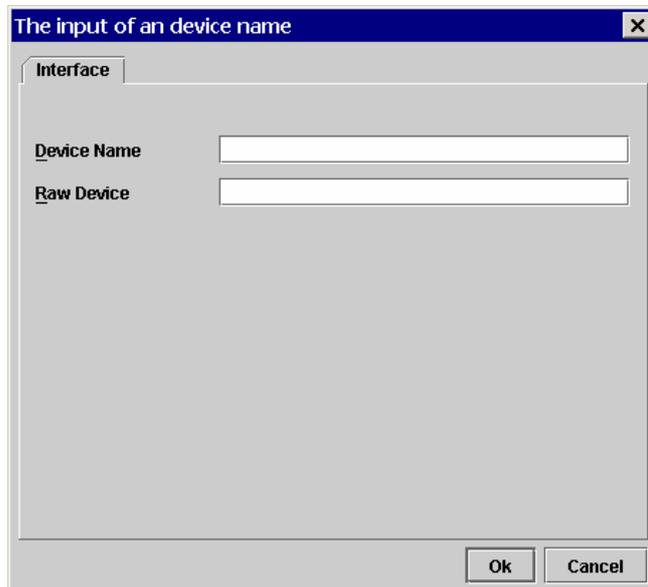
- + To use the disk heartbeat, so-called CLUSTER partitions are required on shared disks.
- + Allocate one CLUSTER partition for each LUN.
- + You do not need to make the file system for CLUSTER partition.
- + Make settings so that all servers can access the same area with the same device name.



If you use shared disks, it is recommended to use the LAN interface mode heartbeat and the disk interface mode heartbeat by CLUSTER partition at the same time.

(1) **Add** **SuspendResume**

You use this button to add an interface. Click [Add]. Then, you see a dialog box where you can enter a disk device.



A. Device Name (up to 1023 bytes)

Enter a real device name for the partition device to be used for the disk heartbeat on shared disks.

You cannot use the partition device you specify here for disk resources.

The name should begin with "/".

B. Raw Device (up to 1023 bytes)

Enter a device name for raw accessing. ExpressCluster uses this, associating this with the real device name.

You cannot register a Raw device that has been registered in [Disk I/F List], [Raw Resource], [Raw Monitor Resource] or [VxVM Volume Resource].

For details of the Raw device of VxVM volume resource, see a separate guide, "Resource Details".

If you use an application that uses a Raw device such as database, be careful that Raw devices do not collide.

The name should begin with "/".

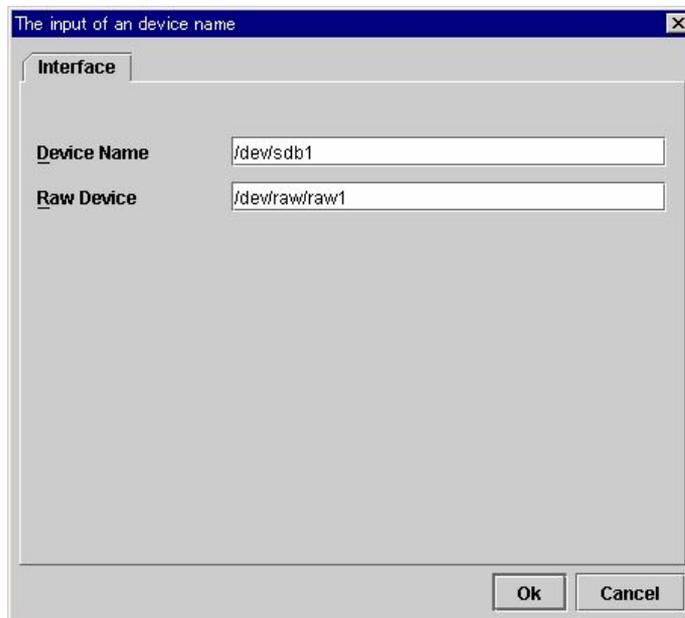
(2) **Remove** **SuspendResume**

You use this button to remove an interface. Select an interface you want to remove from the interface list. Then, click [Remove].

However, you cannot remove the I/F No. specified for the heartbeat interface. To remove it, change the heartbeat interface setting first.

(3) Edit SuspendResume

You use this to edit a device or Raw device. Select a device or Raw device you want to edit from the interface list. Click [Edit]. Then, you see a disk device dialog box where the selected device name and Raw device are preset and you can change them.



(4) [Up] & [Down] SuspendResume

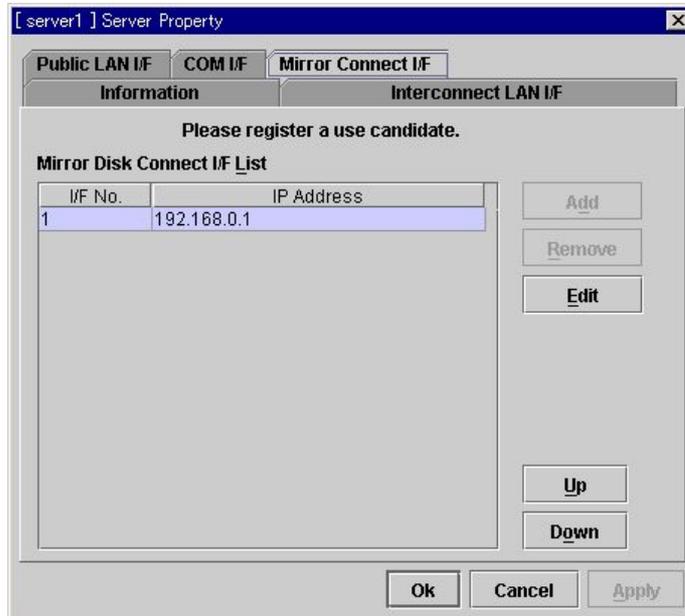
You use this button to change I/F No. Select an interface from the interface list. Click [Up] or [Down]. Then, the selected row moves accordingly.

5.2.7 Mirror Connect I/F tab ~ For LE ~

You can add/remove and edit a mirror disk connect interface.

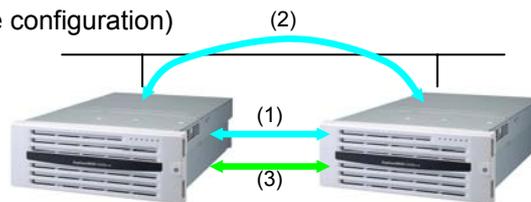
Registered I/F No. and IP addresses are listed in the Mirror Disk Connect I/F List.

You have to specify a mirror disk connect interface.



- * Specify the IP address of interconnect dedicated LAN heartbeat.
- * If there are two or more Interconnect dedicated LAN heartbeats, specify the IP address of any other interconnect dedicated LAN heartbeat than the first one.

(Sample configuration)



(1), (2) and (3) correspond to the heartbeat I/F orders, 1, 2, and 3.

Order	Type	I/F No.
1	LAN	1
2	LAN	2
3	LAN	3
4	COM	1

(Heartbeat I/F tab in Cluster Property)

Interconnect dedicated LAN heartbeat

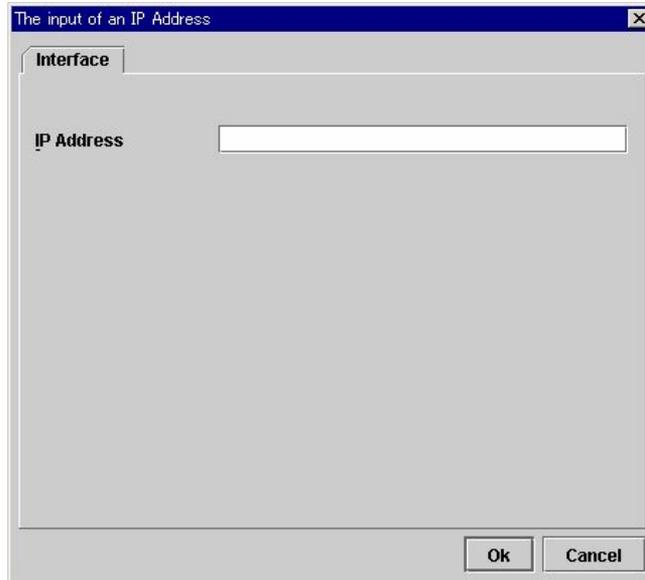
Public LAN heartbeat, too

Interconnect dedicated LAN heartbeat

Set this LAN to the mirror disk connect I/F.

(1) **Add** **ShutdownReboot**

You use this button to add an interface. Click [Add]. Then, you see a dialog box where you can enter an IP address.



- A. IP address
Enter a real IP to be used for mirror disk connect.

(2) **Remove** **ShutdownReboot**

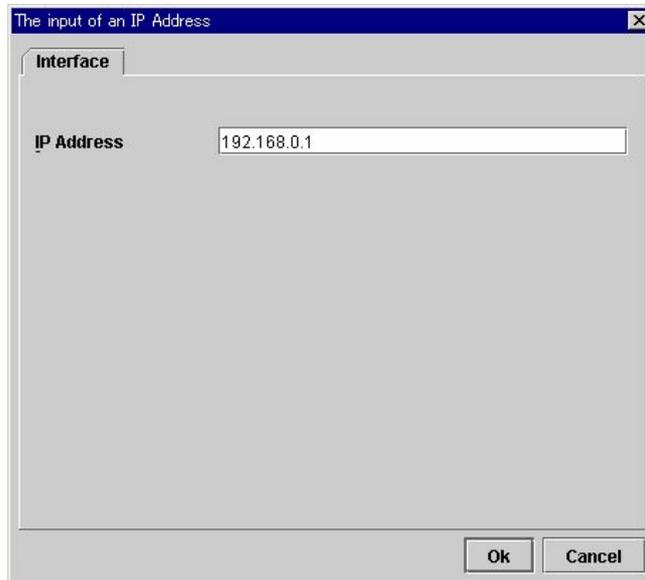
You use this button to remove an interface. Select an interface you want to remove from the interface list. Then, click [Remove].

However, you cannot remove an I/F No. if it is set for mirror disk resources. To remove such an I/F No., remove its mirror disk resources first.

You cannot remove an I/F No. either if it is set for the mirror disk connect interface of mirror disk connect monitor resource. To remove such an I/F No., first change its mirror disk connect interface setting of mirror disk connect monitor resource.

(3) **Edit** **ShutdownReboot**

You use this button to remove an IP address. Select an interface you want to edit from the interface list. Then, click [Edit]. You see a dialog box where the selected IP address is preset and you can change it



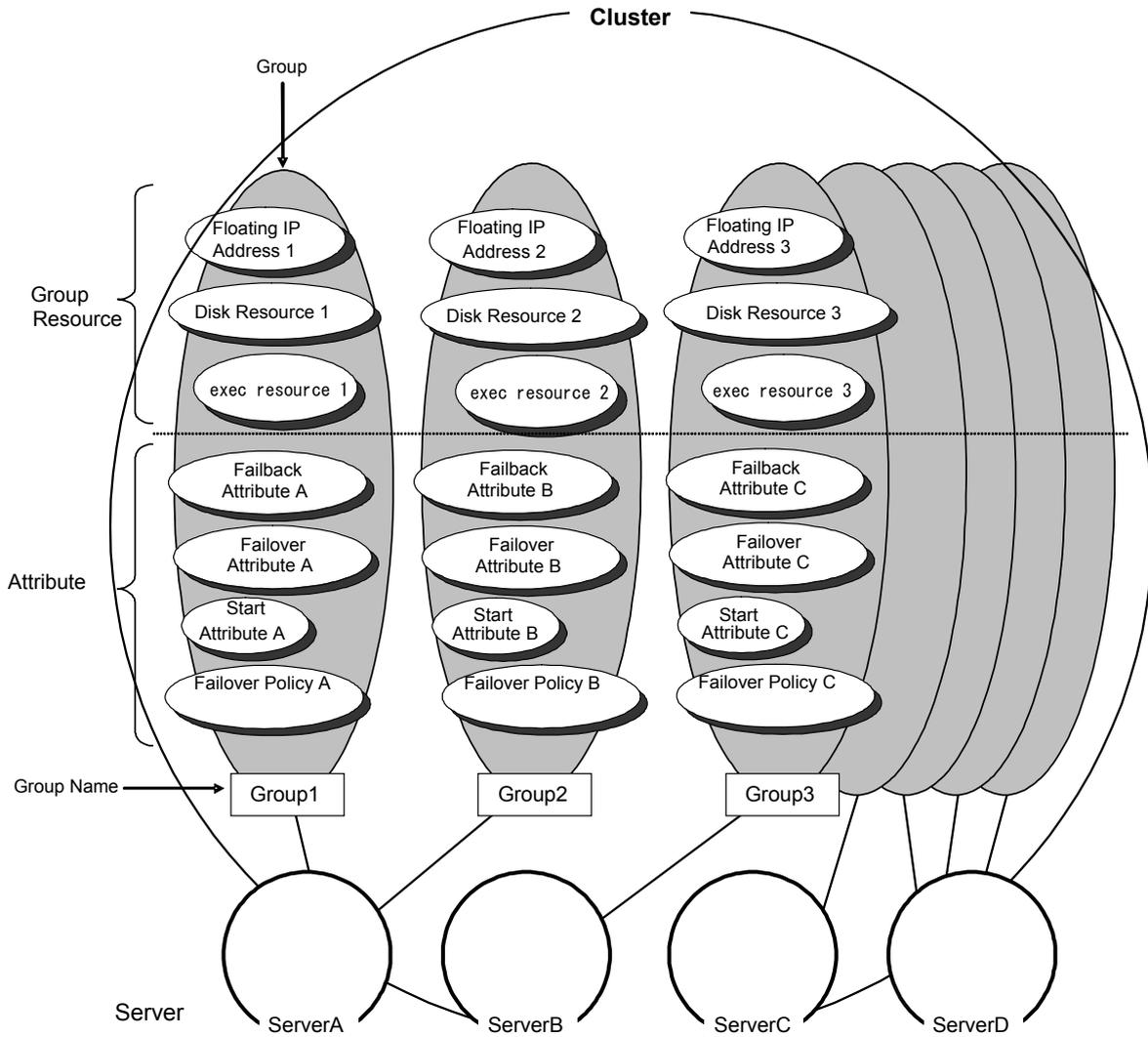
(4) **[Up] & [Down]** **ShutdownReboot**

You use this button to change I/F No. Select an interface from the interface list. Click [Up] or [Down]. Then, the selected row moves accordingly.

5.3 Group

A group is a set of resources required to perform an independent business service in a cluster system. This is also the unit of failover.

A group has its group name, group resources, and attributes.



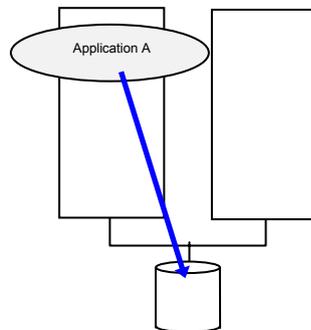
Each group's resources are handled a set of group. Namely, if a failover occurs in Group1 that has Disk resource1 and Floating IP address1, Disk resource1 and Floating IP address1 fails over (it never happens that only Disk resources1 fails over).

Likewise, Disk resources1 is never contained in other group (for example, Group2).

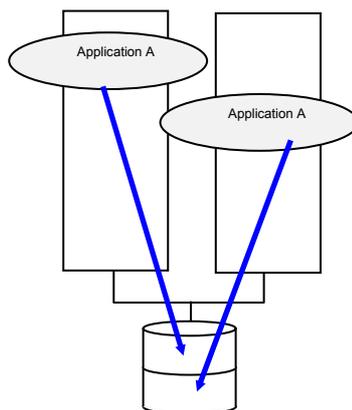
5.3.1 Operation style

ExpressCluster supports the following operation styles;

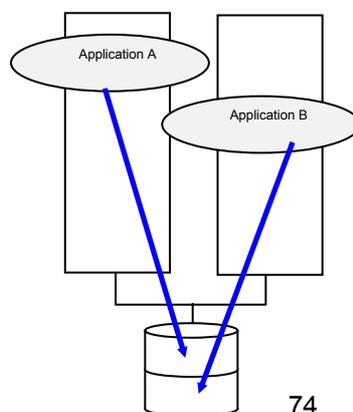
- * Uni-directional standby cluster
In this operation style, only one business application runs on a cluster system.



- * The same application multi-directional standby cluster
In this operation style, the same business applications run simultaneously on a cluster system.



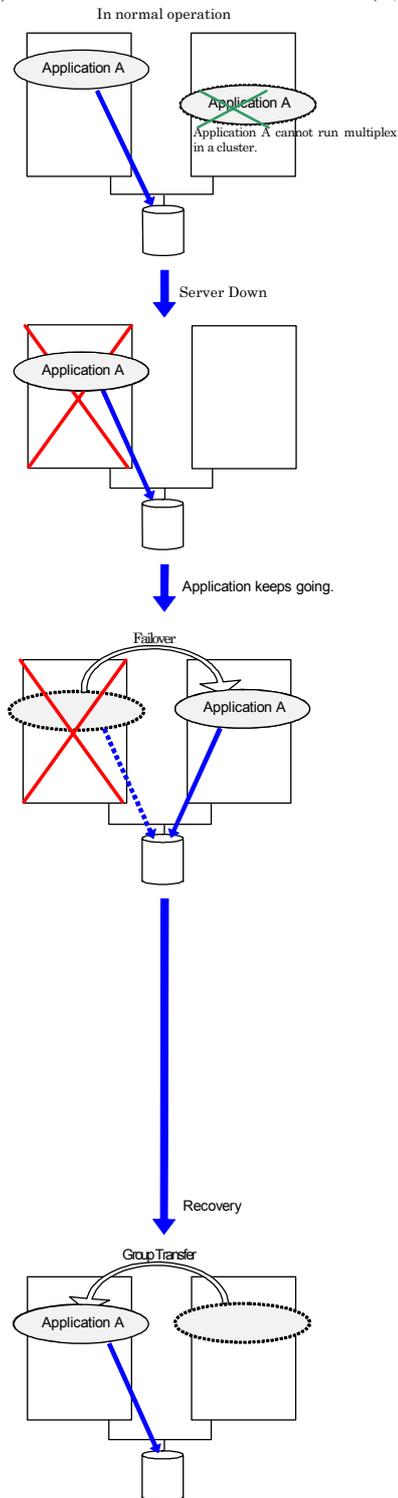
- * Different application multi-directional standby cluster
In this operation style, different business applications run on different servers for each. They stand by each other.



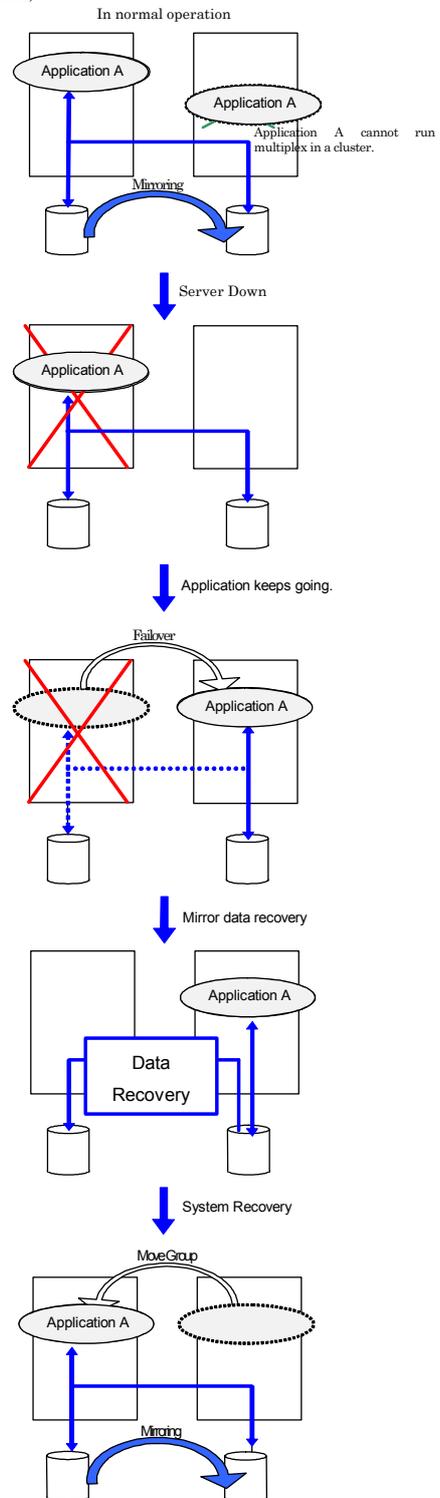
(1) Uni-directional standby cluster

On a uni-directional standby cluster system, the number of groups for a business application is limited to one.

(For SE)



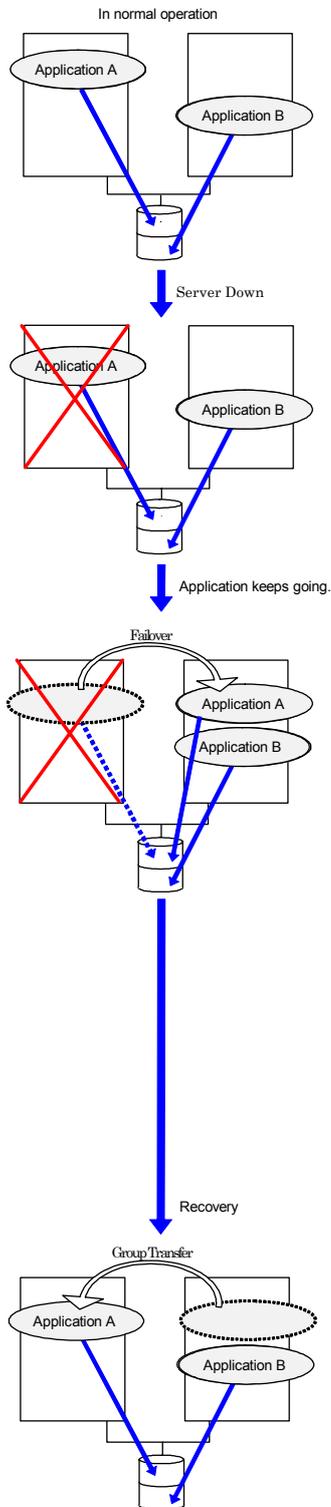
(For LE)



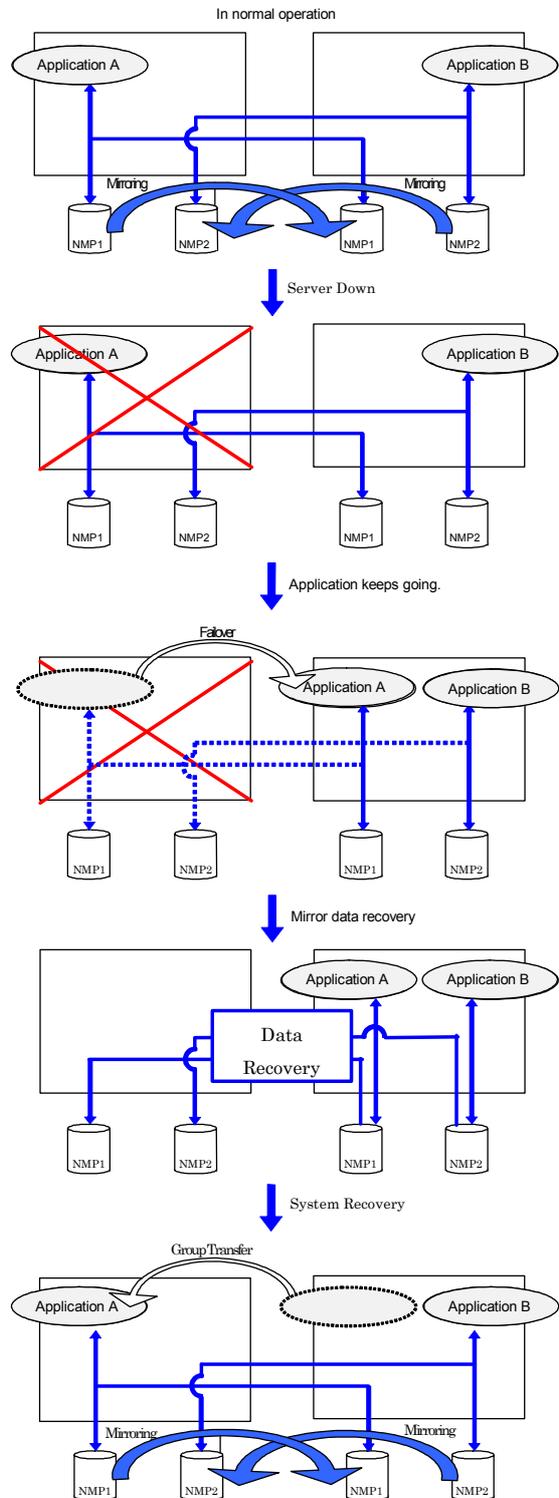
(2) Multi-directional standby cluster

On a multi-directional standby cluster system, a business application can simultaneously run on two or more servers.

(For SE)



(For LE)



5.3.2 Failover policy

Failover policy contains a list of servers where groups can failover to and their failover priorities. The followings describe how servers behave differently depending on failover policies when a failover occurs.

<Legends and meanings>

Server Status	Description
o	Normal Status (properly working as a part of cluster)
x	Stopped (Cluster is off.)

In 3-node configuration:

Group	Failover Policy		
	Priority 1 Server		Priority 1 Server
A	Server 1	A	Server 1
B	Server 2	B	Server 2

In 2-node configuration:

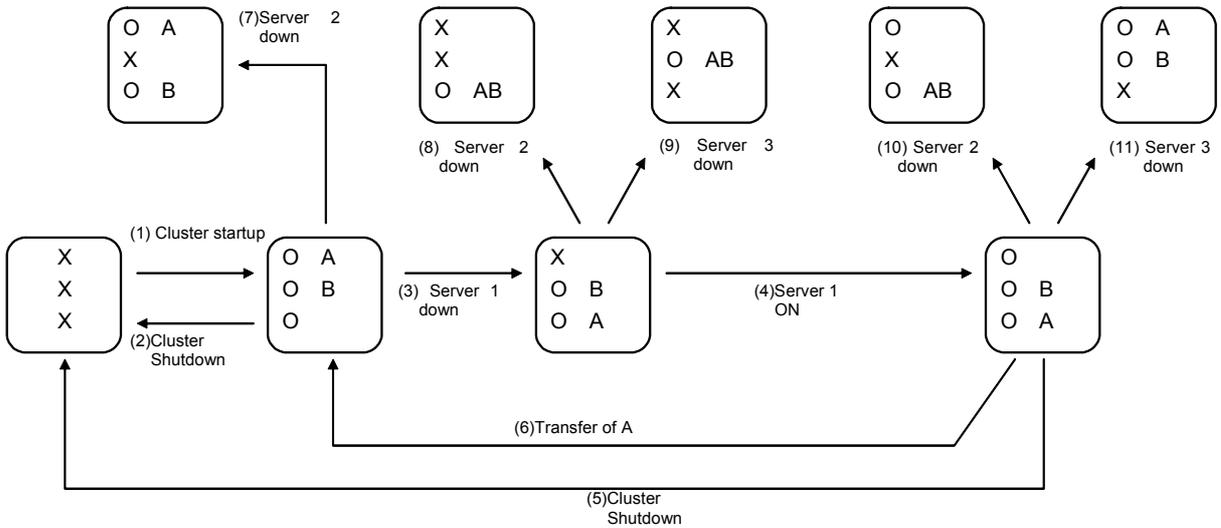
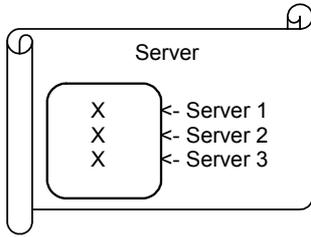
	Failover Policy	
	Priority 1 Server	
A	Server 1	A
B	Server 2	B

It is assumed that the group startup attribute is set to the auto-startup and the auto failback attribute is set to the manual failback for A and B.

- * If groups of different failover exclusive attributes coexist in a cluster, they do not interfere with each other. For example, a group of full exclusive attribute may start on a server where another group of off exclusive attribute is active, and vice versa.
- * For groups whose failover exclusive attribute is Normal or Full Exclusive, the server which they start up on or fail over to is determined based on the failover priority to the server. If a group has two or more servers of the same failover priority, it is determined in alphanumerical order of group name.
- * Based on the priorities of servers themselves, the failover priorities are given to Web Manager group. You specify servers' priorities in Master Server tab of Cluster properties.

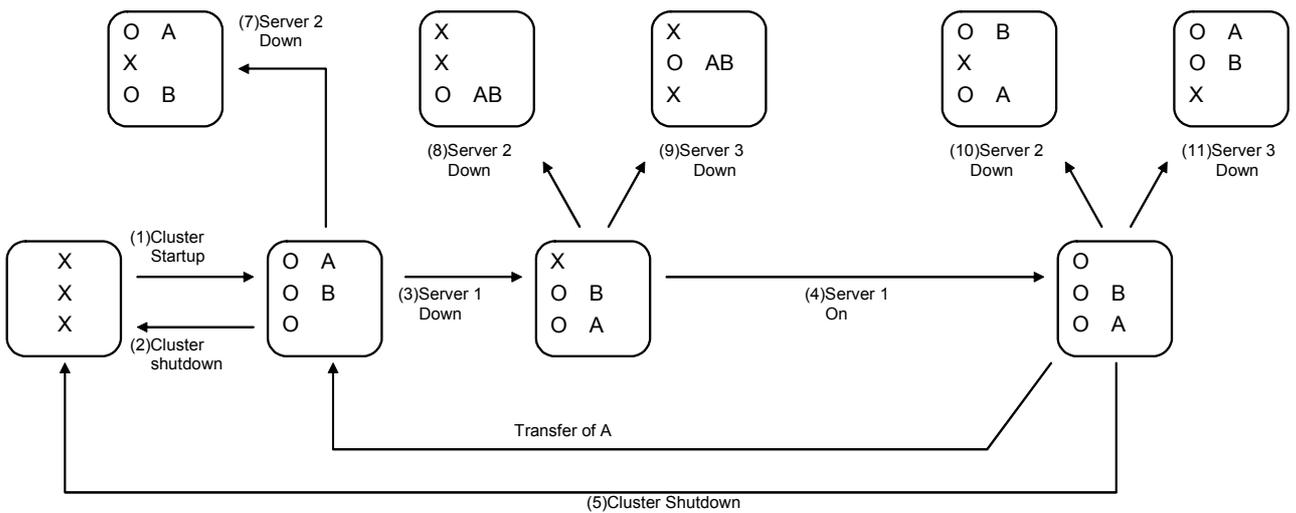
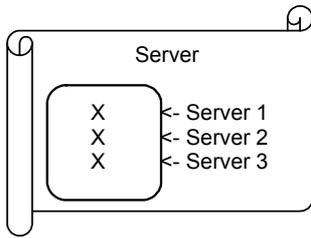
5.3.2.1 For SE and XE

(1) If the failover exclusive attribute is set to Off for groups A and B



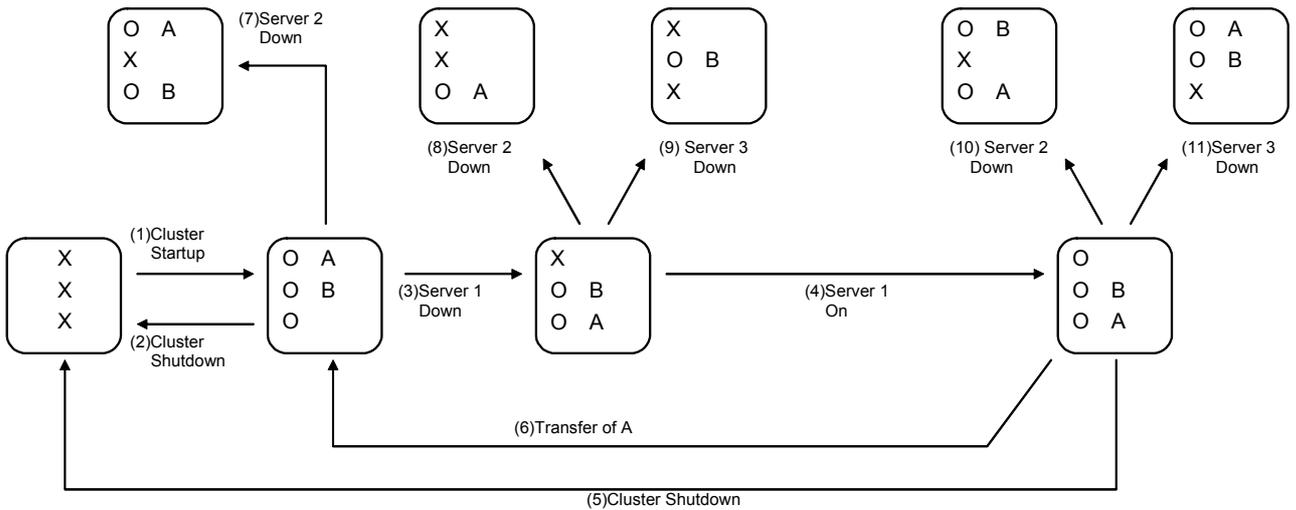
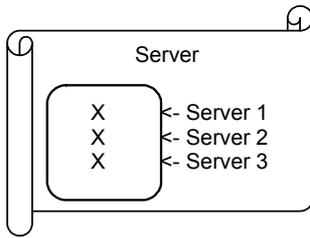
1. Cluster Startup
2. Cluster Shutdown
3. Server 1 Down : Fails over to the next priority server.
4. Server 1 Power On
5. Cluster Shutdown
6. Migration of group A
7. Server 2 Down : Fails over to the next priority server.
8. Server 2 Down : Fails over to the next priority server.
9. Server 3 Down : Fails over to the next priority server.
10. Server 2 Down : Fails over to the next priority server.
11. Server 2 Down : Fails over to the next priority server.

(2) If the failover exclusive attribute is set to Normal for groups A and B



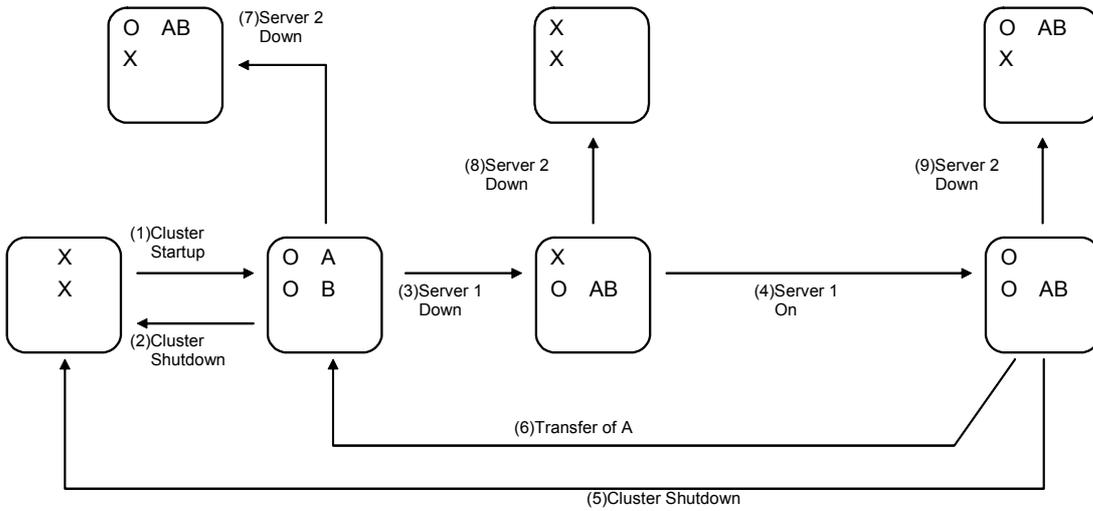
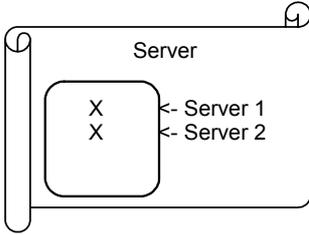
1. Cluster startup
2. Cluster shutdown
3. Server 1 Down : Fails over to the server where a Normal Exclusive group is not active.
4. Server 1 Power On
5. Cluster shutdown
6. Migration of group A
7. Server 2 Down : Fails over to the server where a Normal Exclusive group is not active.
8. Server 2 Down : Fails over because a server can start even though one or more Normal Exclusive group is active on all servers.
9. Server 3 Down : Fails over because a server can start even though one or more Normal Exclusive group is active on all servers.
10. Server 2 Down : Fails over to the server where a Normal Exclusive group is not active.
11. Server 3 Down : Fails over to the server where a Normal Exclusive group is not active.

(3) If the failover exclusive attribute is set to Full for groups A and B



1. Cluster Startup
2. Cluster Shutdown
3. Server1 Down : Fails over to a server where no group of full exclusive is active.
4. Server 1 Power On
5. Cluster Shutdown
6. Migration of group A
7. Server 2 Down : Fails over to a server where no group of full exclusive is active.
8. Server 2 Down : Not fails over (groupB becomes inactive).
9. Server 3 Down : Not fails over (groupA becomes inactive).
10. Server 2 Down : Fails over to a server where no group of full exclusive is active.
11. Server 3 Down : Fails over to a server where no group of full exclusive is active.

5.3.2.2 For LE (including SE and XE of 2-server configuration)
(1) If the failover exclusive attribute is set to Off for groups A and B



1. Cluster Startup
2. Cluster Shutdown
3. Server1 Down : Fails over to groupA's standby server.
4. Server 1 Power On
5. Cluster Shutdown
6. Migration of group A
7. Server 2 Down : Fails over to groupB's standby server.
8. Server 2 Down
9. Server 2 Down : Fails over to a standby server.

5.3.3 Application

If an application supports clustering, when a “failover” or “group’s migration” occurs, you can restart it with a script on the other server. However, it is prerequisite that the application of the same revision is installed on all servers in the failover policy. Also, the application’s data to be ongoingly used should be able stored in shared disks or mirror disks.

To run an application in ExpressCluster environment, it should satisfy other conditions, too. For details, see Section 8.2 “Applications in ExpressCluster Environment”.

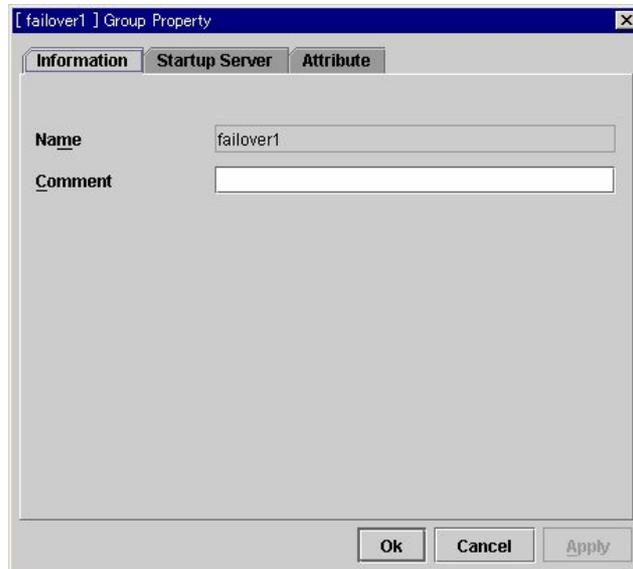
5.3.4 Failover factors

The main causes of failover are listed below.

- * Server shutdown
- * Power down
- * OS panics
- * OS stalling
- * ExpressCluster daemon error
- * Activation or deactivation failure of a group resource
- * Abnormality detection by Monitor Resource

5.3.5 Information tab

You can view the group name, and enter/change a comment for this group.



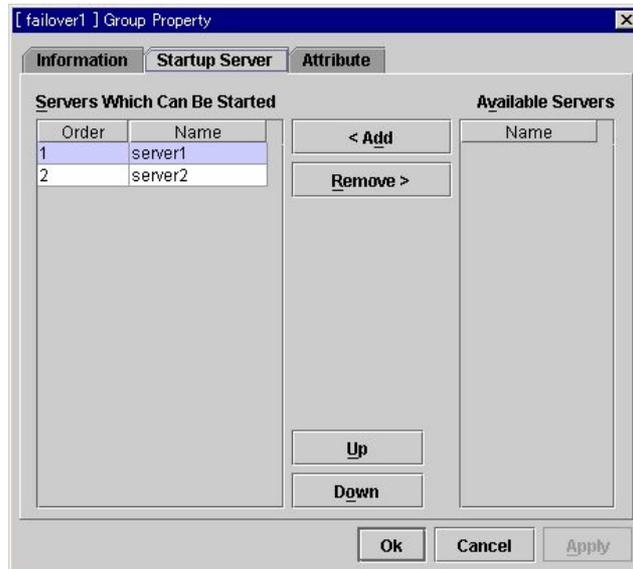
- (1) **Name**
The group name is displayed.
You cannot rename this here.
- (2) **Comment (up to 127 bytes)**
You enter a comment for the above group.

5.3.6 Startup Server tab

You make settings for startup servers.

“Servers Which Can Be Started” lists the servers where the group can start up and their priorities. The smaller the number in “Order” is, the higher priority the server has.

“Available Servers” lists servers which can be registered in “Servers Which Can Be Started”.



(1) **Add** **SuspendResume**

You use this button to add a server on which the group can start up. Select a server you want to add from “Available Servers”. Click [Add]. Then, the server is added to “Servers Which Can Be Started”.

(2) **Remove** **SuspendResume**

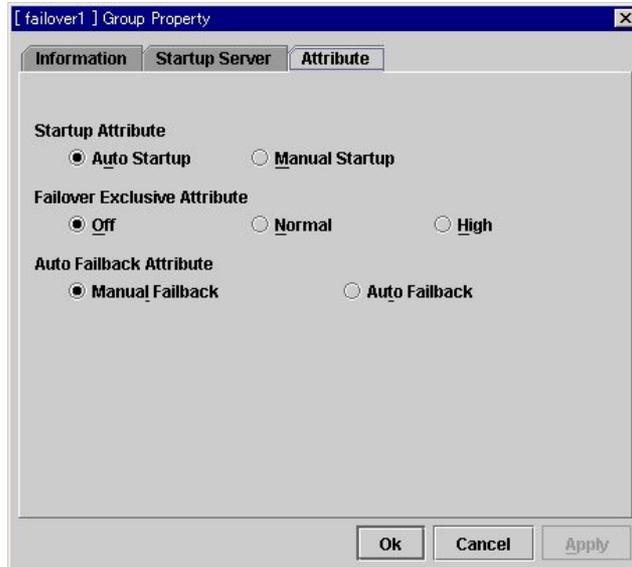
You use this button to remove a server on which the group can start up. Select a server you want to remove from [Servers Which Can Be Started]. Click [Remove]. Then, the server is added to “Available Servers”.

(3) **[Up] & [Down]** **SuspendResume**

Click this to change the priority of a selected “Servers Which Can Be Started”. Select a server you want to change its priority from [Servers Which Can Be Started]. Click [Up] or [Down]. Then, the selected row moves accordingly.

5.3.7 Attributes tab

You specify attributes of group startup, failover, and failback for this group.



(1) Group Startup Attribute **SuspendResume**

You select how to start up the group: to automatically start it up by ExpressCluster at cluster startup (auto-startup) or by user operations from Web Manager or with the clpgrp command (manual startup).

- A. Auto Startup
The group will automatically be started (become active) at the cluster startup.
- B. Manual Startup
The group will not be started (stay inactive) at the cluster startup.
It is started (become active) by user's explicit operation from Web Manager or with the clpgrp command.

(2) Failover Exclusive Attribute **SuspendResume**

This attribute determines the server to which ExpressCluster automatically moves the group at failover. You can select from Off, Normal Exclusive, and Full Exclusive.

A. Off

This is always the top priority server. Multiple groups may be started up at the same server.

B. Normal Exclusive

This is the top priority server among servers where no group of Normal Exclusive is active. If there is no server where no group of Normal Exclusive is active, the group fails over to the top priority server. Multiple groups may be started up at the same server.

C. Full Exclusive

This is the top priority server among servers where no group of Full Exclusive is active. If there is no server where no group of Full Exclusive is active, the group does not failover. More than one group of Full Exclusive cannot start on the same server.

It is not recommended to specify this in 2-server cluster systems (In 2-server configurations, failovers do not occur in many cases).

(3) Auto Failback Attribute **SuspendResume**

You select whether to automatically failback the group if a server of higher priority than another server where the group is active is started.

For groups that have mirror disk resources, set here to manual failback.

A. Manual failback

Failback is not automatically performed.

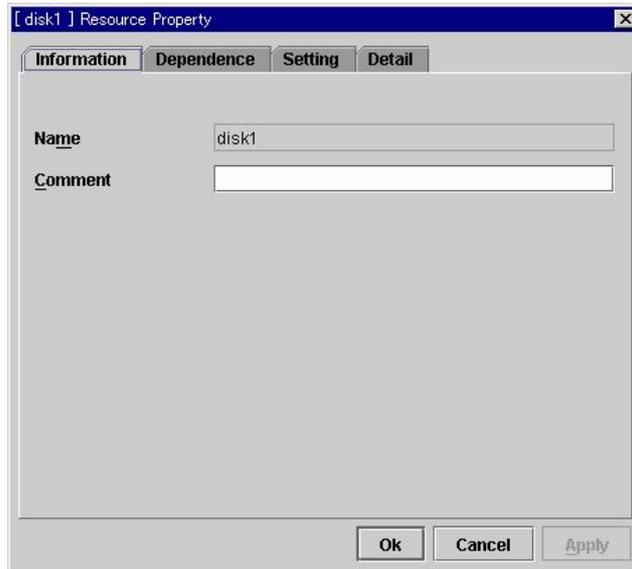
B. Auto-failback

Failback is automatically performed.

5.4 Group Resource

On the group resource properties, you can view/change group resource settings.

5.4.1 Information tab (common to group resources)



- (1) **Name**
The group resource name is displayed.
You cannot rename this here.
- (2) **Comment (up to 127 bytes)**
You enter a comment for the above group resource.

5.4.2 Dependency tab (common to group resources)

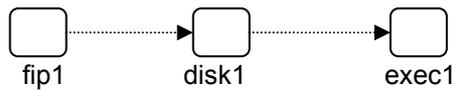
By specifying dependencies among group resources, you can specify the order to activate them.

- * If dependencies are specified for group resources:
 - + To activate a group resource whose properties are displayed, the activation process starts for it when its “Depend on this resource” have been activated.
 - + To deactivate a group resource whose properties are displayed, the deactivation process starts for its “Depend on this resource” when it has been deactivated.

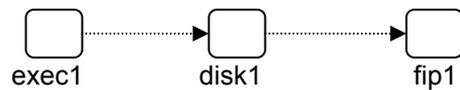
For example, the depths of dependencies of resources for a group are listed.

Resource List		Whole Dependence	
Depth	Name	Depend on this resources	Type
0	fip1	none	
1	disk1	fip1	floating ip resource
2	exec1	disk1	disk resource
		fip1	floating ip resource

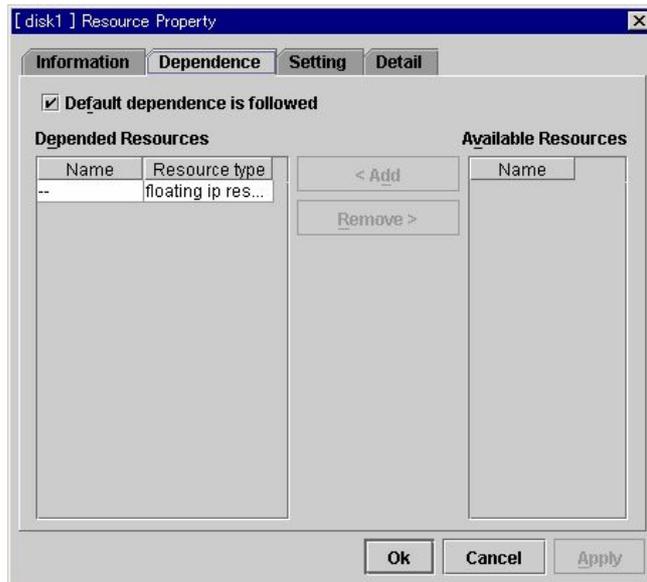
Activation order



Deactivation order



- * When [Default dependence is followed] is selected,
 - + Default depending resource types are listed in “Depended Resources”.
 - + [Available resources] has no item.
- * When [Default dependence is followed] is deselected,
 - + Depending group resource names and types are listed in “Depended Resources”.
 - + [Available resources] shows group resources to which you can add dependency.
If group resources have dependencies each other (a group resource depends on another group resource, and the latter depends on the former), they are not listed here. Group resources in “Depended Resources” are not listed here, either.



(1) **Default dependence is followed** **SuspendResume**

You select if the selected group resource follows the default ExpressCluster dependencies.

When selected:

The selected group resource depends on the specified resources.

When deselected:

The selected group resource depends on a type(s) of resources.

If there are more than one resources of the same type, it depends on all resources of the type.

Default dependencies

Resource	Depending Resource Type
Disk resource	Floating IP resource
Disk resource	Floating IP resource
exec resource	Disk resource Mirror disk resource Floating IP resource

(2) **Add** **SuspendResume**

You use this button to add the group resource selected in [Available resources] to [Depended Resources].

(3) **Remove** **SuspendResume**

You use this button to remove the group resource selected in [Depended Resources] from [Depended Resources].

5.4.3 Setting tab (common to group resources)

You see what actions are taken when an abnormality is detected at group resource activation/deactivation.

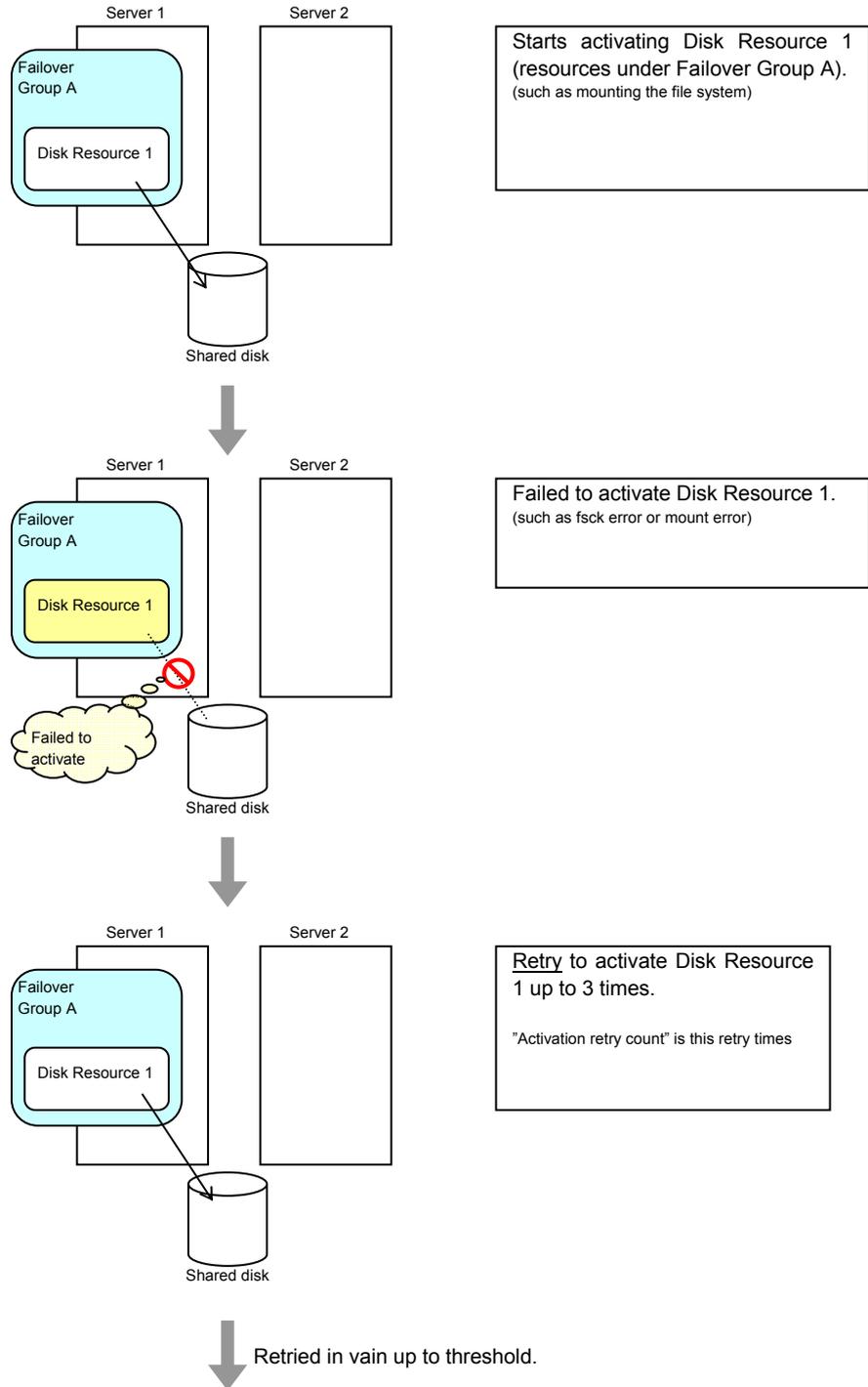
- * When a group resource activation abnormality is detected:
 - + Activation retries are attempted.
 - + Activation retries exceeds the [Activation retry threshold], a failover is performed.
 - + If the group resource cannot be activated even when failovers have been performed as many times as [Failover threshold] allows, the final action is taken.

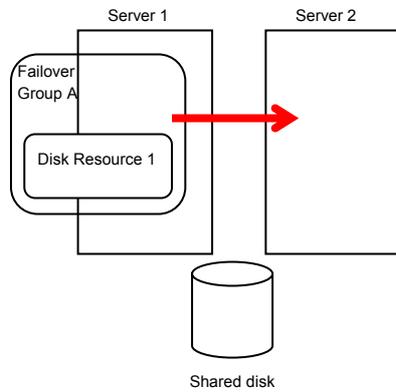
- * When a group resource deactivation abnormality is detected:
 - + Deactivation retries are attempted.
 - + Deactivation retries exceeds the [Deactivation retry threshold], the final action is taken.

[Sample settings]

Activation retry threshold 3 times
Failover threshold Once
Final action Stop group

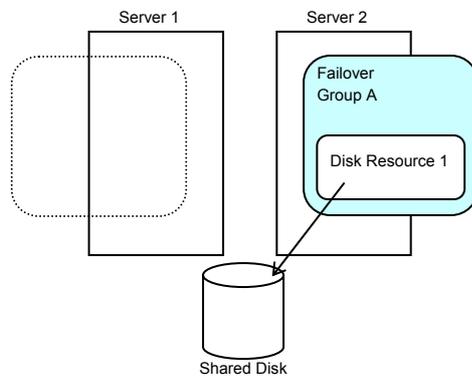
With the above settings, how group resources are handled is illustrated below.





Starts failover of Failover Group A.

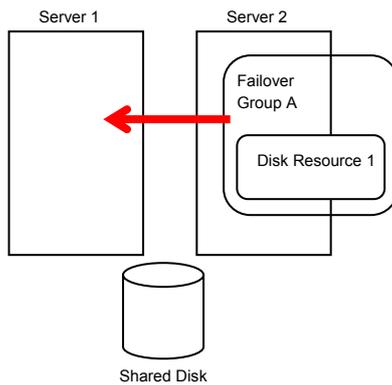
"Failover threshold" is the upper limit of failovers per server.
1st faiover on Server 1.



Starts activating Disk Resource 1.
(such as mounting the file system)

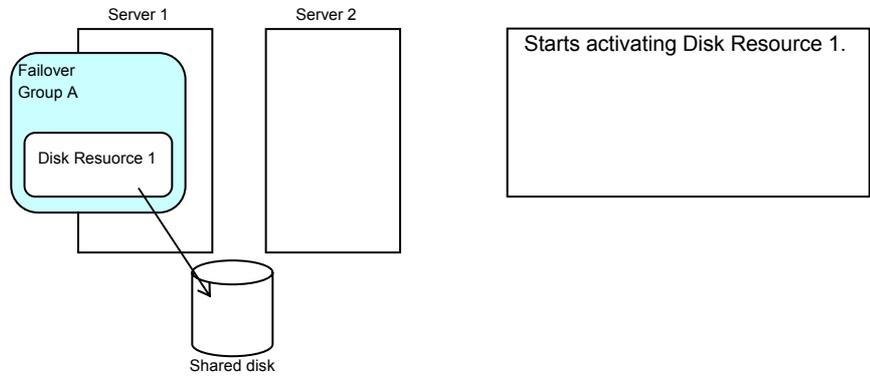
Disk Resource 1 activation can be retried up to 3 times if any error occurs.

Resource activation has been retried in vain on Server 2 also up to the upper limit.

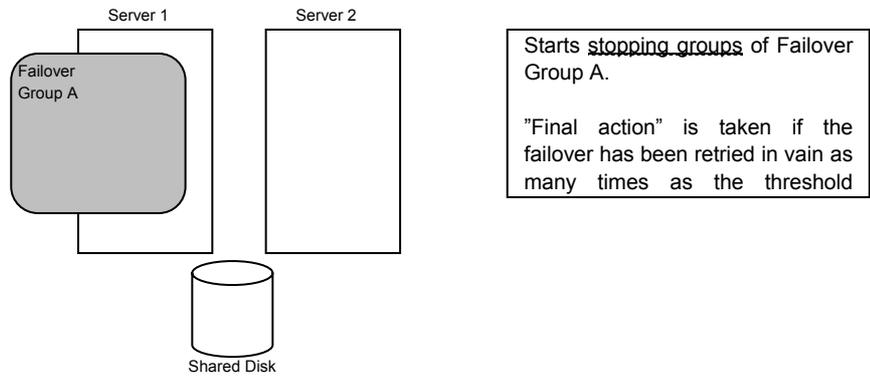


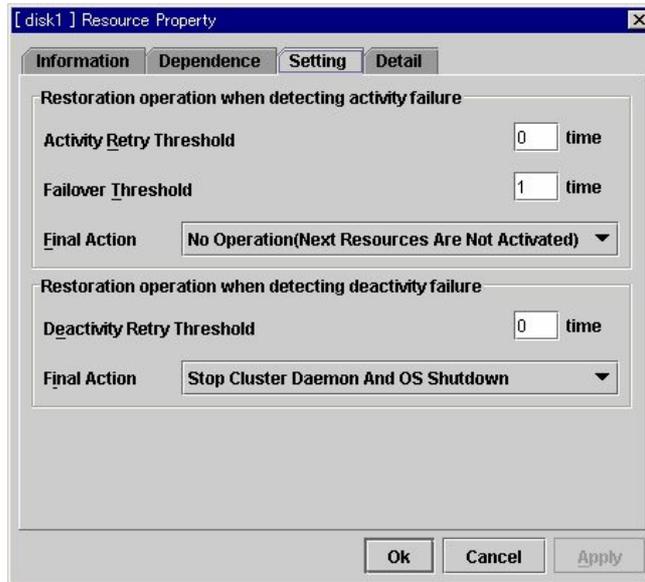
Starts failover of Failover Group A.

1st faiover on Server 2.



Resource activation has been retried in vain on Server 1 also up to the upper limit.
 Because the failover threshold is 1, failover process is not performed.
 Final action starts.





- (1) **Activity Retry Threshold (0 to 99)** **SuspendResume**
You specify how many times you want to retry activations when an activation abnormality is detected.
If you set this to zero (0), activation will not be retried.

- (2) **Failover Threshold (0 to 99)** **SuspendResume**
You specify how many times you want to retry failovers after activation retires failed as many times as specified in [Activation retry threshold] when an activation abnormality is detected.
If you set this to zero (0), failover will not be retried.

(3) Final action at activation abnormality detection **SuspendResume**

You select an action to be taken if activation retries failed as many times as specified in [Activation retry threshold] and failovers failed as many times as specified in [Failover threshold] at activation abnormality detection.

You can select a final action from:

- + No operation (Next Resources Are Activated.)
 - = Activates a group resource which depends on the group resource where an activation abnormality was detected.
- + No operation (Next Resources Are Not Activated.)
 - = Does not activate a group resource which depends on the group resource where an activation abnormality was detected.
- + Stop Group
 - = Deactivates all resources in the group that contains the group resource where an activation abnormality was detected.
- + Stop Cluster Daemon
 - = Stops the cluster daemon on the server where an activation abnormality was detected.
- + Stop Cluster Daemon And OS Shutdown
 - = Stops the cluster daemon on the server where an activation abnormality was detected, and shuts down the OS.
- + Stop Cluster Daemon and OS Reboot
 - = Stops the cluster daemon on the server where an activation abnormality was detected, and restarts the OS.

(4) Deactivation retry threshold (0 to 99) **SuspendResume**

You specify how many times you want to retry deactivations when a deactivation abnormality is detected.

If you set this to zero (0), deactivation will not be retried.

(5) Final action at deactivation abnormality detection **SuspendResume**

You select an action to be taken if deactivation retries failed as many times as specified in [Deactivation retry threshold] at deactivation abnormality detection.

You can select a final action from:

- + No operation (Next Resources Are Deactivated.)
 - = Deactivates a group resource which depends on the group resource where a deactivation abnormality was detected.
- + No operation (Next Resources Are Not Deactivated.)
 - = Does not deactivate a group resource which depends on the group resource where a deactivation abnormality was detected.
- + Stop Cluster Daemon And OS Shutdown
 - = Stops the cluster daemon on the server where a deactivation abnormality was detected, and shuts down the OS.
- + Stop Cluster Daemon and OS Reboot
 - = Stops the cluster daemon on the server where a deactivation abnormality was detected, and restarts the OS.

5.4.4 Exec resources

You can register applications and shell scripts in ExpressCluster that are managed by ExpressCluster and to be run at group startup, stop, failover or migration.

You can register your own programs and shell scripts also in exec resources.

Shell scripts are formatted in the same manner as sh shell scripts, therefore, you can write codes as required for the application.

* Notes on exec resources:

- + It is prerequisite that the application to be run from exec resources of the same revision is installed on all servers in failover policy.

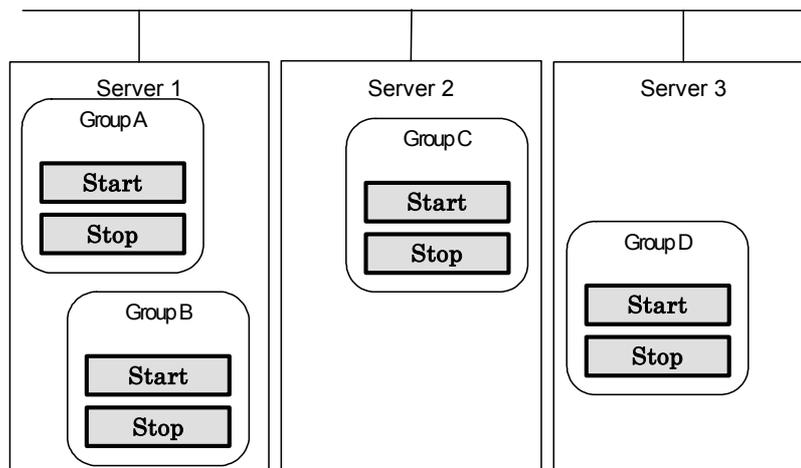
This section explains scripts provided in exec resources by default.

The top priority server specified in the group's startup server tab is called "Primary server".

5.4.4.1 Script types

Start Script and Stop Script are provided in exec resources.

ExpressCluster runs a script for each exec resource if the cluster needs to change its status. You have to describe processes in these scripts about how you want applications to start, stop, and restore in your cluster environment.



Start : Start Script
Stop : Stop Script

5.4.4.2 Script environment variables

When ExpressCluster runs a script, it sets information (about the condition which it was run on such as script starting factor) in environment variables.

You can use the environment variables in the table below as branching conditions when you write codes for your system operation.

Stop Script returns the contents of immediately preceding Start Script in the environment variable as a value. Start Script does not set environment variables, CLP_FACTOR or CLP_PID.

The environment variable, CLP_LASTACTION, is set only when the environment variable, CLP_FACTOR, is CLUSTERSHUTDOWN or SERVERSHUTDOWN.

Environment Variable	Environment Variable Value	Meaning
CLP_EVENT ...script starting factor	START	Is set when the script was run by, the cluster startup, or by the group startup, or by the group migration on the server that the group moved to, or by the group restart on the same server because of abnormality detection in monitor resource, or by the group resource restart on the same server because of abnormality detection in monitor resource
	FAILOVER	Is set when the script was run by, the server down on the server that the group failed to, or by an abnormality detection in monitor resource on the server that the group failed to, or by the group resource activation failure on the server that the group failed to.
CLP_FACTOR ...group stopping factor	CLUSTERSHUTDOWN	Is set when the group was stopped by the cluster shutdown.
	SERVERSHUTDOWN	Is set when the group was stopped by the server shutdown.
	GROUPSTOP	A group was stopped with group stop.
	GROUPMOVE	A group was moved with group move.
	GROUPFAILOVER	Is set when the group failed over by an abnormality detection in monitor resource, or by the group resource activation failure.
	GROUPRESTART	Is set when the group was restarted by a monitor resource abnormality detection.
	RESTART	Is set when the group resource was restarted by a monitor resource abnormality detection.
CLP_LASTACTION ...process after cluster shutdown	REBOOT	To reboot the OS
	HALT	To halt the OS
	NONE	No action is taken.

Environment Variable	Environment Variable Value	Meaning
CLP_SERVER ...server where the script was run	HOME	The script was run on the group's primary server.
	OTHER	The script was run on a server other than the group's primary server.
CLP_DISK ...partition connection information on shared or mirror disks	SUCCESS	There is no partition where connection has failed.
	FAILURE	There is one or more partition where has connection failed.
CLP_PRIORITY ... the order in failover policy of the server where the script was run	1 to the number of servers in the cluster	Represents the priority of server where the script is run. This number starts from 1. The smaller the number, the higher the server's priority. If CLP_PRIORITY is 1, it means that the script was run on the primary server.
CLP_GROUPNAME ...Group name	Group name	Represents the group name that the script is contained.
CLP_RESOURCENAME ...Resource name	Resource name	Represents the resource name that the script is contained.
CLP_PID ...Process ID	Process ID	Represents the Start Script process ID if the Start Script's property is set to asynchronous. This environment variable is null when the Start Script is synchronous.

5.4.4.3 Script execution timing

This section describes the relationships between the execution timings of Start and Stop Scripts and environment variables according to cluster status transition diagrams.

- * To simplify the explanations, a 2-server cluster configuration is used.

See the supplements for the relations between possible execution timings and environment variables in 3 or more server configurations.

- * O and X in diagrams represent the server statuses.

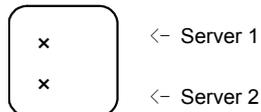
Server	Server Status
O	Normal Status (properly working as a part of cluster)
X	Stopped (Cluster is off.)

(Example) OA : Group A is working on a normally running server.

- * Each group is started on the top priority server among active servers.
- * Three groups are defined in the cluster, they have their own failover policies as follows;

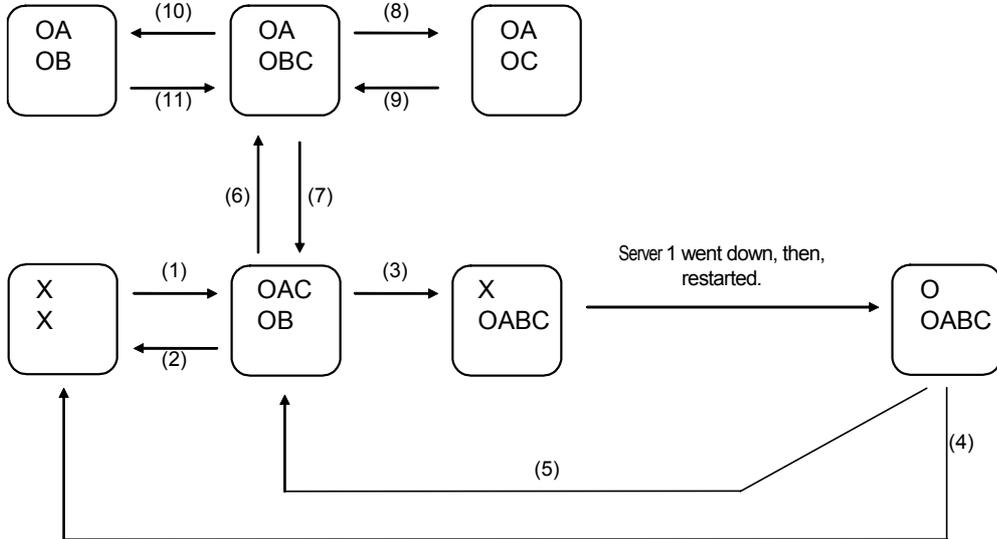
Group	Priority 1 Server	Priority 2 Server
A	Server 1	Server 2
B	Server 2	Server 1
C	Server 1	Server 2

- * The upper server is referred to as Server 1 and the lower one is to Server 2.



Cluster status transition diagram:

This diagram illustrates a typical cluster status transition.

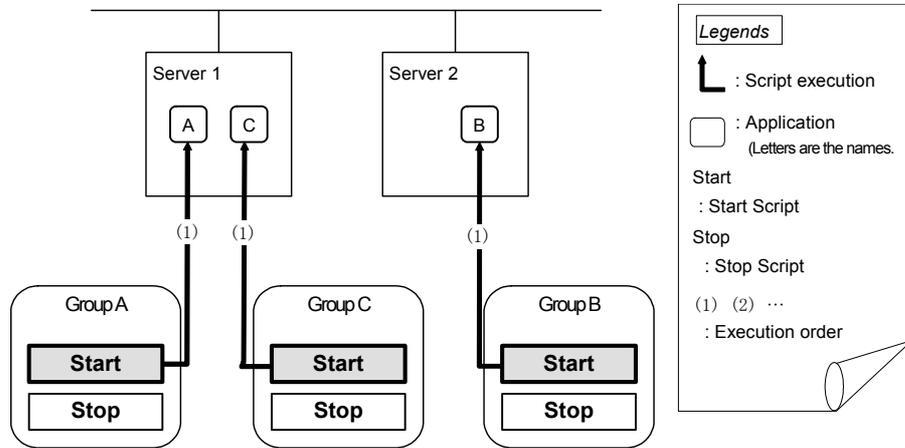


Numbers (1) to (11) in the diagram correspond to descriptions in the following pages.

(1) Normal startup

Normal startup here means that the Start Script has been run properly on the primary server.

Each group is started on the top priority server among the active servers.

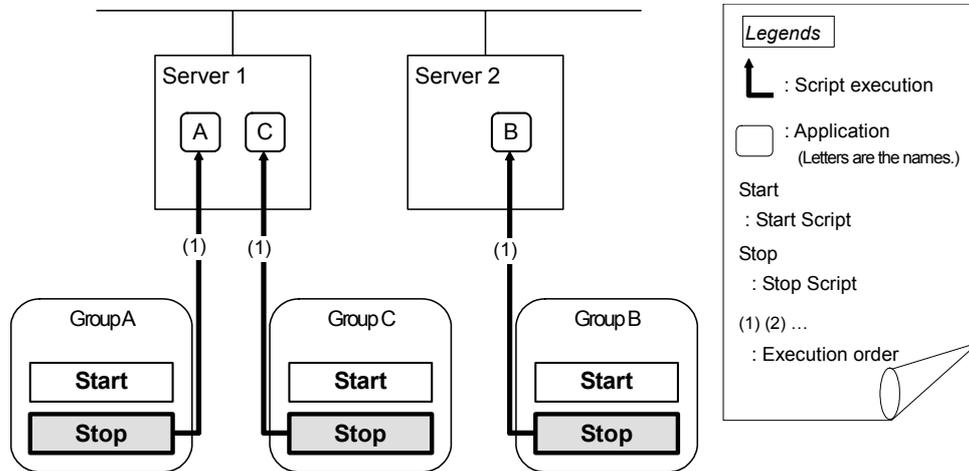


Environment variables for Start

Group	Environment Variable	Value
A	CLP_EVENT	START
	CLP_SERVER	HOME
B	CLP_EVENT	START
	CLP_SERVER	HOME
C	CLP_EVENT	START
	CLP_SERVER	HOME

(2) Normal shutdown

If a cluster shutdown is run immediately after a Start Script corresponding to Stop Script was run by normal startup or by a group migration (online failback), it is the normal shutdown here.



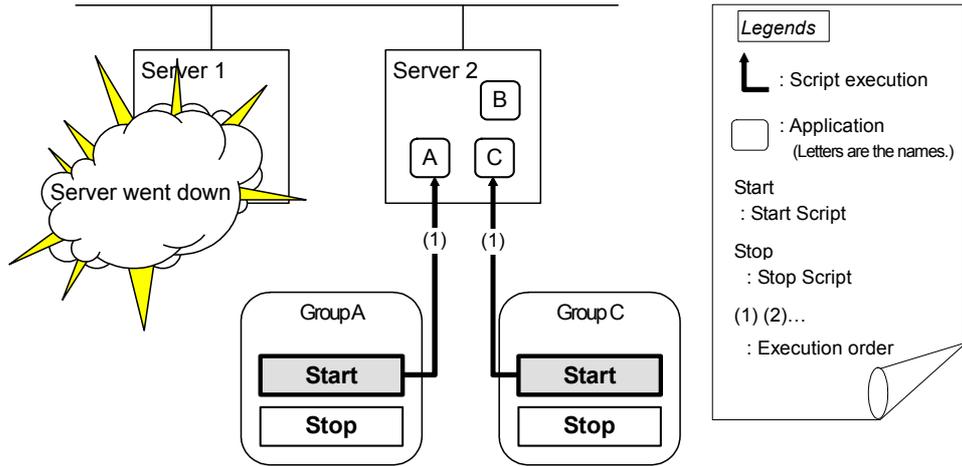
Environment variables for Stop

Group	Environment Variable	Value
A	CLP_EVENT	START
	CLP_SERVER	HOME
B	CLP_EVENT	START
	CLP_SERVER	HOME
C	CLP_EVENT	START
	CLP_SERVER	HOME

(3) Failover when Server 1 goes down

When a group's Start Script has Server1 as its primary server, if the server goes down, it is run on a lower priority server (Server2). To do so, Start Script should have CLP_EVENT(=FAILOVER) as a branching condition for triggering applications' startup and recovery processes (such as database rollback process).

If you have a process you want to perform only on a server other than the primary server, you have to specify CLP_SERVER(=OTHER) as a branching condition and describe the process in your script.

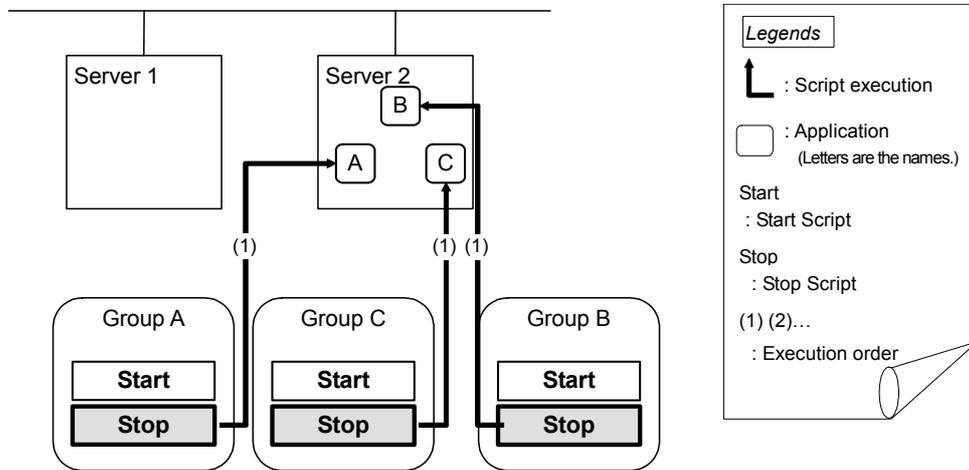


Environment variables for Start

Group	Environment Variable	Value
A	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER
C	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER

(4) Cluster shutdown after Server 1 failover

Stop Scripts of groups A and C are run on Server 2 where the groups failed over to (Group B's Stop Script is run by a normal shutdown).

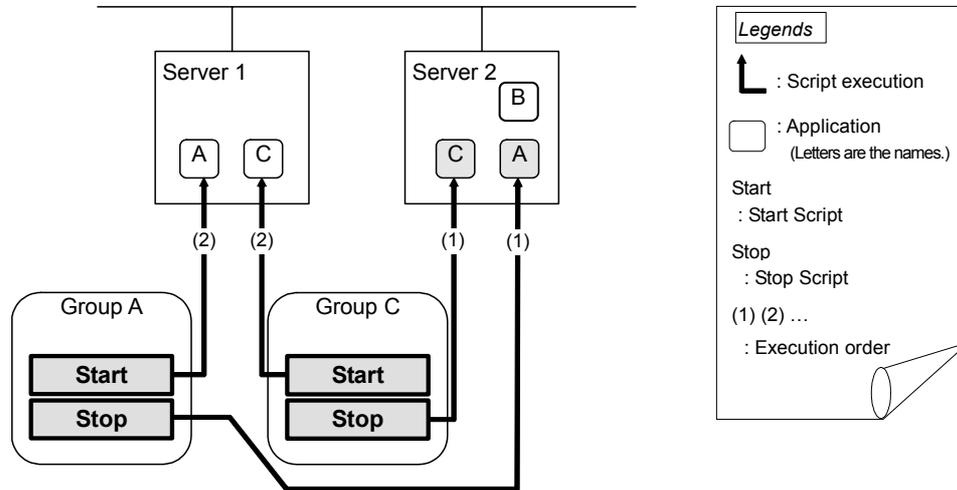


Environment variables for Stop

Group	Environment Variable	Value
A	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER
B	CLP_EVENT	START
	CLP_SERVER	HOME
C	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER

(5) Migration of groups A and C

Stop Scripts of groups A and C are run on Server 2 where the groups failed over to, then, their Start Scripts are run on Server 1.



Environment variables for Stop

Group	Environment Variable	Value
A	CLP_EVENT	FAILOVER ^a
	CLP_SERVER	OTHER
C	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER

Environment variables for Start

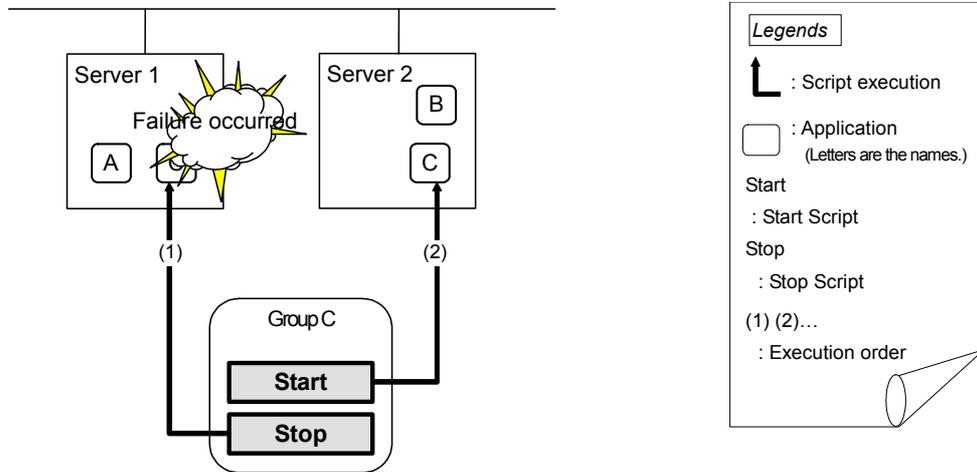
Group	Environment Variable	Value
A	CLP_EVENT	START
	CLP_SERVER	HOME
C	CLP_EVENT	START
	CLP_SERVER	HOME

^a Environment variables in Stop script take those in the preceding Start script.

In case of Section 5.4.4.3 (5) Migration of Group A and C, because it is not preceded by a cluster shutdown, the environment variable is FAILOVER. However, if a cluster shutdown is performed in this case, the environment variable will be START.

(6) Failure in Group C and failover

If a failure occurs in Group C, its Stop Script is run on Server 1, then, its Start Script is run on Server 2.



Stop for Server 1

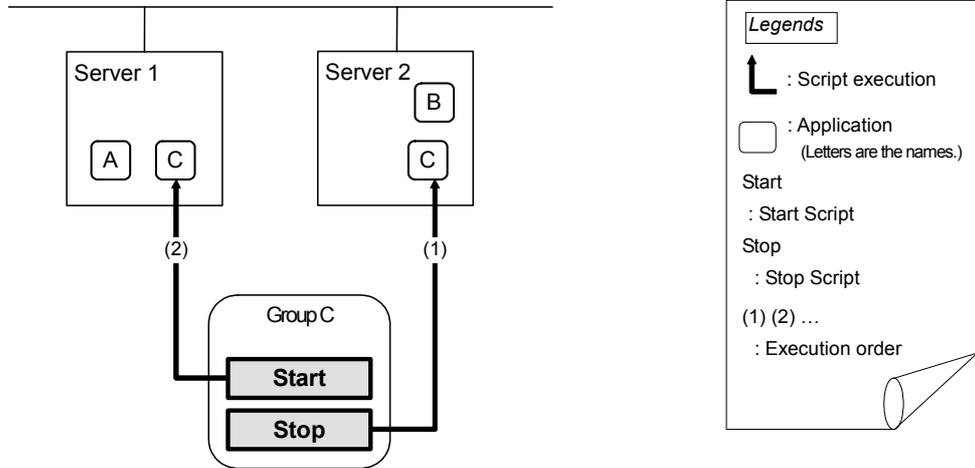
Group	Environment Variable	Value
C	CLP_EVENT	START
	CLP_SERVER	HOME

Start for Server 2

Group	Environment Variable	Value
C	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER

(7) Migration of Group C

You move the group C that was failed over to Server 2 in Step (6) from Server 2 to Server 1. Run the Stop Script on Server 2, then, run Start Script on Server 1.



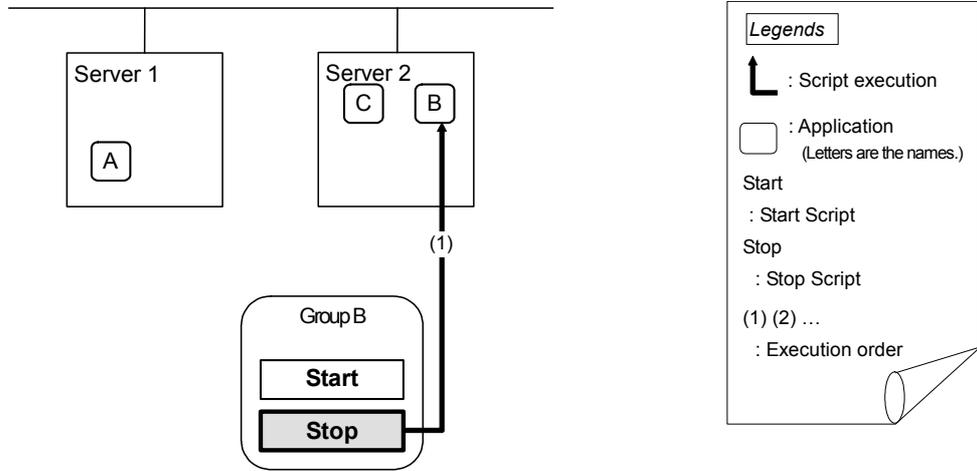
Stop (because this is failed over in Step (6))

Group	Environment Variable	Value
C	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER

Start

Group	Environment Variable	Value
C	CLP_EVENT	START
	CLP_SERVER	HOME

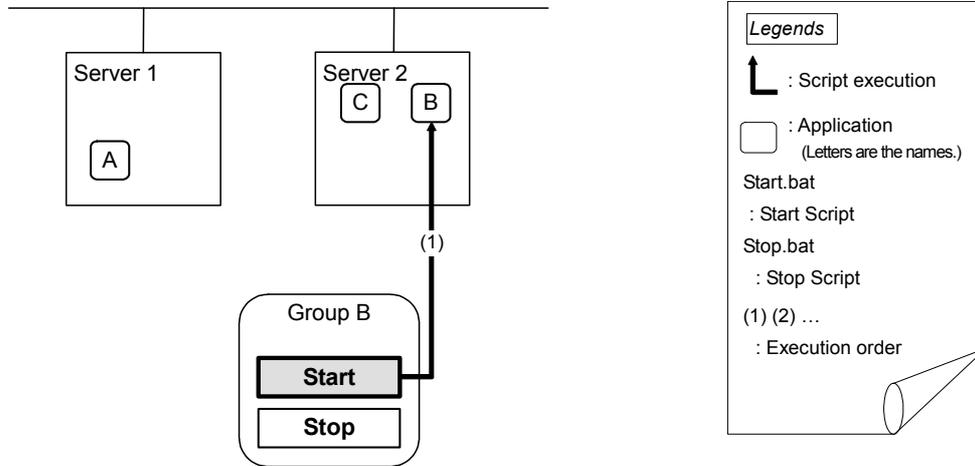
(8) Stopping group B
 Group B's Stop Script is run on Server 2.



Stop

Group	Environment Variable	Value
B	CLP_EVENT	START
	CLP_SERVER	HOME

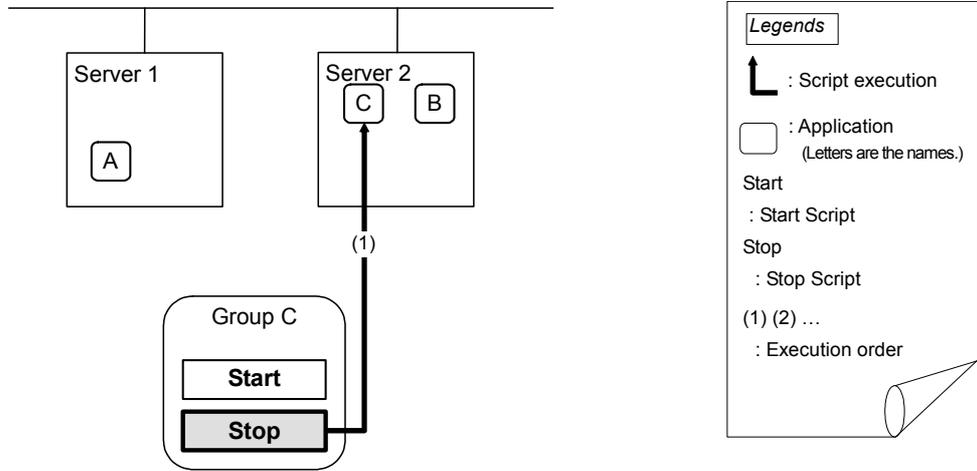
(9) Starting Group B
 Group B's Start Script is run on Server 2.



Start

Group	Environment Variable	Value
B	CLP_EVENT	START
	CLP_SERVER	HOME

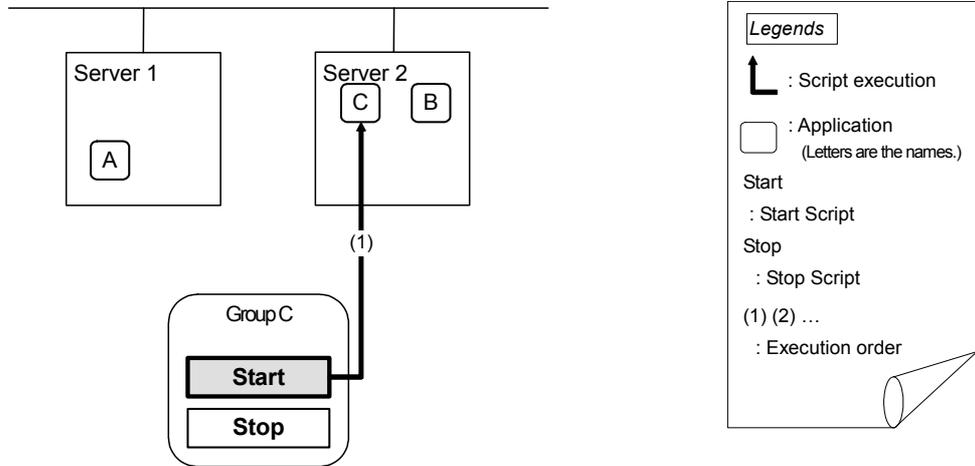
(10) Stopping Group C
 Group C's Stop Script is run on Server 2.



Stop

Group	Environment Variable	Value
C	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER

(11) Starting Group C
 Group C's Start Script is run on Server 2.

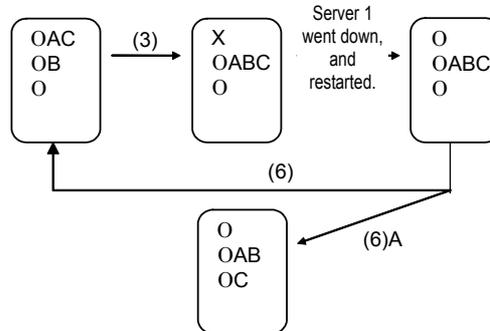


Start

Group	Environment Variable	Value
C	CLP_EVENT	START
	CLP_SERVER	OTHER

Supplement 1:

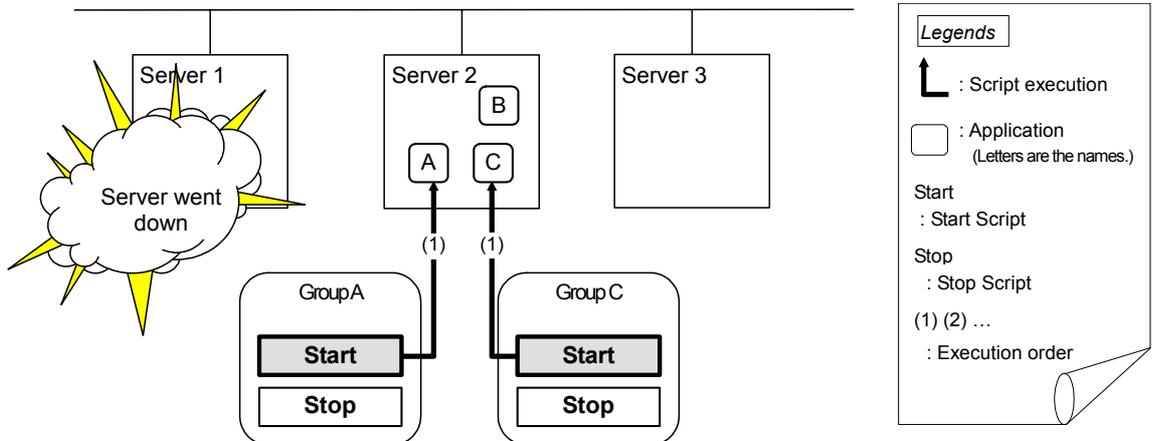
If you want a group who has three or more servers specified in the failover policy to behave differently on other servers than the primary server, you should use CLP_PRIORITY instead of CLP_SERVER(HOME/OTHER).



Sample 1: On (3) Failover when Server 1 goes down in cluster status transition diagram

A group has Server 1 as its primary server. If a failure occurs on Server 1, its Start Script is run on the next prioritized failover policy server, Server 2. The Start Script should have CLP_EVENT(=FAILOVER) as the branching condition for triggering applications' startup and recovery processes (such as database rollback process).

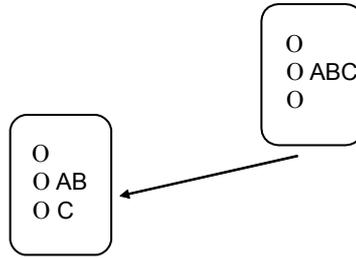
If you want a process to perform only on the second priority failover policy server, your script for the process should have CLP_PRIORITY(=2) as the branching condition.



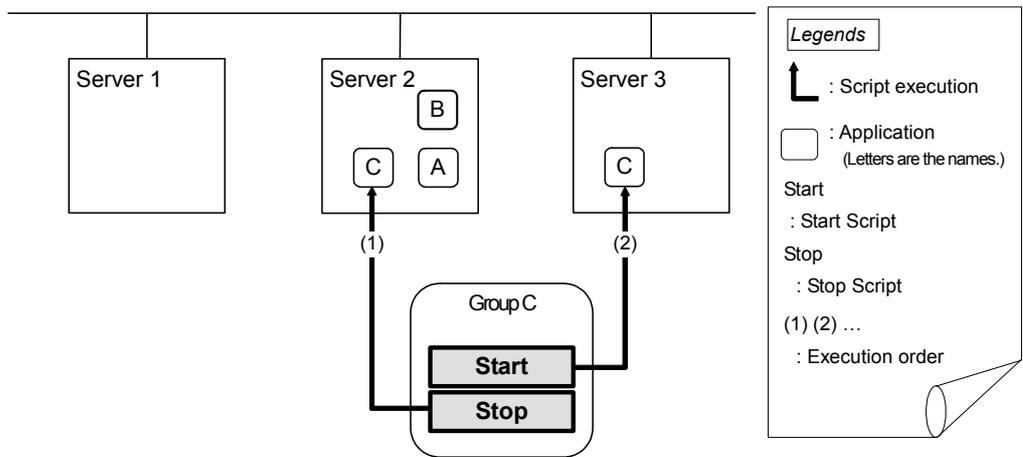
Environment variables for Start

Group	Environment Variable	Value
A	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER
	CLP_PRIORITY	2
C	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER
	CLP_PRIORITY	2

Sample 2: On (7) Migration of GroupC in the cluster status transition diagram



Group C's Stop Script is run on Server 2 where the group failed over from, then, Start Script is run on Server 3.



Environment variables for Stop

Group	Environment Variable	Value
C	CLP_EVENT	FAILOVER
	CLP_SERVER	OTHER
	CLP_PRIORITY	2

Environment variables for Start

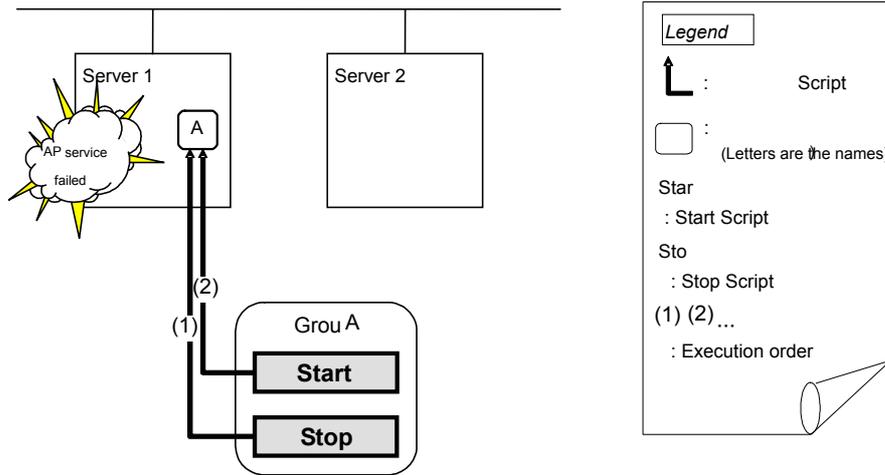
Group	Environment Variable	Value
C	CLP_EVENT	START
	CLP_SERVER	OTHER
	CLP_PRIORITY	3

Supplement 2:

If Resource Monitor (re)starts a script,

To restart a Start Script when Resource Monitor detected an abnormality in an application, the environment variables should be as follows;

Sample 1: Resource Monitor detected an abnormal termination in an application that was running on Server 1, and you want to restart Group A on Server.



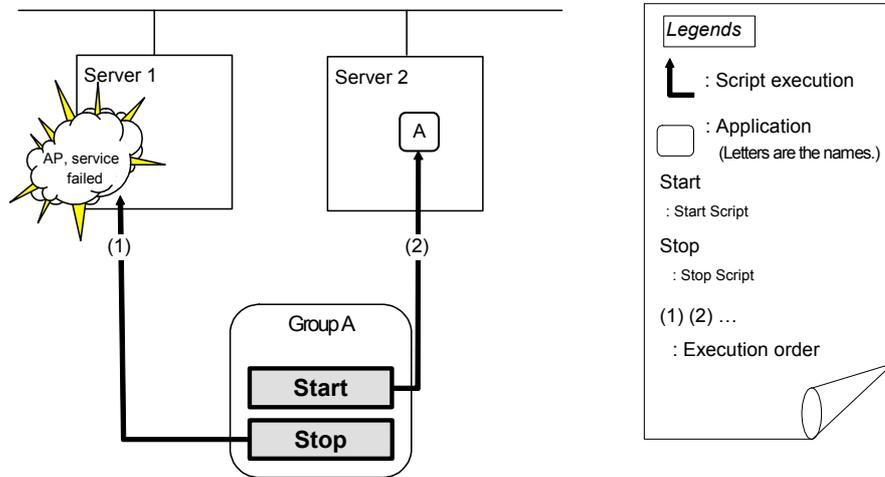
Environment variable for Stop

Group		Environment Variable	Value
A	(1)	CLP_EVENT	The same value as when Start is run.

Environment variable for Start

Group		Environment Variable	Value
A	(2)	CLP_EVENT	START

(Sample 2) Resource Monitor detected an abnormal termination of application that was active on Server 1, then, Group A failed over to Server 2 and started there.



Environment variable for Stop

Group		Environment Variable	Value
A	(1)	CLP_EVENT	The same value as when Start is run.

Environment variable for Start

Group		Environment Variable	Value
A	(2)	CLP_EVENT	FAILOVER

5.4.4.4 Script codes

This section explains script execution timing described in the preceding section with samples script codes.

Numbers in brackets (#) in the following code sample represent corresponding actions described in Section 5.4.4.3 "Script execution timing".

A. Group A Start Script: A sample start.sh

```
#!/bin/sh
# *****
# *          start.sh          *
# *****

if [ "$CLP_EVENT" = "START" ]
then
    if [ "$CLP_DISK" = "SUCCESS" ]
    then
        

According to this environment variable of script starting factor, the process to go is determined.



Overview of processing:  

            Application's normal startup process  

When to start this process:  

            (1) Normal startup  

            (5) Migration of Group A and C


        if [ "$CLP_SERVER" = "HOME" ]
        then
            

According to this execution server environment variable, the process to go is determined.



Overview of processing:  

                A process you want to do if the application is normally started on the primary server.  

When to start this process:  

                (1) Normal startup  

                (5) Migration of Group A and C


        else
            

Overview of processing:  

                A process you want to do if the application is normally started on other server the primary server.  

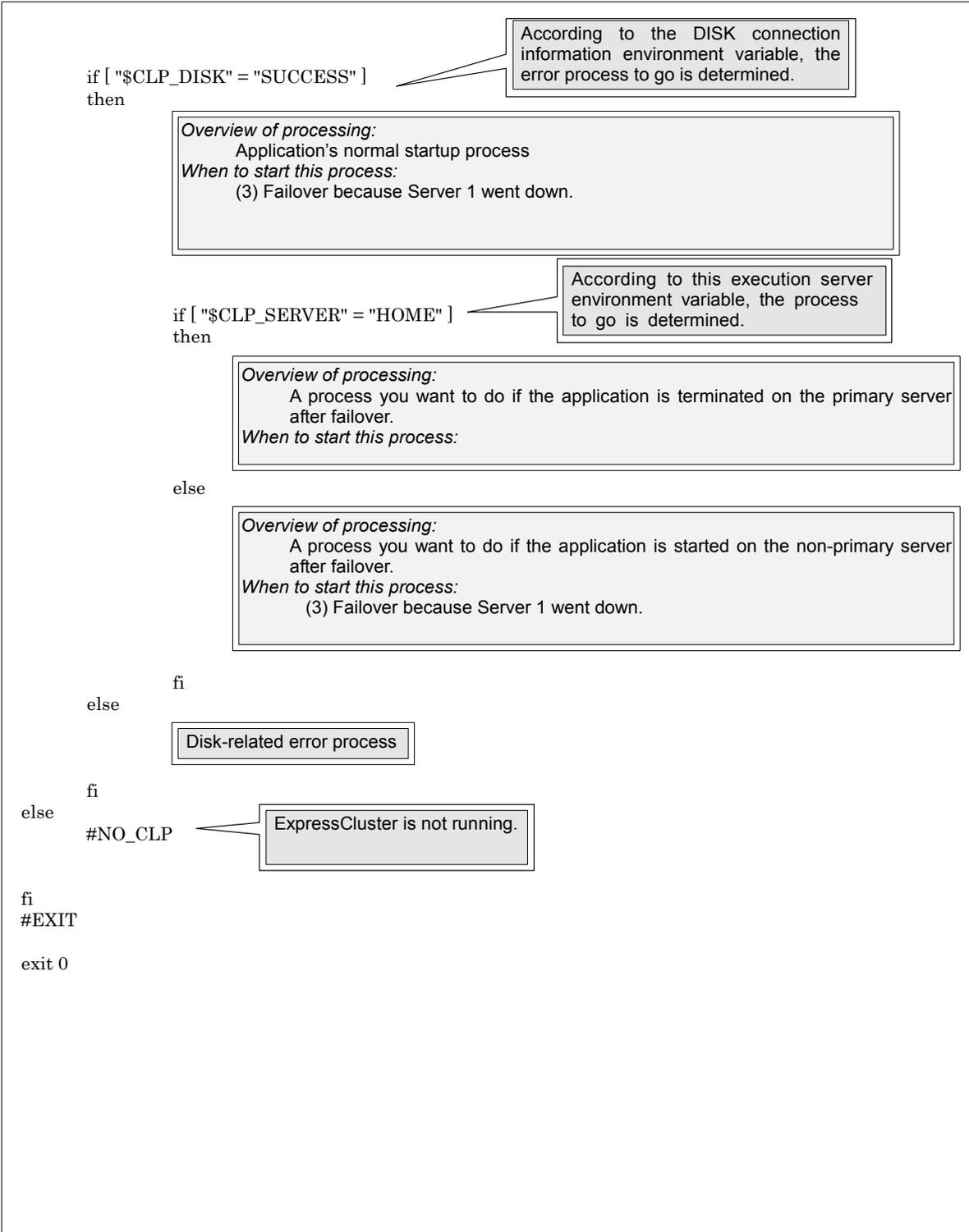
When to start this process:


        fi
    else
        

Disk-related error process


    fi
fi

elif [ "$CLP_EVENT" = "FAILOVER" ]
then
```



B. Group A Stop Script: A sample stop.sh

```
#!/bin/sh
# *****
# *          stop.sh          *
# *****
```

```
if [ "$CLP_EVENT" = "START" ]
then
  if [ "$CLP_DISK" = "SUCCESS" ]
  then
```

According to this environment variable of script starting factor, the process to go is determined.

Overview of processing:
Application's normal startup process
When to start this process:
(2) Normal shutdown

```
if [ "$CLP_SERVER" = "HOME" ]
then
```

According to this execution server environment variable, the process to go is determined.

Overview of processing:
A process you want to do if the application is normally processed on the primary server.
When to start this process:
(2) Normal shutdown

```
else
```

Overview of processing:
A process you want to do if the application is normally terminated on other server than the primary server.
When to start this process:

```
fi
```

```
else
```

Disk-related error process

```
fi
```

```
elif [ "$CLP_EVENT" = "FAILOVER" ]
then
```

```
if [ "$CLP_DISK" = "SUCCESS" ]
then
```

Overview of processing:
Normal termination process after failover
When to start this process:
(4) Cluster shutdown after Server 1 failed over
(5) Migration of Group A and C

```
if [ "$CLP_SERVER" = "HOME" ]
then
```

According to this execution server environment variable, the process to go is determined.

Overview of processing:
A process you want to do if the application is terminated on the primary server after failover
When to start this process:

```
else
```

Overview of processing:
A process you want to do if the application is terminated on other server than the primary server after failover
When to start this process:
(4) Cluster shutdown after Server 1 failed over
(5) Migration of Group A and C

```
fi
```

```
else
```

Disk-related error process

```
fi
```

```
else
```

```
#NO_CLP
```

ExpressCluster is not running.

```
fi
```

```
#EXIT
```

```
exit 0
```

5.4.4.5 Tips to create a script

Note the followings when creating scripts.

- * If your script has a command that requires some time to complete, it is recommended to always deliver a command completion message to standard output. You can deliver messages with the echo command to standard output. In addition to this, you make settings for the log output path in the resource properties that contain the script.

These messages are useful to examine the cause of troubles if any.

However, these messages are not logged by default. For how to make settings for the log output path, see Section 5.4.5.4 "Exec Resource Tuning Properties".

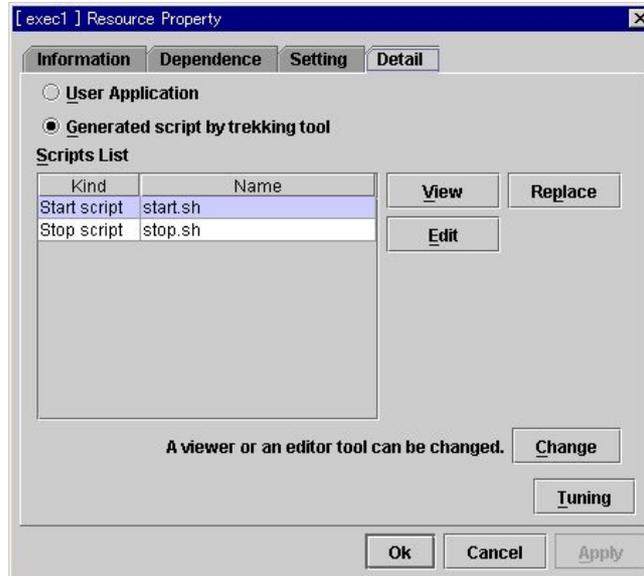
(Example: Image in script)

```
echo "appstart.."
appstart
echo "OK"
```

- * Observe your file system's available disk space carefully because if you specify a file as the log output destination file, messages are sent to that file no matter how many disk spaces are available there.

5.4.5 Exec Resource Property: Detail tab

5.4.5.1 Exec Resource Property: Detail tab (common)



(1) User application

Select this to use executable files (executable shell scripts/binary files) on your server script.

Specify the local disk path on server for each executable file name.

Executable files are not distributed among servers. They should be placed on each server in advance. The cluster configuration data created by Trekking Tool does not contain these files.

You can edit script files by Trekking Tool.

(2) Generated script by trekking tool

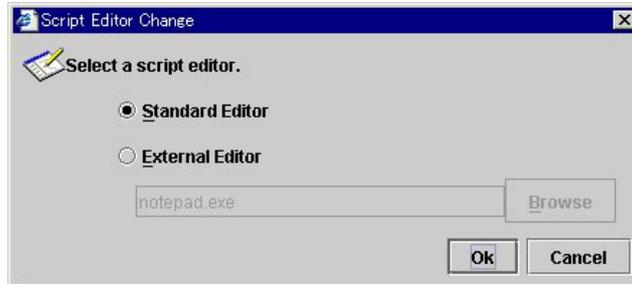
Select this to use script files created by Trekking Tool as scripts.

You can edit script files by Trekking Tool as necessary.

The cluster configuration data contains these script files.

(3) Change

Click this. Then, you see a dialog box where you can change the script editor. You can change your script editor to view/edit scripts to any editor.



A. Standard Editor

Select this to use the standard editor for editing scripts.

- * Linux: vi (vi which is detected by the run user's search path)
- * Windows: Notepad (notepad.exe which is detected by the run user's search path)

B. External Editor

Select this to specify a script editor.

Click [Browse] to select an editor.

- To specify a CUI-based external editor for Linux, create a shell script.

The following is a sample shell script to run vi;

```
xterm -name clpedit -title "Trekking Tool" -n "Trekking Tool" -e vi "$1"
```

(4) Tuning

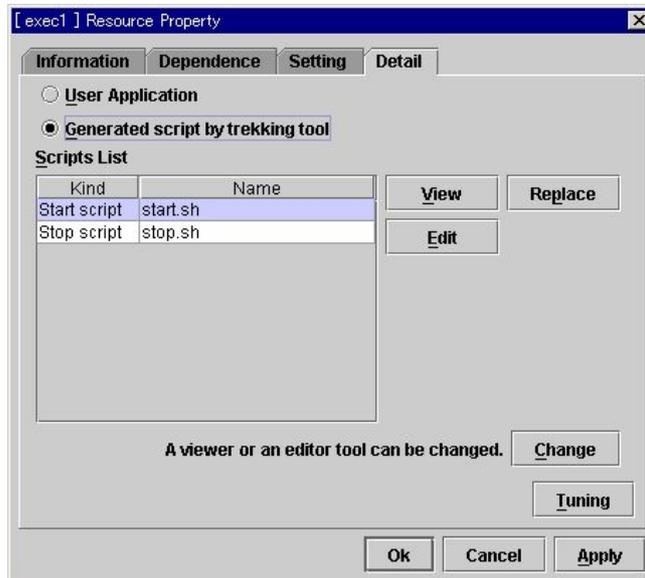
Click this. Then, you see the exec resource tuning properties dialog box.

You can make detailed settings for the exec resource.

If you want the pid monitor resource to monitor the exec resources, you have to set Start Script to asynchronous.

5.4.5.2 Exec Resource Property: Detail tab (Generated script by Trekking Tool)

Script file names, “start.sh” and “stop.sh”, are listed in “Scripts List”.



(1) View

Click this. Then, you can see the selected script file on the script editor. Changes made and saved by the editor are not reflected. If the selected script file is being viewed or edited, you cannot see it.

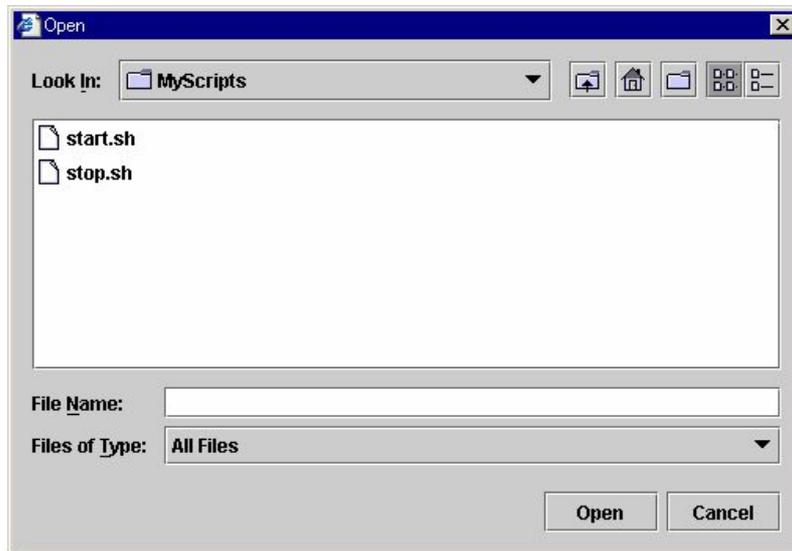
(2) Edit

Click this. Then, you can edit the selected script file on the script editor. To reflect changes, overwrite the file. If the selected script file is being viewed or edited, you cannot edit it.

You cannot rename the script file.

(3) Replace

Click this. Then, you see a dialog box where you can select a file.



The selected script file is replaced.

Select a new file in the file selection dialog box.

The contents of script file are replaced with the contents of selected new file.

If the selected script file is being viewed or edited, you cannot replace it.

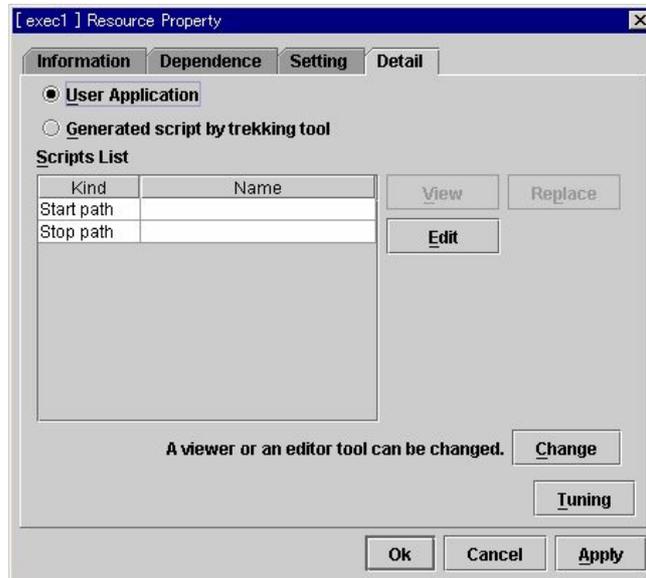
Select a script file here. Do not select a binary file such as application programs.

5.4.5.3 Exec Resource Property: Detail tab (User application)

You select a file as the exec resource executable file.

Specified executable file names are listed in “Scripts List”.

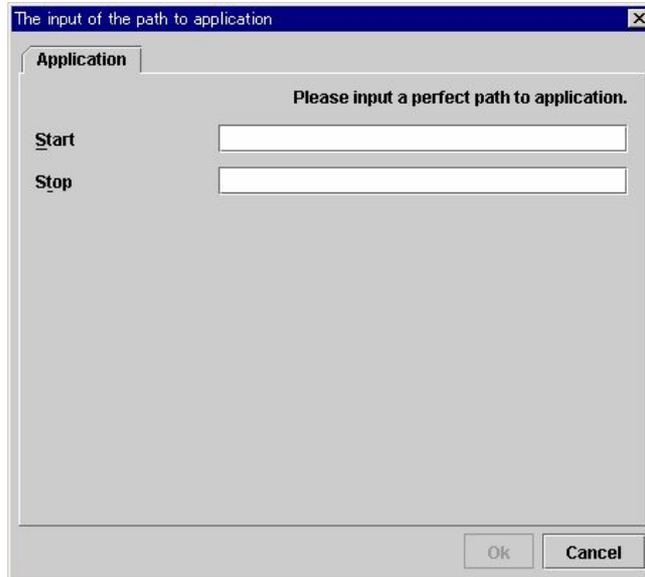
+ Executable files are such as executable shell scripts and binary files.



(1) Edit

You specify an exec resource executable file name.

You see a dialog box where you can enter a full path to an application.



A. Start (up to 1023 bytes)

You enter an executable file name to be run when the exec resource starts.
The name should begin with “/”.

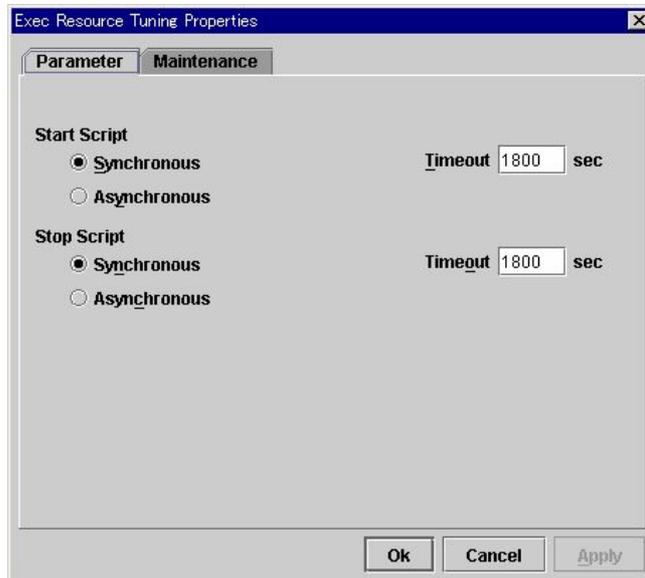
B. Stop (up to 1023 bytes)

You enter an executable file name to be run when the exec resource exits.
The name should begin with “/”.
Stop Script is optional.

- * You have to specify a full path starting with “/” to a file on your cluster server for the executable file name.

5.4.5.4 Exec Resource Tuning Properties

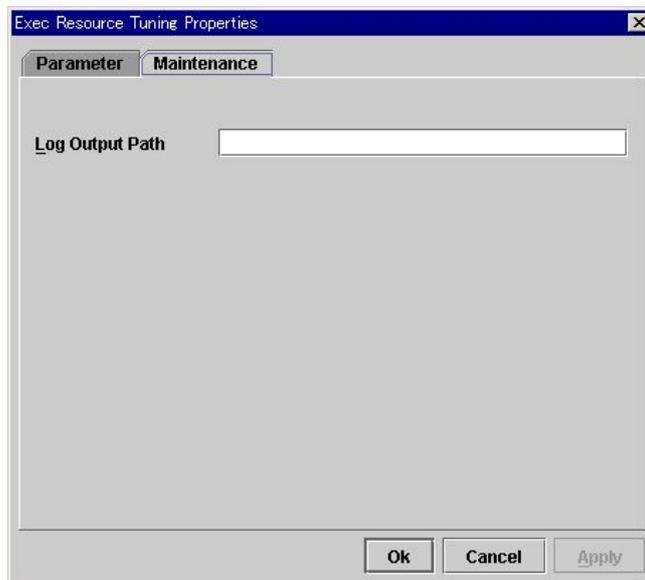
(1) Parameter tab



Common to [Start Script] and [Stop Script]

- A. Synchronous
If you select this, when a script is run, its termination is waited.
Select this for executable files that are not resident (the process returns immediately after the script completion.).
 - B. Asynchronous
If you select this, when a script is run, its termination is not waited.
Select this for resident executable files.
 - C. Timeout (0 to 9999)
When you want to wait for a script termination ([Synchronous]), specify how many seconds you want to wait before a timeout is determined.
This field is enabled when [Synchronous] is selected.
Unless the script completes within the specified time, an abnormality is determined.
- * If you run the exec resource Start Script asynchronously, you can monitor it by the pid monitor resource.

(2) Maintenance tab



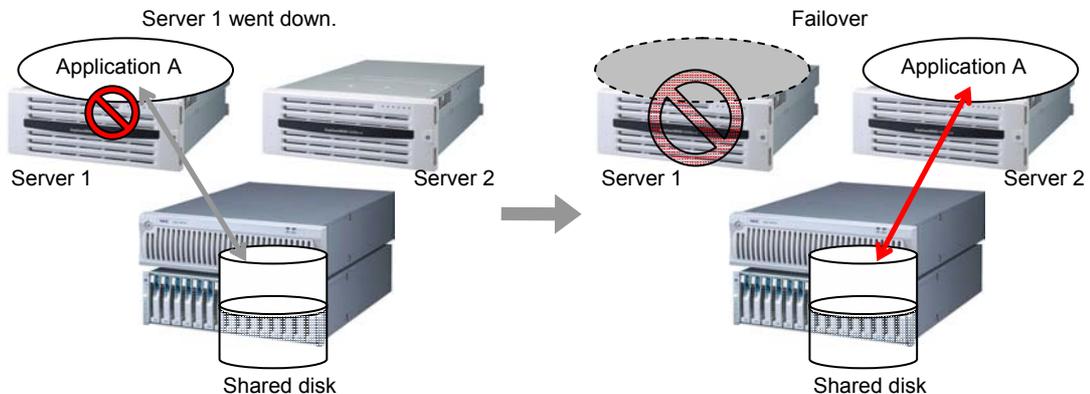
- A. Log output path (up to 1023 bytes)
You specify the redirect destination path of standard output and standard error output for exec resource scripts and executable files.
By default, messages are redirected to /dev/null.
The name should begin with "/".

- * Observer the file system's available disk space carefully because if a file name is specified, messages are sent to that file no matter how many disk spaces are available there.

5.4.6 Disk resources ~ For SE and XE ~

(1) Switching partition

- * Partitions on shared disks connected to more than one servers in a cluster are referred to as Switching partitions.
- * Switching is done for each failover group according to the failover policy. By storing data required for business applications on switching partitions, the data can automatically and seamlessly be used after failover/migration of failover group.
- * The same area in switching partitions should be accessible with the same device name on all servers.

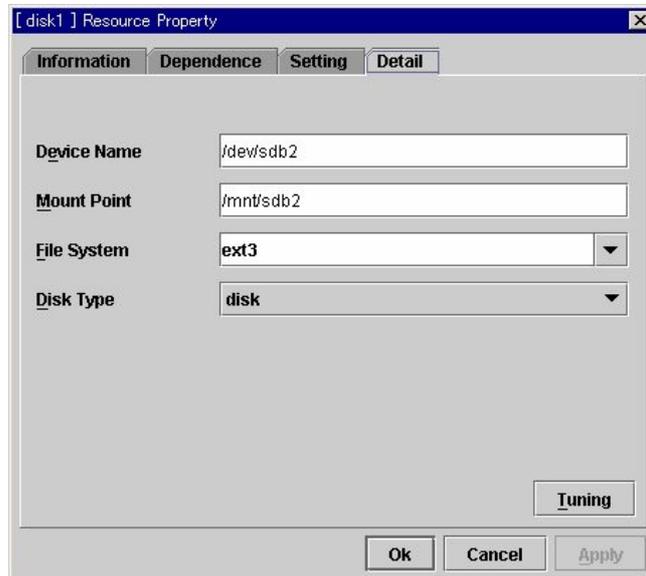


(2) Precautions about shared disks

- * Make settings so that the same partition is accessible with the same device name.
- * For shared disks, functions such as stripe set, volume set, mirroring, stripe set with parity by Linux md are not supported.
- * ExpressCluster controls accesses to the file system (mount/umount). Do not make settings about mount/umount on the OS.
- * Partitions are read-only on servers where no group is active.

5.4.7 Disk Resource Property: Detail tab ~ For SE and XE ~

5.4.7.1 Disk Resource Property: Detail tab

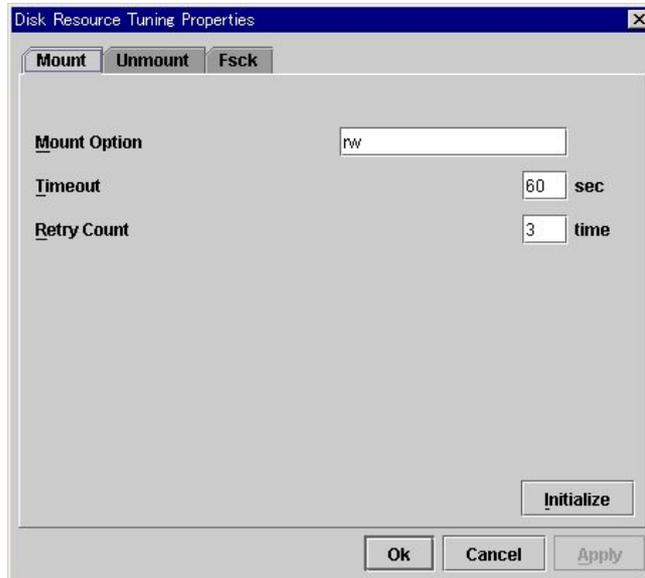


- (1) **Device Name (up to 1023 bytes)** **StopRestart**
Enter the disk device name to be used for disk resources.
The name should begin with “/”.
- (2) **Mount Point (up to 1023 bytes)** **StopRestart**
Enter the directory to mount the disk device.
The name should begin with “/”.
- (3) **File System**
You select a file system type made on the disk device from,
+ ext2
+ ext3
+ xfs
- (4) **Disk Type** **StopRestart**
Select a disk type.
Only [disk] is available.
- (5) **Tuning**
Click this. Then, you see the Disk Resource Tuning Properties dialog box.
You make detailed settings there.

5.4.7.2 Disk Resource Tuning Properties

(1) Mount tab

You see details on mount.



- A. Mount Option (up to 1023 bytes)
Enter options to give the mount command when mounting the file system on the disk device.
Options are delimited with commas (,).

+ A mount option sample

Setting Item	Setting Value
Device name	/dev/sdb5
Mount point	/mnt/sdb5
File system	ext3
Mount option	rw,data=journal

The mount command to be run with the above settings is,
`mount -t ext3 -o rw,data=journal /dev/sdb5 /mnt/sdb5`

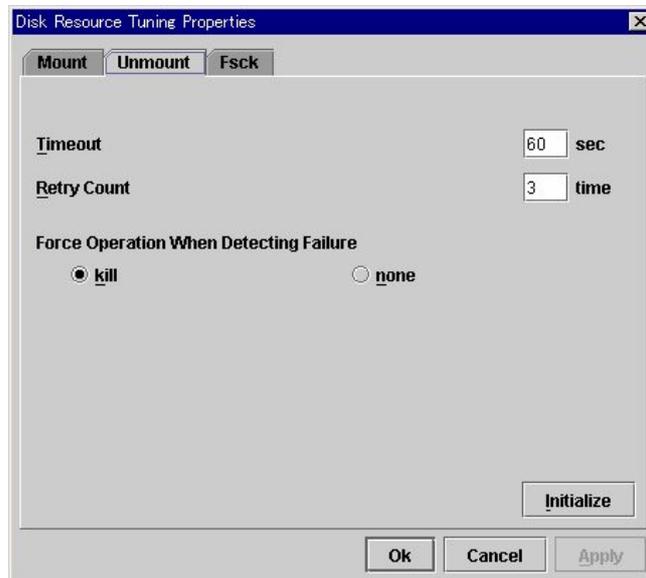
- B. Timeout (1 to 999)
Enter how many seconds you want to wait for the mount command completion before its timeout when you mount the file system on the disk device.
If the file system has a large size of disk space, it may take some time for the command to complete. Be careful about the value you specify.

- C. **Retry Count (0 to 999)**
Enter how many times you want to retry to mount the file system on the disk device when one fails.
If you set this to zero (0), no mount will be retried.

- D. **Initialize**
Click this to reset the mount option, timeout, retry count to the ExpressCluster default values.

(2) Unmount tab

You see details on unmount.

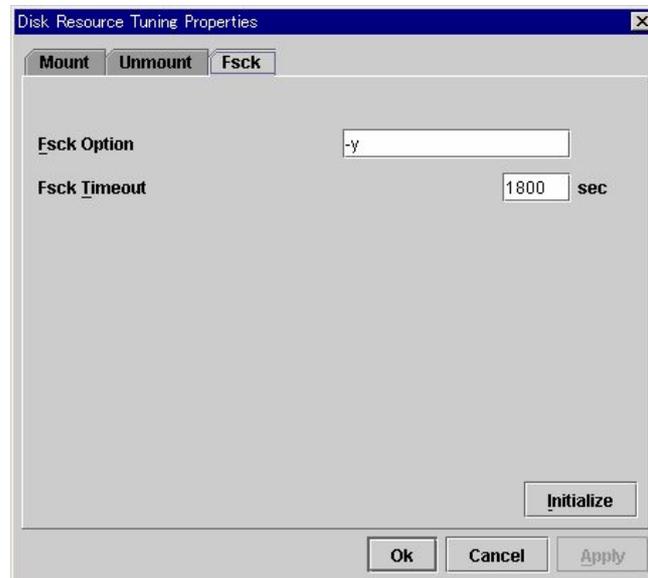


- A. Timeout (1 to 999)
Enter how many seconds you want to wait for the unmount command completion before its timeout when you unmount the file system on the disk device.
- B. Retry Count (0 to 999)
Enter how many times you want to retry to unmount the file system on the disk device when one fails.
If you set this to zero (0), no unmount will be retried.
- C. Forced Operation When Detecting Failure
Select an action to be taken at an unmount retry if you failed to unmount.
 - [Kill]
Select this to try to kill the processes that are accessing the mount point.
Not always the process can be killed.
 - [None]
Select this not to try to kill the processes that are accessing the mount point.
- D. Initialize
Click this to reset the timeout, retry count and forced operation at abnormality detection to ExpressCluster default values.

(3) Fsk tab

You see details on Fsk.

Fsk is run before the mount command when mounting disk resources.

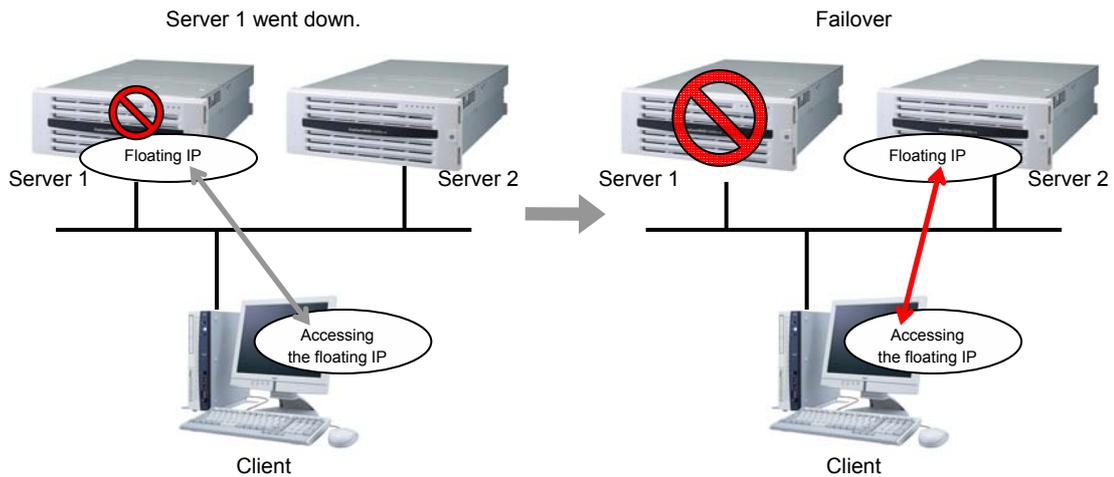


- A. Fsk Option (up to 1023 bytes)
Enter options to give to the fsck command when checking the file system on disk device.
Options are delimited with a space.
Specify options so that the fsck command does not work interactively.
Otherwise, you may not be allowed to mount until the "fsck timeout" elapses.
- B. Fsk timeout (1 to 9999)
Enter how many seconds you want to wait for the fsck command completion before its timeout when you check the file system on the disk device.
If the file system has a large size of disk space, it may take some time for the command to complete. Be careful about the value you specify.
- C. Initialize
Click this to reset the fsck option and fsck timeout to ExpressCluster default values.

5.4.8 Floating IP resources (FIP)

Client applications can use floating IP addresses to access cluster servers. By using floating IP addresses, clients can be unaware if accessing servers are switched even at “failover” and “group migration”.

Floating IP addresses can work on the same LAN and over the remote LAN.



(1) Address assignment

IP addresses to assign for floating IP addresses should;

be in the same network address as the LAN that contains the cluster server, and available host address.

Allocate as many IP addresses that meet the above conditions as required (generally as many as failover groups).

These IP addresses are the same as general host addresses, therefore, you can assign global IP addresses such as Internet.

(2) Switching method

By ARP broadcasting from the server, MAC addresses on ARP table are switched.

(3) Routing

You do not need to make settings for the routing table.

(4) Conditions to use

Floating IP addresses are accessible to the following machines;

- * Cluster server itself
- * The other servers in the same cluster, the servers in other clusters.
- * Clients on the same LAN as the cluster server and on remote LAN.

If the following conditions are satisfied, machines other than the above can access floating IP addresses. However, accessibility is not guaranteed for all models or architectures of machines. Test the accessibility carefully by yourself if you use those machines.

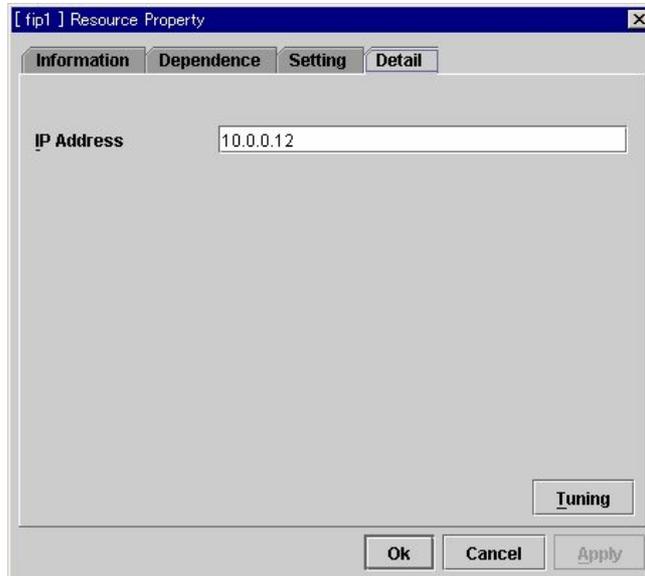
- * TCP/IP is used for the communication protocol.
- * ARP protocol is supported.

Even over LANs configured with switching hubs, floating IP address mechanism works properly.

When a server goes down, the TCP/IP connection the server is accessing will be disconnected.

5.4.9 Floating IP Resource Property: Detail tab

5.4.9.1 Floating IP Resource Property: Detail tab



(1) **IP Address** **StopRestart**

Enter the floating IP address to be used.

When setting the bonding, specify the bonding I/F name by using "%" to separate.
For details, see a separate guide, "Resource Details".

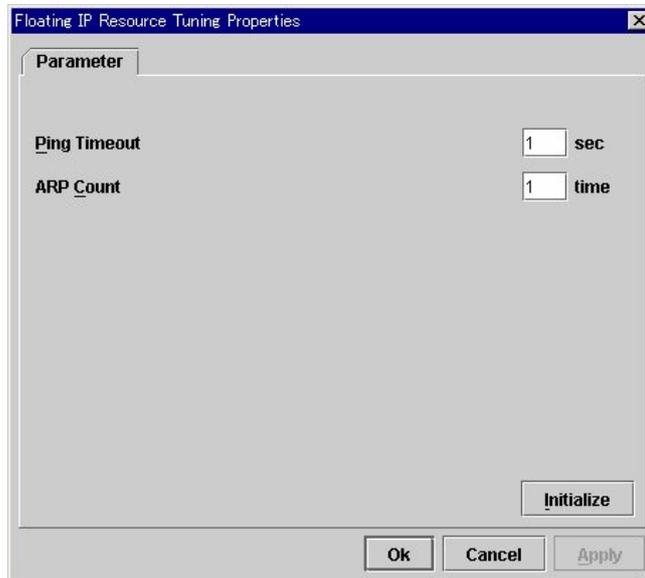
- An example of setting the bonding : 10.0.0.12%bond0

(2) **Tuning**

Click this. Then, you see the floating IP resource tuning properties dialog box where you can make detailed settings for the floating IP resource.

5.4.9.2 Floating IP Resource Tuning Properties

Detailed settings on floating IP resource are displayed.



(1) Ping timeout (0 to 999)

Specify how many seconds you want to wait for a ping command completion before its timeout (a ping command is issued to check if any IP addresses collide before activating floating IP resources).

If this is set to zero (0), the ping command will not be run.

(2) ARP Count (0 to 999)

Specify how many times you want to send ARP packets when activating/deactivating floating IP resources.

If this is set to zero (0), ARP packets will not be sent.

(3) Initialize

Click this to reset the ping timeout and ARP count to ExpressCluster default values.

5.4.10 Mirror disk resources ~ For LE ~

(1) Data mirroring disk

Data mirroring disks are a pair of disks that mirror disk data between two servers in a cluster.

Disks used by the OS (including disks controlled by /etc/fstab of the OS) cannot be mirrored. Add disks for mirroring.

You should give the same disk settings to disks on both servers if the disks are used as mirror disk.

* Disk type

Give the same disk type to mirror disks on both servers.

For disk types whose behaviors have been confirmed, see a separate guide, "Operational Environment".

Samples:

Combination	Server 1	Server 2
OK	SCSI	SCSI
OK	IDE	IDE
NG	IDE	SCSI

* Disk geometry

Give the same disk geometry to mirror disks on both servers.

It is recommended to use the same model of disks on both servers.

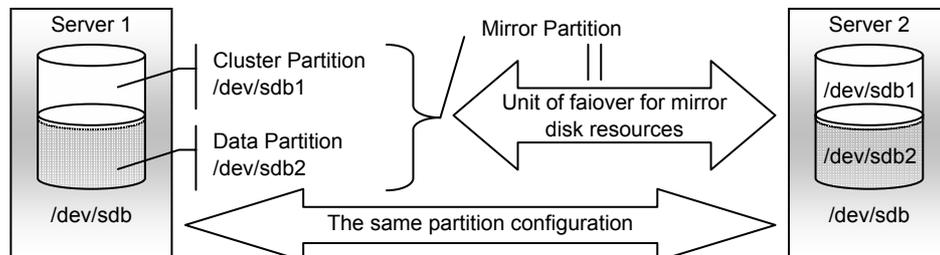
Samples:

Combination		Head	Sector	Cylinder
OK	Server 1	240	63	15881
	Server 2	240	63	15881
NG	Server 1	240	63	15881
	Server 2	120	63	31762

* Disk partition

Make settings so that the same partition is accessible with the same device name on both servers.

Sample: to make a pair of mirror disks by adding a SCSI disk on both servers for each.



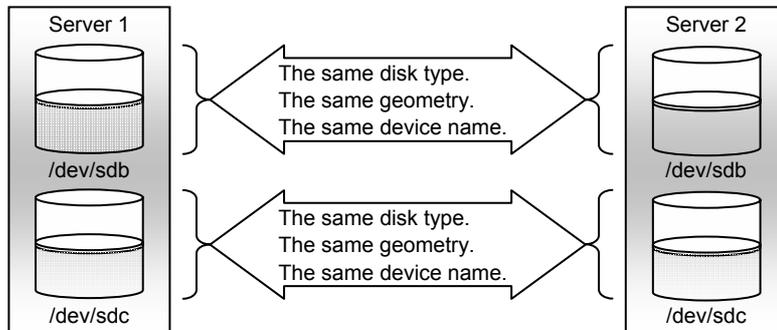
- + Partitions that mirror mirror disks are referred to as mirror partitions.
- + Allocate two partitions, the cluster partition and data partition, as a pair.

* Disk allocation

You can use more than one disks as mirror disks.

You can allocate more than one mirror partitions for a disk.

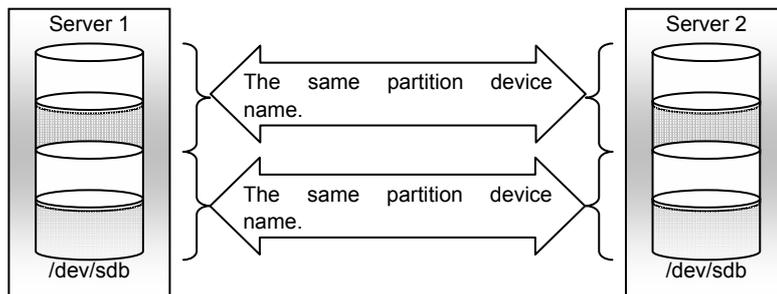
Sample: to make two pairs of mirror disks by adding two SCSI disks on both servers for each.



+ Allocate a cluster partition and data partition as a pair on a disk.

+ It is not allowed to use the data partition as first disk and the cluster partition as the second disk.

Sample: To make two mirror partitions by adding a SCSI disk on both servers for each.



* For disks, functions such as stripe set, volume set, mirroring, stripe set with parity by Linux md and LVM are not supported.

* To use hardware RAID, allocate a mirroring-dedicated LUN^a.

^a LUN is a logically allocated part of a whole disk which configures RAID. Depending RAID board vendors, it is referred to as pack or system disk.

(2) **Data partition**

Partitions where ExpressCluster Server stores mirrored data on mirror partitions (such as business application data) are referred to as data partitions.

Allocate data partitions as follows;

- * **data partition size**

The partition size should be a multiple of 4096 bytes, and a multiple of 4^a for the number of blocks.

- * **Partition ID**

83(Linux)

- * **You do not need to make the file system on data partitions.**

The file system is automatically made when clustering servers.

- * **For this version, it is confirmed that file systems, ext2, ext3 and xfs, work properly.**

- * **ExpressCluster Server controls accesses to the file system (mount/umount). Do not make settings about mount/umount on the OS**

(3) **Cluster partition**

Partitions dedicated for ExpressCluster Server's mirror partition controlling are referred to as Cluster partition.

Allocate cluster partitions as follows;

- * **Cluster partition size**

10 MB or more

Depending on the geometry, the size may be larger than 10 MB. This is not a problem.

- * **Partition ID**

83(Linux)

- * **A cluster partition and data partition for data mirroring should be paired.**

- * **You do not need to make the file system on cluster partitions.**

^a The default block size is 1024 bytes on Linux.

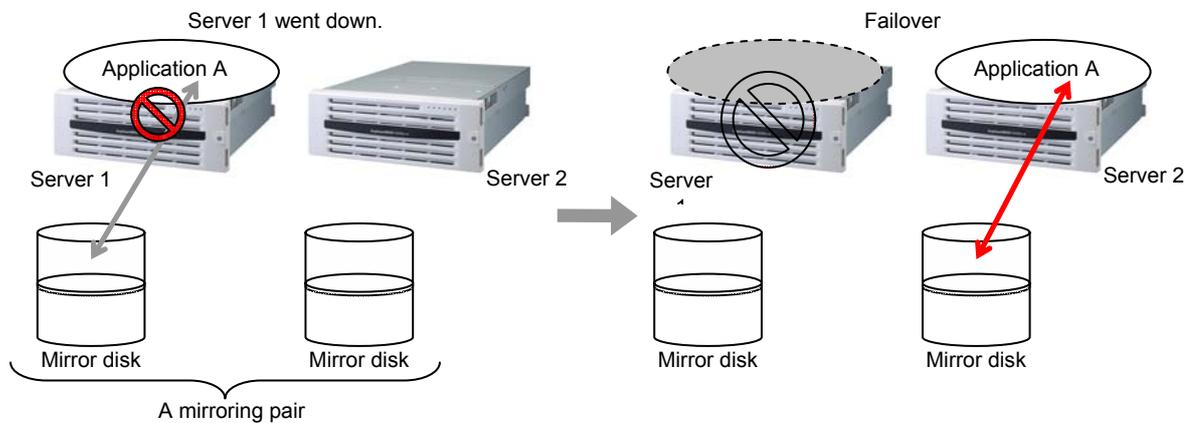
(4) Mirror partition

A mirror disk resource can handle a mirror partition.

Registered mirror disk resources are accessible only to one server (Normally the primary server).

Mirror partition's (mirror disk resource's) accessibility to business applications is the same as switching partition (disk resources) that uses shared disks.

- * Mirror partition switching is done for each failover group according to the failover policy.
- * By storing data required for business applications on mirror partitions, the data can automatically and seamlessly be used after failover/migration of failover group.



5.4.11 Mirror Disk Resource Property: Detail tab ~ For LE ~

5.4.11.1 Mirror Disk Resource Property: Detail tab

The screenshot shows a window titled "[md1] Resource Property" with a close button. It contains four tabs: "Information", "Dependence", "Setting", and "Detail". The "Detail" tab is selected. The fields and their values are as follows:

Field Name	Value
Mirror Partition Device Name	/dev/NMP1
Mirror Mount Point	/mnt/sdb2
Data Partition Device Name	/dev/sdb2
Cluster Partition Device Name	/dev/sdb1
Disk Device Name	/dev/sdb
File System	ext3
Mirror Data Port Number	29051

At the bottom right of the dialog is a "Tuning" button. At the very bottom are "Ok", "Cancel", and "Apply" buttons.

(1) Mirror Partition Device Name

Select a mirror partition device name to be associated with the mirror partition.

(2) Mirror mount point (up to 1023 bytes)

Specify a directory to mount the mirror partition device.
The name should begin with "/".

(3) Data Partition Device Name (up to 1023 bytes)

Specify a data partition device name to be used for a disk resource.
The name should begin with "/".

(4) Cluster Partition Device Name (up to 1023 bytes)

Specify a cluster partition device name to be paired with the data partition.
The name should begin with "/".

(5) Disk Device Name (up to 1023 bytes)

Specify a device name that represents the whole disk that contains the mirroring partition.
The name should begin with "/".

(6) File System

You select a file system type to be used on the mirror partition,

- + ext2
- + ext3
- + xfs

(7) Mirror Data Port Number (1 to 65535 ^a)

Enter a TCP port number to be used for sending/receiving disk data between servers.

(8) Tuning

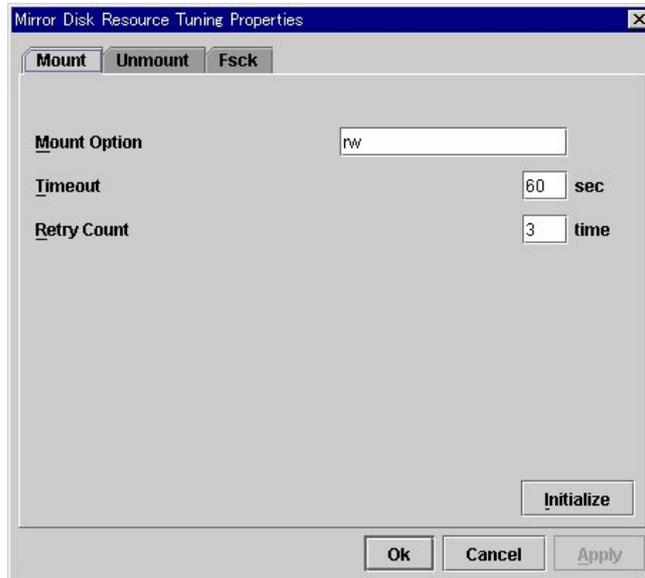
Click this. Then, you see the Mirror Disk Resource Tuning Properties dialog box. You make detailed settings for the mirror disk resource there.

^a It is strongly recommended not to use well-known ports, especially reserved port from 1 to 1023.

5.4.11.2 Mirror Disk Resource Tuning Properties

(1) Mount tab

You see details on mount.



- A. Mount Option (up to 1023 bytes)
Enter options to give the mount command when mounting the file system on the mirror partition device.
Options are delimited with commas (,).

+ A mount option sample

Setting Item	Setting Value
mirror partitiondevice name	/dev/NMP5
Mirro mount point	/mnt/sdb5
file system	ext3
Mount option	rw,data=journal

The mount command to be run with the above settings is,
`mount -t ext3 -o rw,data=journal /dev/NMP5 /mnt/sdb5`

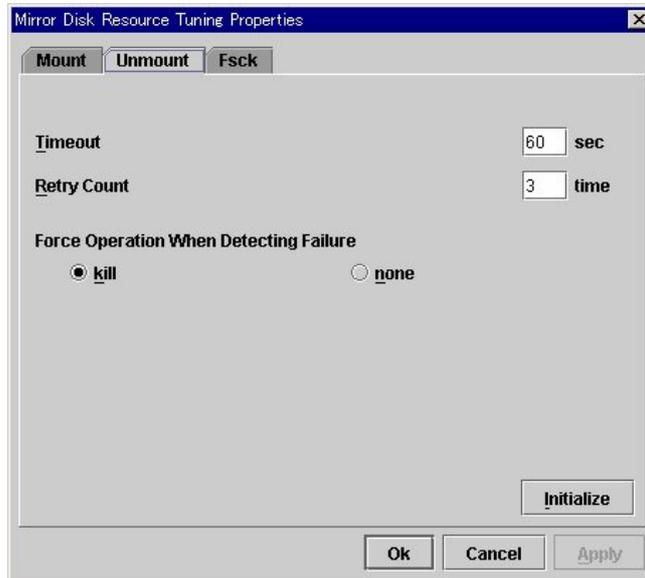
- B. Timeout (1 to 999)
Enter how many seconds you want to wait for the mount command completion before its timeout when you mount the file system on the mirror partition device.
If the file system has a large size of disk space, it may take some time for the command to complete. Be careful about the value you specify.

- C. **Retry Count (0 to 999)**
Enter how many times you want to retry to mount the file system on the mirror partition device when one fails.
If you set this to zero (0), no mount will be retried.

- D. **Initialize**
Click this to reset the mount option, timeout, retry count to the ExpressCluster default values.

(2) Unmount tab

You see details on unmount.

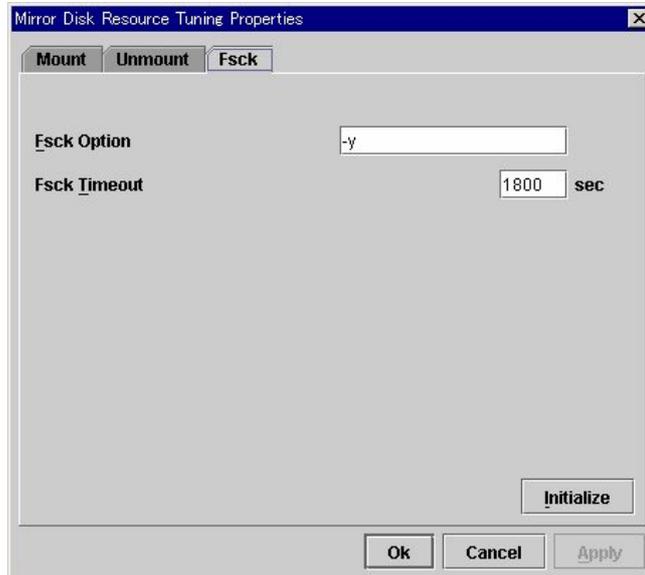


- A. Timeout (1 to 999)
Enter how many seconds you want to wait for the unmount command completion before its timeout when you unmount the file system on the mirror partition device.
- B. Retry Count (0 to 999)
Enter how many times you want to retry to unmount the file system on the mirror partition device when one fails.
If you set this to zero (0), no unmount will be retried.
- C. Forced Operation When Detecting Failure
Select an action to be taken at an unmount retry if you failed to unmount.
 - [Kill]
Select this to try to kill the processes that are accessing the mount point.
Not always the process can be killed.
 - [None]
Select this not to try to kill the processes that are accessing the mount point.
- D. Initialize
Click this to reset the timeout, retry count and forced operation at abnormality detection to ExpressCluster default values.

(3) Fsk tab

You see details on Fsk.

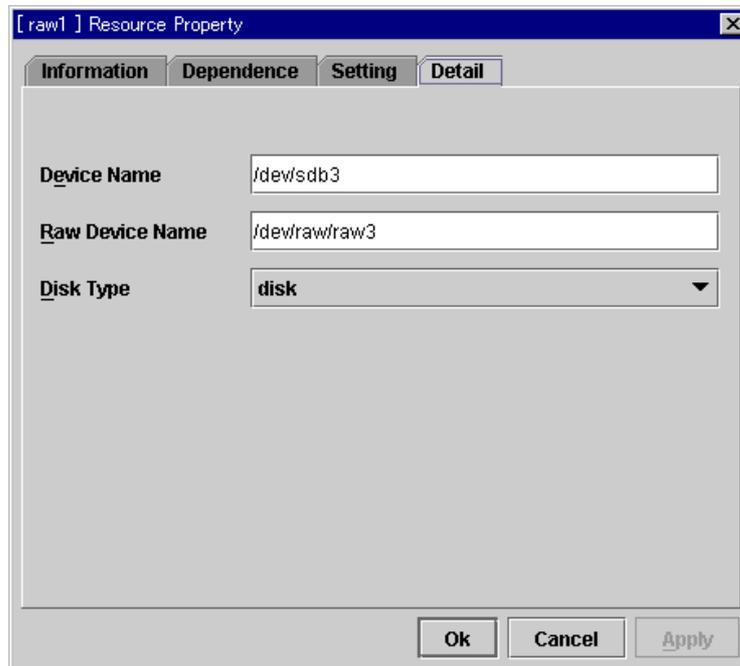
Fsk is run before the mount command when mounting the disk resource.



- A. Fsk Option (up to 1023 bytes)
Enter options to give the fsck command when checking the file system on the mirror partition device.
Options are delimited with a space.
Specify options so that the fsck command does not work interactively.
Otherwise, you may not be allowed to mount until the "fsck timeout" elapses.
- B. Fsk timeout (1 to 9999)
Enter how many seconds you want to wait for the fsck command completion before its timeout when you check the file system on the mirror partition device.
If the file system has a large size of disk space, it may take some time for the command to complete. Be careful about the value you specify.
- C. Initialize
Click this to reset the fsck option and fsck timeout to ExpressCluster default values.

5.4.12 Raw Resource Property: Detail tab ~ For SE ~

5.4.12.1 Raw Resource Property: Detail tab



The screenshot shows a window titled "[raw1] Resource Property" with a close button (X) in the top right corner. The window has four tabs: "Information", "Dependence", "Setting", and "Detail". The "Detail" tab is selected. Below the tabs are three input fields:

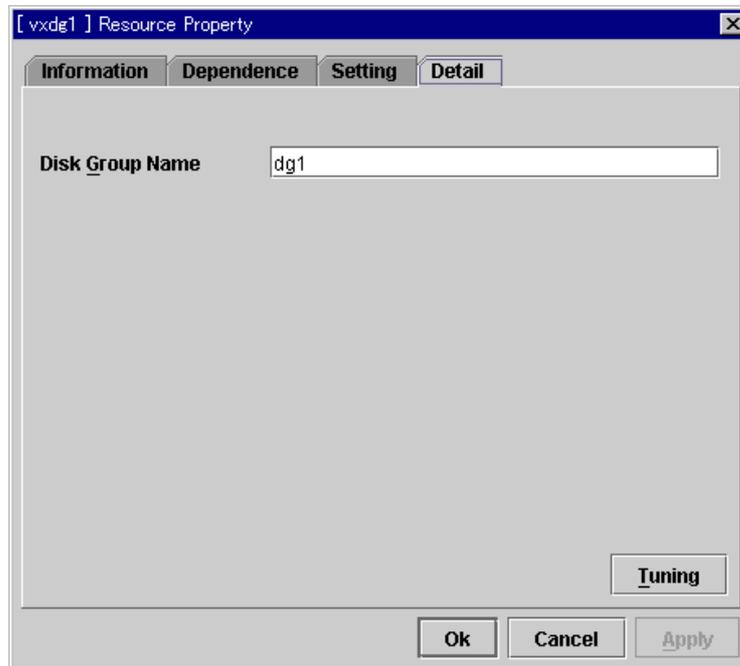
- Device Name:** A text box containing the value "/dev/sdb3".
- Raw Device Name:** A text box containing the value "/dev/raw/raw3".
- Disk Type:** A dropdown menu with "disk" selected.

At the bottom of the dialog are three buttons: "Ok", "Cancel", and "Apply".

- (1) **Device Name (up to 1023 byte)** **StopRestart**
Enter the name of a real device, in a shared disk, which will be used as a raw resource.
The name must start with “/.”
- (2) **Raw Device Name (up to 1023 byte)** **StopRestart**
Enter the name of a device used for a raw access.
The raw device that is already registered in “Disk I/F List” and “Raw Monitor Resource” of the server property cannot be registered.
The raw device that is registered in the VxVM volume resource cannot be registered.
For details of the Raw device of VxVM volume resource, see a separate guide, “Resource Details”.
The name must begin with “/.”
- (3) **Disk Type** **StopRestart**
Specify the disk type.
Only [disk] can be selected.

5.4.13 VxVM Disk Group Resource Property: Detail tab ~ For SE ~

5.4.13.1 VxVM Disk Group Resource Property: Detail tab

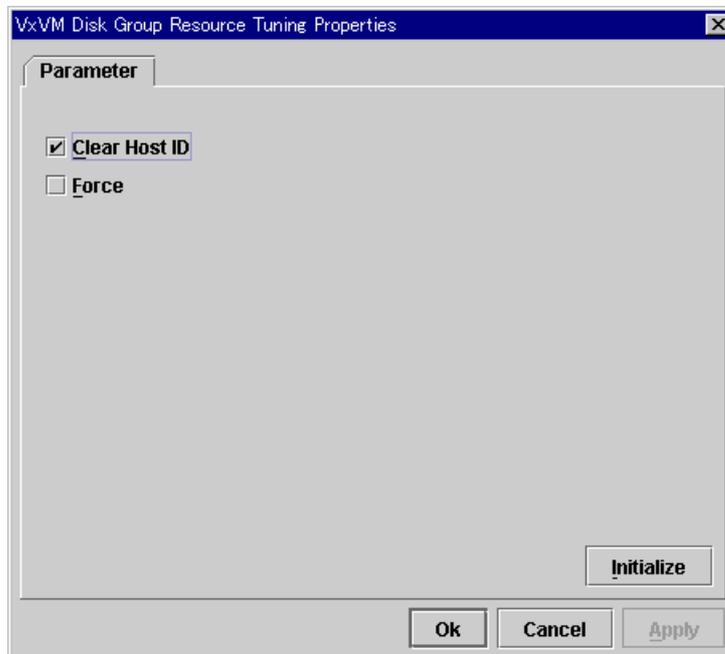


- (1) **Disk Group Name (up to 31 byte)** **StopRestart**
Enter the VxVM disk group name.

5.4.13.2 VxVM Disk Group Resource Tuning Properties

(1) Parameter tab

You see details on VxVM disk group resource.



A. Clear Host ID

When general importing of the VxVM disk group fails, the importing is set by performing Clear Host ID.

The import command which will be performed by the setting written above is:
`vxdg -tC import [disk group]`

B. Force

When general importing of the VxVM Disk Group fails and re-importing by Clear Host ID setting fails, force import will be set.

The import command which will be performed by the setting written above is:
If the "Clear Host ID" option is OFF : `vxdg -tf import [disk group]`
If the "Clear Host ID" option is ON : `vxdg -tCf import [disk group]`

5.4.14 VxVM Volume Resource Property: Detail tab ~ For SE ~

5.4.14.1 VxVM Volume Resource Property: Detail tab

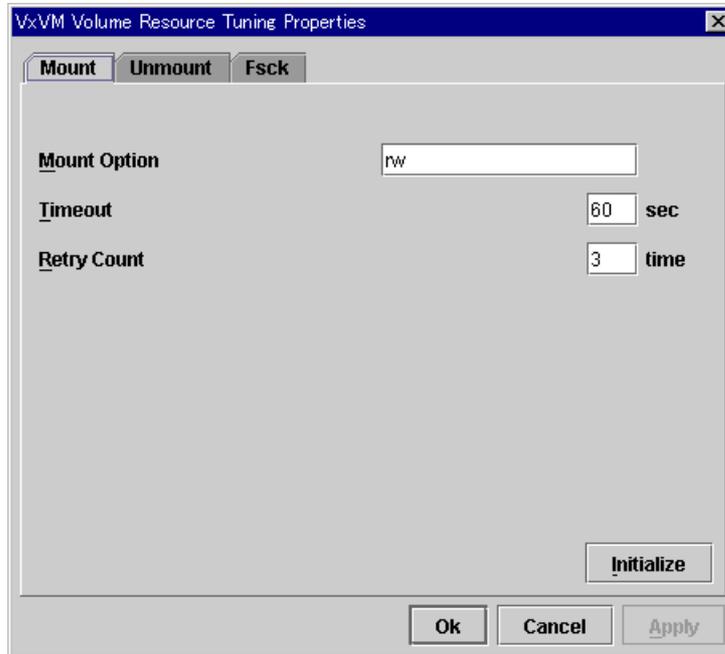
The screenshot shows a dialog box titled "[vxvol1] Resource Property" with a close button (X) in the top right corner. The dialog has four tabs: "Information", "Dependence", "Setting", and "Detail", with "Detail" selected. The "Detail" tab contains four fields: "Volume Device Name" with the value "/dev/vx/dsk/dg1/vol1", "Volume Raw Device Name" with the value "/dev/vx/rdisk/dg1/vol1", "Mount Point" with the value "/mnt/vxvol1", and "File System" with a dropdown menu showing "vxfs". At the bottom right of the dialog is a "Tuning" button. At the bottom center are three buttons: "Ok", "Cancel", and "Apply".

- (1) **Volume Device Name (up to 1023 byte)**
Enter the name of a volume device used as the VxVM volume resource.
The name must begin with a "/."
- (2) **Volume Raw Device Name (up to 1023 byte)**
Enter the name of a RAW device used as the VxVM volume resource.
The name must begin with a "/."
- (3) **Mount Point (up to 1023 byte)** **StopRestart**
Set the directory to mount the VxVM volume device.
The name must begin with a "/."
- (4) **File System (up to 15 byte)**
Specify the type of the file system created on the VxVM Volume Device.
Select from the followings. You may also enter it directly.
+ vxfs

5.4.14.2 VxVM Volume Resource Tuning Properties

(1) Mount tab

You see details on mount.



- A. Mount Option (up to 1023 byte)
Sets the option that is passed to the mount command when mounting the VxVM volume device.
Multiple options are separated by a comma “,”.

+ A mount option sample

Setting Item	Setting Value
Volume Device Name	/dev/vx/dsk/dg1/vol1
Mount Point	/mnt/vxvol1
File System	vxfs
Mount Option	rw

The mount command which will be performed by the setting written above:
`mount -t vxfs -o rw /dev/vx/dsk/dg1/vol1 /mnt/vxvol1`

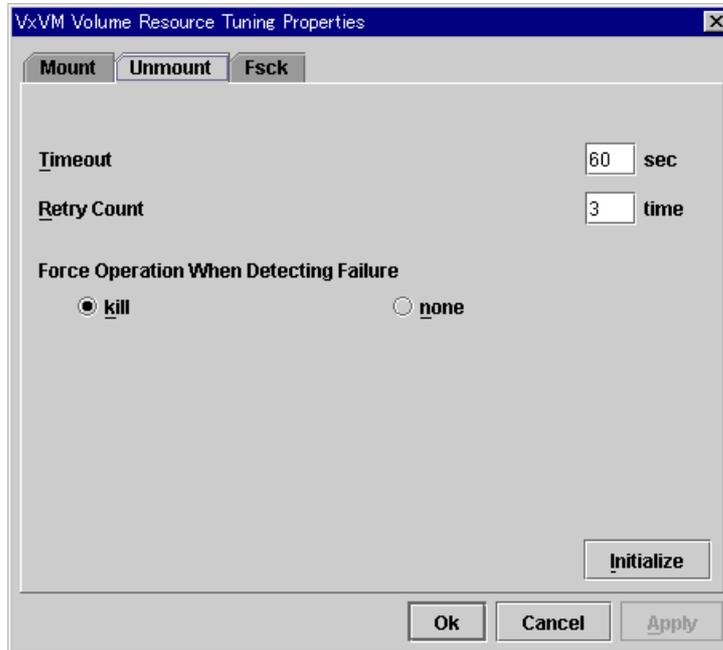
- B. Timeout (1 to 999)
Sets the timeout to wait for the end of the mounting command which is used to mount the VxVM volume device.
This may take some time if the file system capacity is large. Pay attention to the setting value.

- C. Retry Count (0 to 999)
 Sets the retry count used when failed to mount the VxVM volume device
 Retry will not be run if 0 is set.

- D. Initialize
 Sets the default value of EXPRESSCLUSTER on the mount option, timeout
 and retry count.

(2) **Unmount tab**

You see details on unmount.

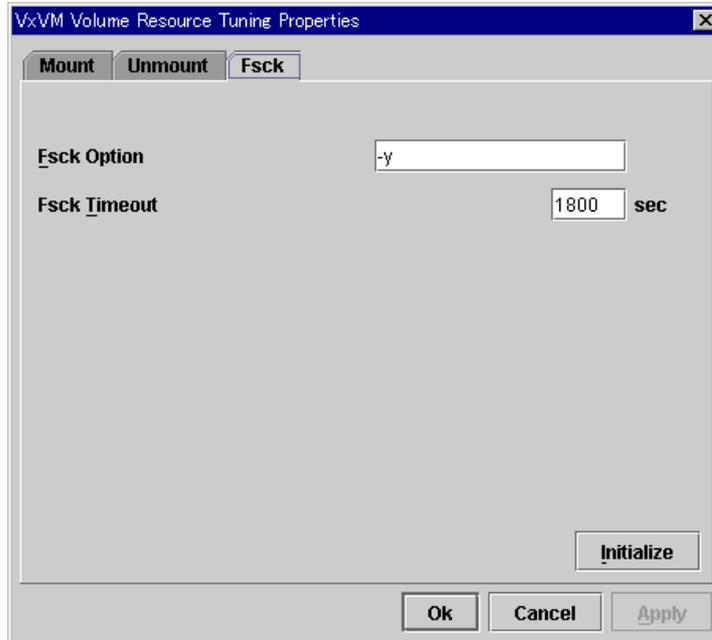


- A. Timeout (1 to 999)
Sets the timeout to wait for the unmount command used to unmount the VxVM volume device.
- B. Retry Count (0 to 999)
Specifies the unmount retry count used when failed to unmount the VxVM volume device.
Retry cannot be run if 0 is set.
- C. Force Operation When Detecting Failure
When retrying unmounting after unmount has failed, the operation to be performed is chosen from the followings:
 - [kill]
Attempt to forcefully terminate the process that is accessing the mount point.
The process cannot necessarily be forcefully terminated.
 - [none]
Do not attempt to forcefully terminate the process that is accessing the mount point.
- D. Initialize
The default value of EXPRESSCLUSTER will be set for the timeout, retry count, and force action when failure is detected.

(3) Fsk tab

You see details on Fsk.

Fsk is performed when failed to mount the VxVM volume device.



A. Fsk Option (up to 1023 byte)

When checking the VxVM volume device, specify the option to pass to the fsck command.

To set multiple options, use a space to separate the options.

Specify the option so the fsck command will not operate interactively.

If the fsck command operates interactively, resource activation becomes an error after "fsck timeout" progress.

If the file system is reiserfs, the command operates interactively. However, it is avoided by EXPRESSCLUSTER passing "Yes" to reiserfsck.

B. Fsk Timeout (1 to 9999)

Specifies the timeout to wait for the fsck command to end when checking the VxVM volume device.

This may take some time if the capacity of the file system is large. Pay attention to the set value.

C. Initialize

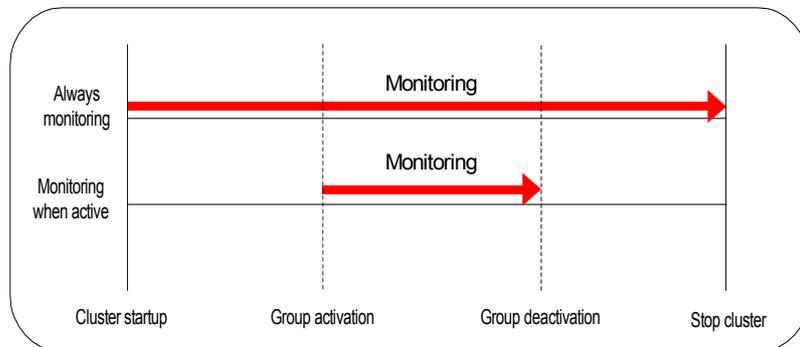
A default value of EXPRESSCLUSTER is set for the fsck option and the fsck timeout.

5.5 Monitor Resource

Monitor Resource monitors specified targets. If an abnormality is detected in a target, Monitor Resource restarts/fails over the group resource.

The following monitor resources can be monitored. Monitorable statuses are divided into two groups.

- + Always monitored (From the cluster startup to the cluster stop)
 - = Disk monitor resource
 - = IP monitor resource
 - = User space monitor resource
 - = Mirror disk monitor resource
 - = mirror disk connect monitor resource
- + Monitored when active (From the group activation to the group deactivation)
 - = Pid monitor resource



If an abnormality is detected, the following countermeasures are taken.
However, the following recovery operation will not be performed if the recovery object is non-activity.

- + Reactivation is tried if an abnormality is detected in a resource being monitored.
- + Failover is tried if reactivation retries fail as many times as the reactivation threshold.
- + The final action is taken if an abnormality is detected even after failovers are performed as many times as the failover threshold.



If the group resource (disk resource, exec resource...) is set as the recovery target at the setting when a failure of monitor resource is detected and monitor resource detected a failure during the recovery operation transition (reactivation -> failover -> final action), do not perform the following command, and control the cluster and group from Web manager.

- + termination/suspension of cluster
- + start/terminate/migrate group

If you perform the control written above during the recovery operation transmission due to a monitor resource failure, the group resource of other group may not terminate.

In addition, if after final action has been done, the control written above may be performed even when the monitor resource is in a failure status.

The following pages describe the monitor resource work flow at abnormality detection based on the sample settings below.

Sample setting:

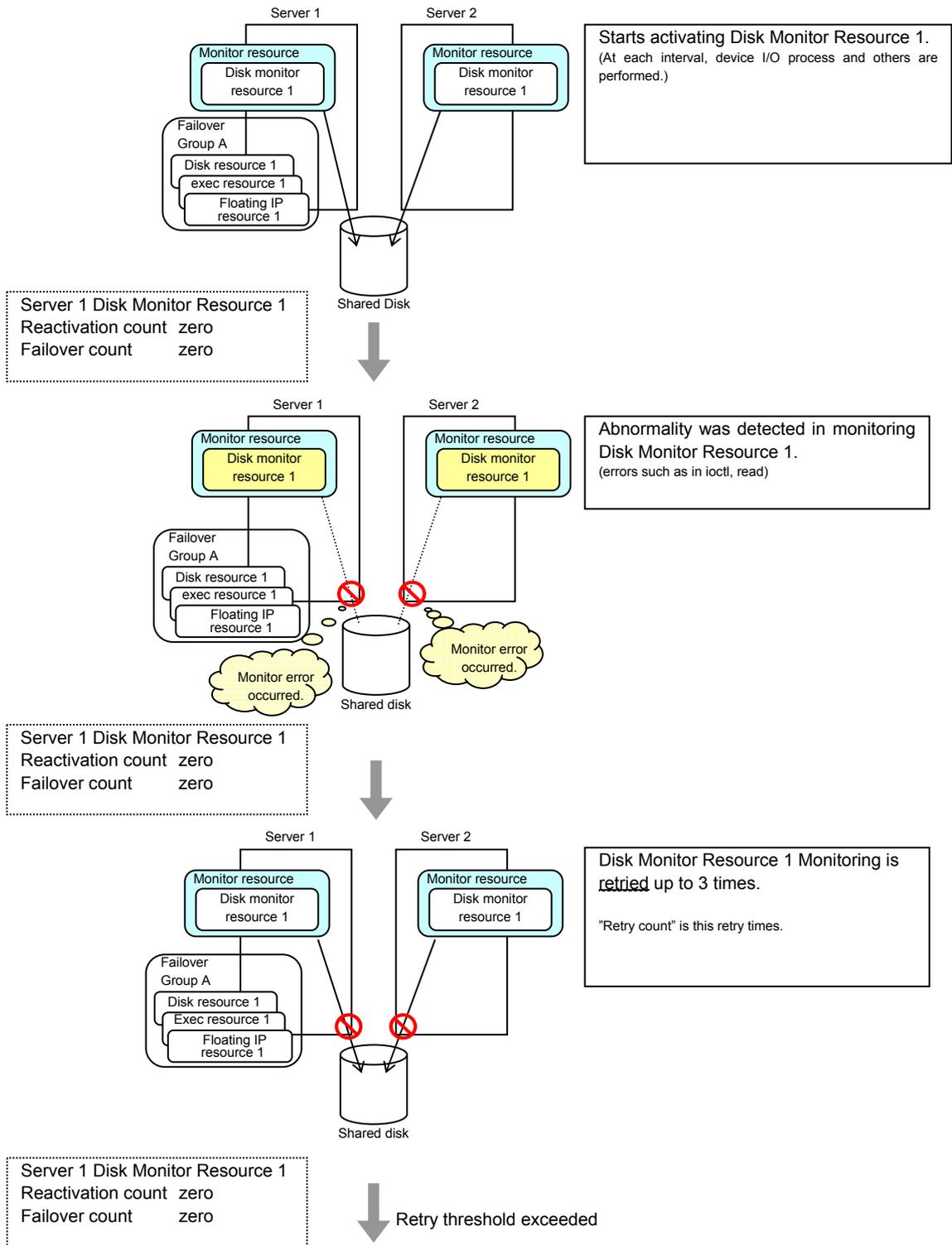
<Monitor>

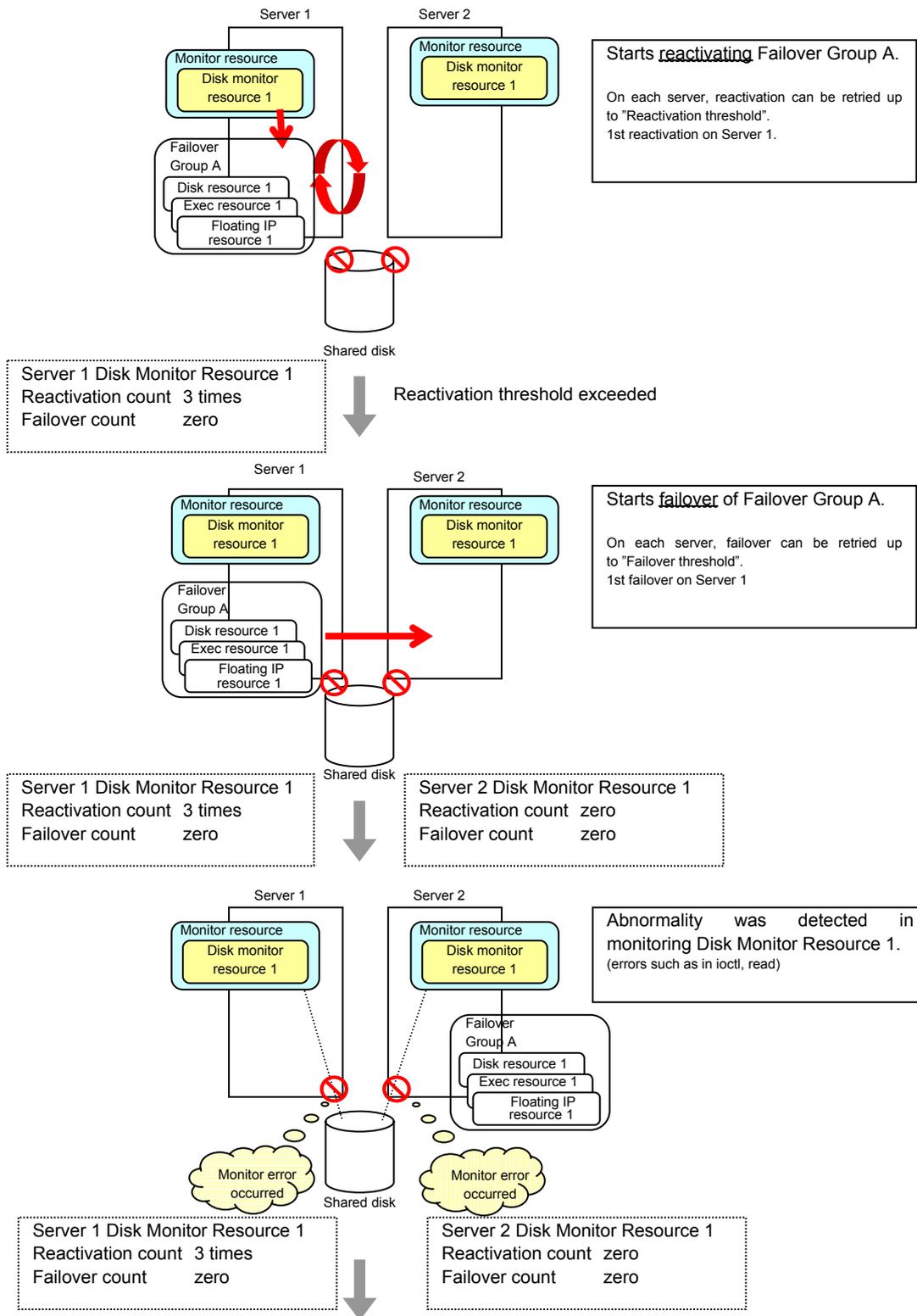
Interval	60 seconds
Timeout	120 seconds
Retry count	3 times

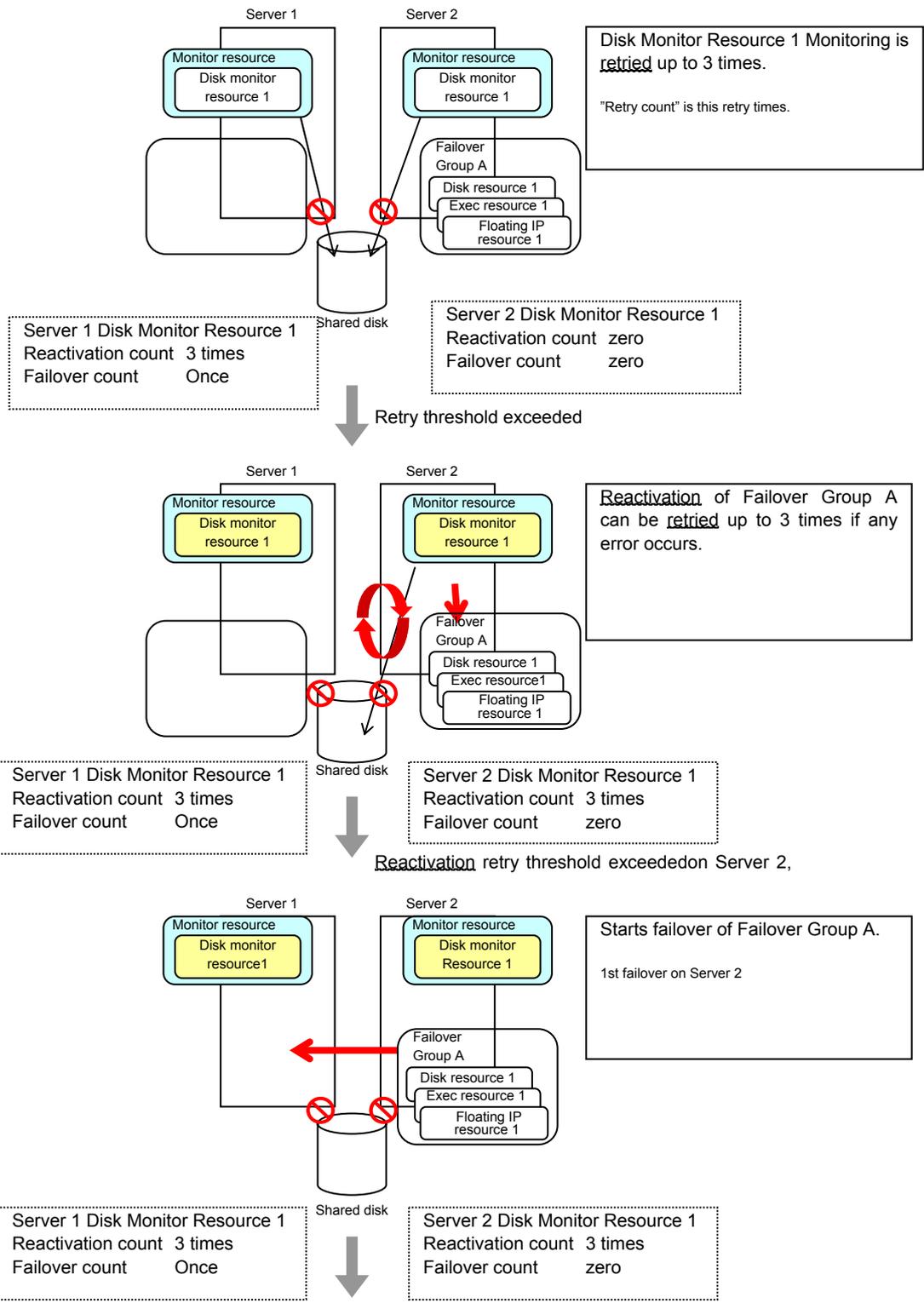
<Abnormality detection>

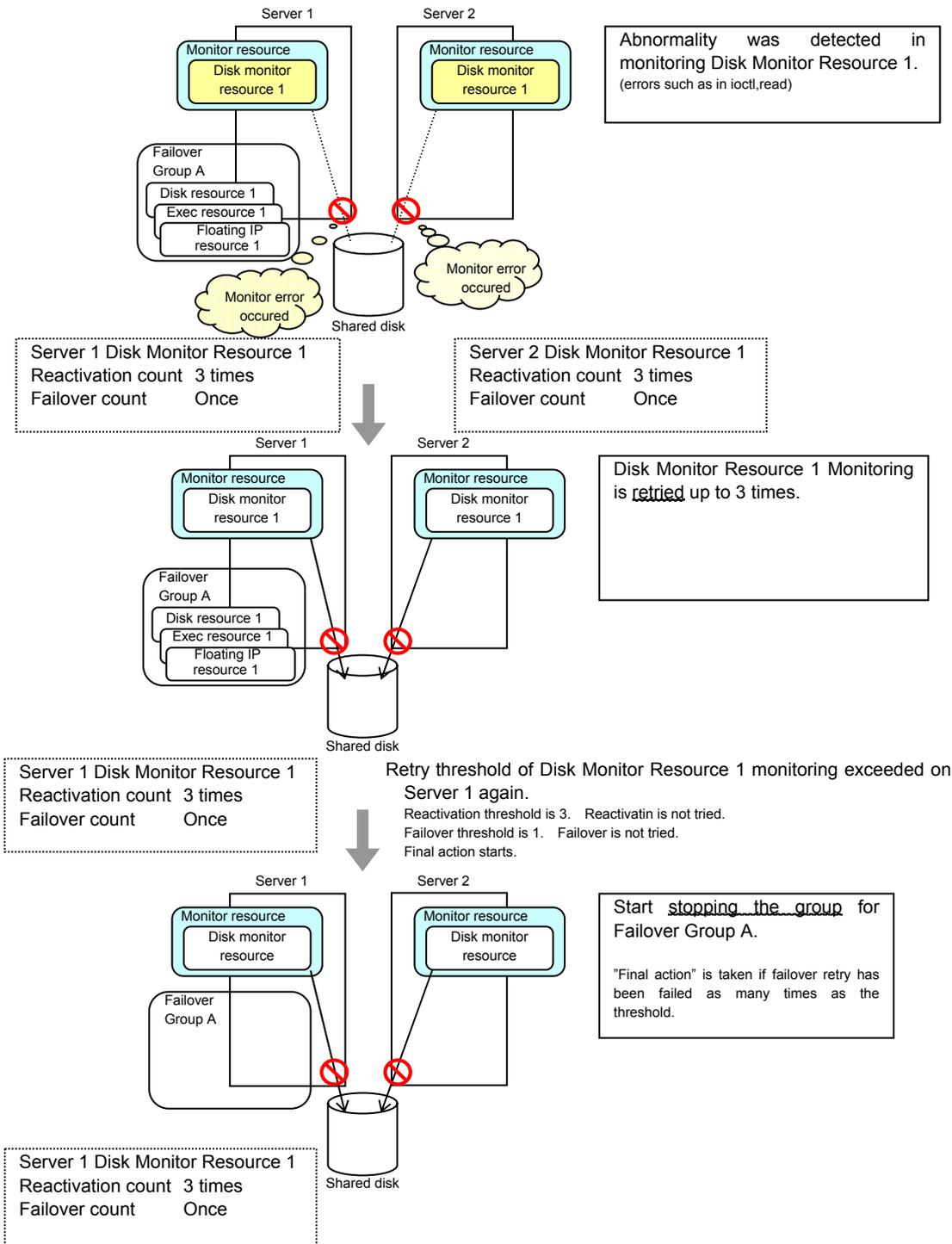
Recovery object	Group A
Reactivation threshold	3 times
Failover threshold	Once
Final Action	Stop group

Actions to be taken with the above settings at abnormality detection are illustrated on the following pages.









Supplement:

When the monitor resource recovers from abnormal to normal on the monitored server, the counters for reactivation and failover are reset to zero (0).

These sample work flows assume the health of interconnect LAN.

When all interconnect LANs are disconnected, internal communications are disabled among servers. Therefore, even if an abnormality is detected on a server being monitored, the group failover process fails.

A way to fail over the group when all interconnect LANs are disconnected is to shut down the server where the abnormality is detected. If the server is shut down, other servers can detect it and start the group's failover.

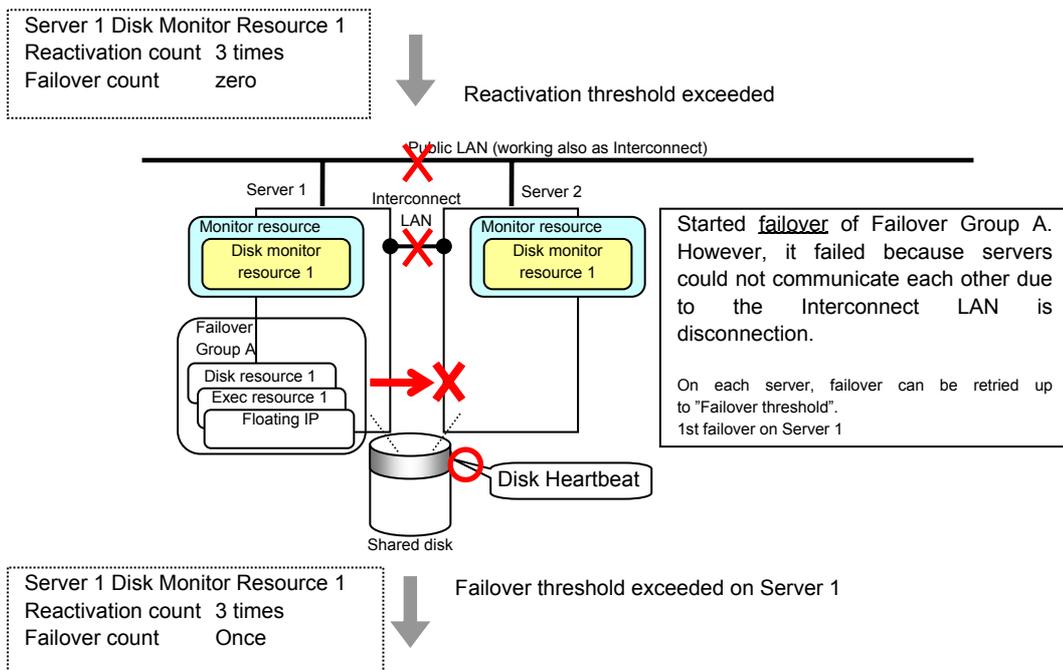
The following pages describe, based on the sample settings below, the abnormality detection work flow on the condition that all interconnect LANs are disconnected.

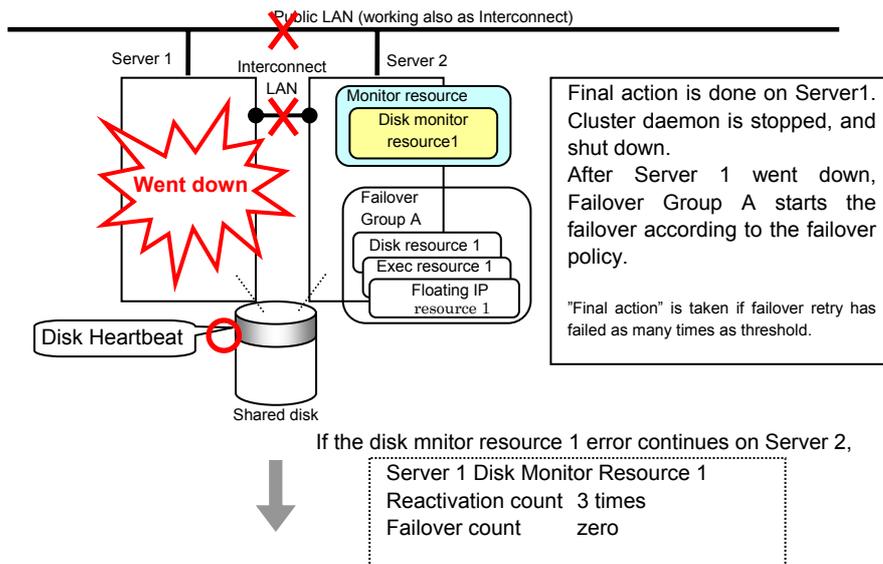
Sample setting:	
<Monitor>	
Interval	60 seconds
Timeout	120 seconds
Retry count	3 times
<Abnormality detection>	
Recovery object	Failover Group A
Reactivation threshold	3 times
Failover threshold	Once
Final Action	Stop Cluster Daemon And OS Shutdown

Actions to be taken with the above settings at abnormality detection are illustrated on the following pages.

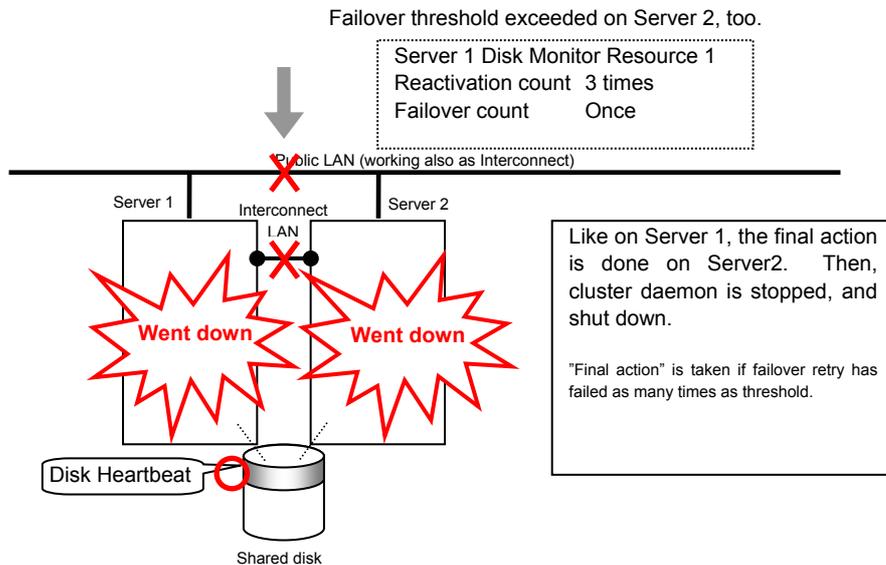
The recovery object reactivation process is the same as when the interconnect LANs are healthy.

Starting from the failover process on Server 1 which requires interconnect LAN, the work flow is explained below.

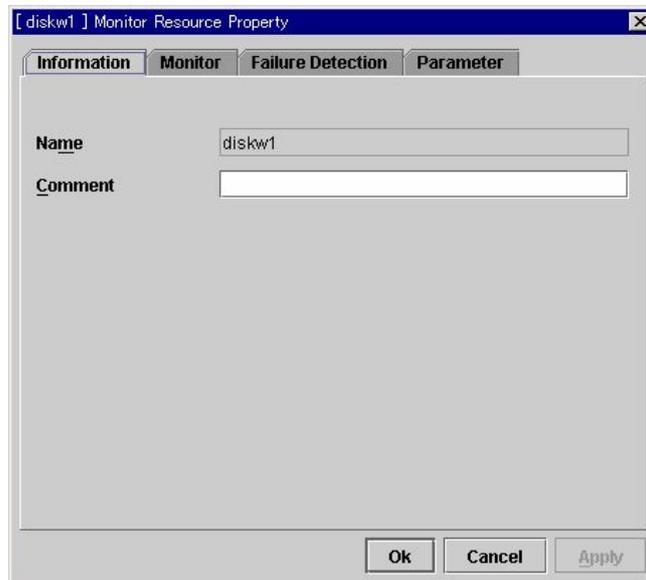




Reactivation is tried for Group A on Server 2 as done on Server 1. On Server 2 also, failover is tried if reactivation fails for Group A. However, because there is no server that the failover group can move to, no failover can successfully complete. If failover fails as many times as the threshold, the final action is taken on Server 2 as done on Server 1.



5.5.1 Information tab (common to monitor resources)

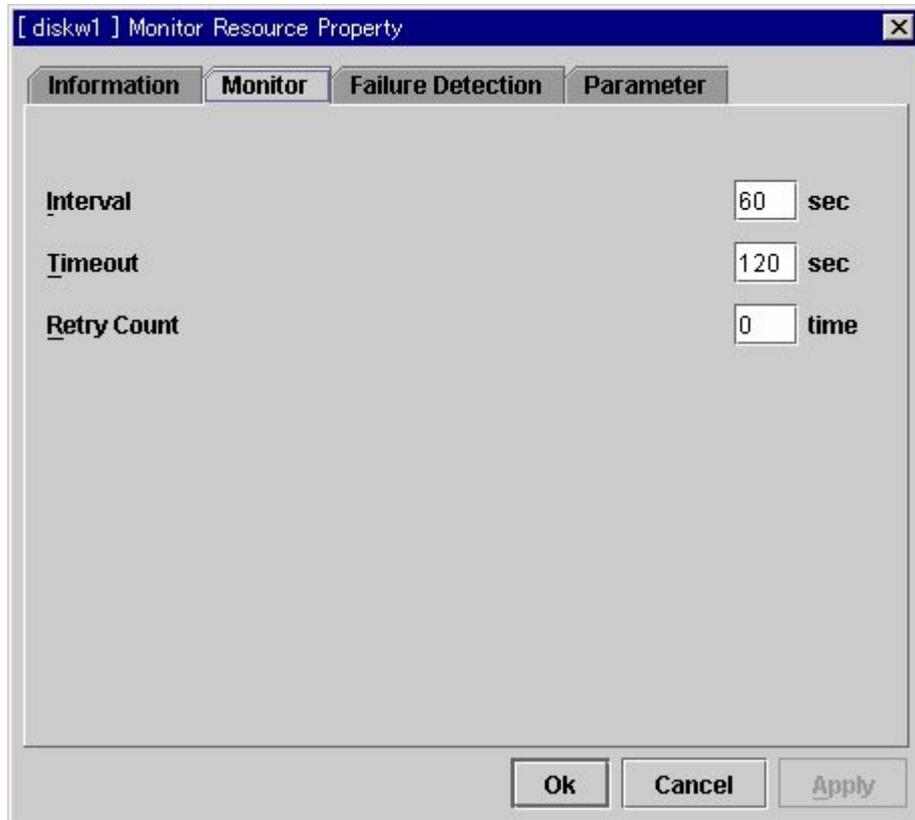


- (1) **Name**
You see a monitor resource name.
You cannot rename this here.

- (2) **Comment (up to 127 bytes)**
You enter a comment for the above monitor resource.

5.5.2 Monitor tab (common to monitor resources)

You see details on the monitor resource.



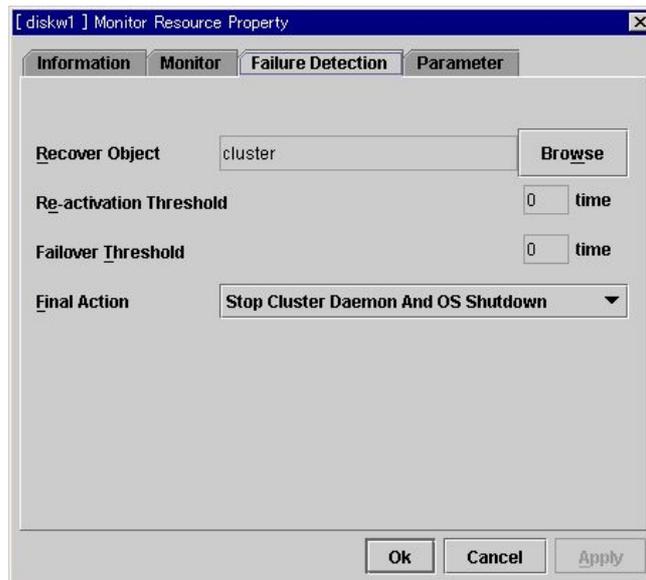
- (1) **Interval (1 to 999)** **SuspendResume**
Specify at how many seconds interval you want to check the monitor target.
- (2) **Timeout (5 to 999)** **SuspendResume**
Specify a timeout. An abnormality is determined if the normal status can not be detected within the time specified here.
- (3) **Retry Count (0 to 999)** **SuspendResume**
Specify how many times an abnormality should be detected in a row after the first detection before it is determined as abnormal.
If you set this to zero (0), an abnormality is determined at the first detection.

5.5.3 Failure Detection tab (common to monitor resources)

You specify a recovery object and action to be taken at abnormality detection.

You can select actions such as group failover, resource restart and cluster restart as the action to be taken at abnormality detection.

However, recovery operation will not be performed if the recovery object is non-activity.



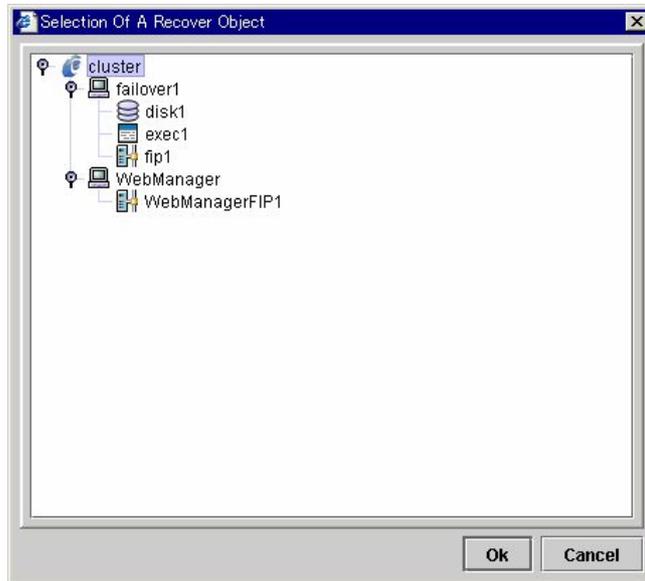
(1) **Recovery Object** **SuspendResume**

You see an object to be recovered when a resource abnormality is determined.

(2) **Browse SuspendResume**

Click this. Then, you see a dialog box where you can select a recovery object. Cluster name, group names and resource names registered in the cluster are displayed in a tree view.

Select an object as recovery object. Click [OK].



(3) **Re-activation Threshold (0 to 99) SuspendResume**

Specify how many times you want to try reactivation at abnormality detection.

If this is set to zero (0), no reactivation is tried.

This is enabled when a group or group resource is selected in Recovery Object.

(4) **Failover Threshold (0 to 99) SuspendResume**

Specify how many times you want to try failover if reactivation failed as many times as "Reactivation Threshold" at abnormality detection.

If this is set to zero (0), no failover is tried.

This is enabled when a group or group resource is selected in Recovery Object.

(5) Final Action `SuspendResume`

Select a final action to be taken if failover fails as many times as Failover Threshold after reactivation failed as many times as Reactivation Threshold at abnormality detection.

You can select a final action from,

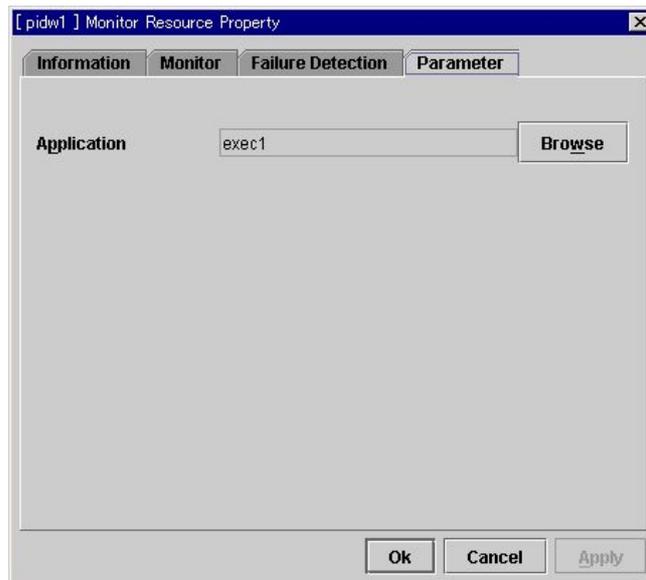
- + No Operation
 - = No action is taken.
- + Stop Group
 - = If a group is selected for the monitor target, this option stops the group. If a group resource is selected for the monitor target, this option stops the group that contains the group resource. This is disabled if a cluster is selected for the monitor target.
- + Stop Cluster Daemon
 - = Stops the cluster daemon on the server where the abnormality is detected.
- + Stop Cluster Daemon And OS Shutdown
 - = Stops the cluster daemon on the server where the abnormality is detected, then, shuts down the OS.
- + Stop Cluster Daemon and OS Reboot
 - = Stops the cluster daemon on the server where the abnormality is detected, then, restarts the OS.

5.5.4 Pid monitor resource

If you select an exec resource here, it will be monitored if activated. Monitoring the presence of process ID, an abnormality is determined when the process ID disappeared.

You can select only exec resources whose startup setting is [Asynchronous] for monitor target.

By this setting, you cannot detect if a process stalls.



(1) Application

You see the exec resource to be monitored.

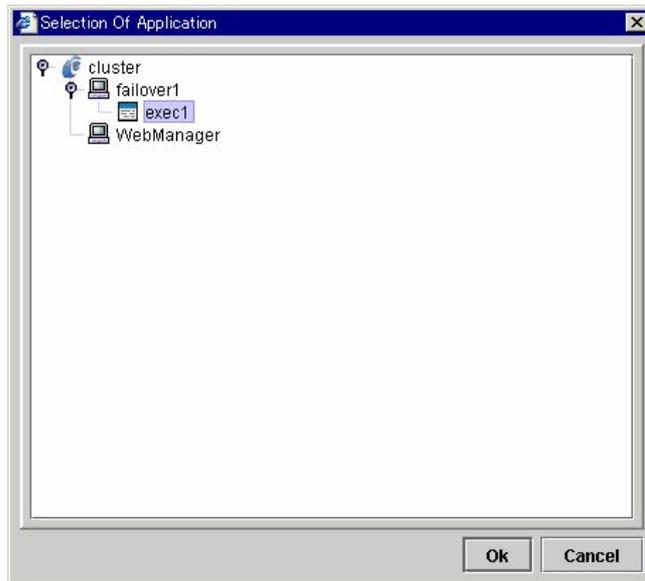
(2) Browse

Click this. Then, you see a dialog box where you can select an application for the exec resource to be monitored.

Among exec resources registered in the cluster, only exec resources whose Start Script is set to [Asynchronous] are displayed in a tree view.

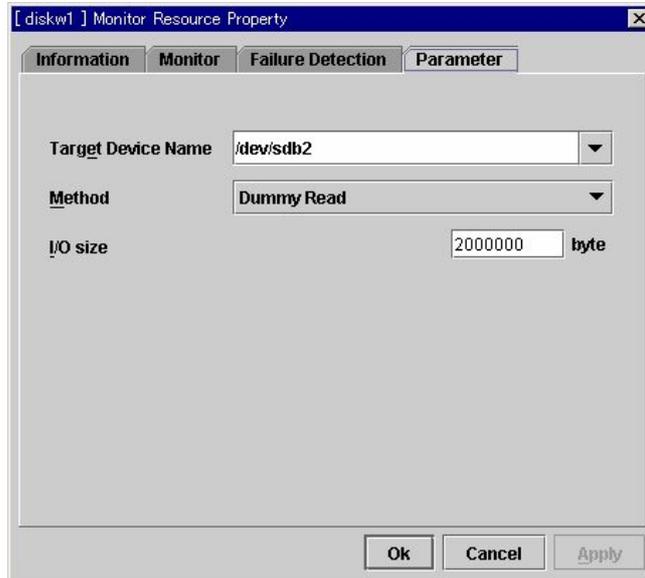
You can select only exec resources in this view.

Select an exec resource. Click [OK].



5.5.5 Disk monitor resource

You specify a disk device for the monitor target.



(1) **Target device name (up to 1023 bytes)**

Specify a disk device name that you want to monitor.

The name should begin with "/".

If disk resources exist, you can select a device name specified in Disk Resource Properties: Detail tab.

If mirror disk resources exist, you can select a data partition device name specified in Mirror Disk Resource Properties: Detail tab.

(2) Method

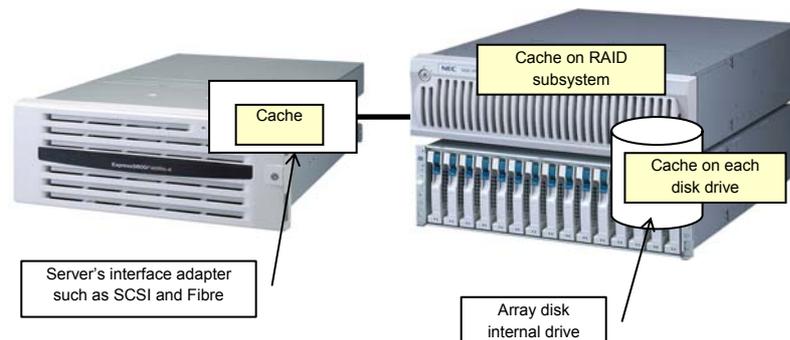
You select how to monitor the disk device from

- * TUR (Test Unit Ready)
 - + Test Unit Ready (TUR) command (one of SCSI commands) is issued to the specified device. Monitoring the command result, an abnormality is examined.
 - + Test Unit Ready command can not be run on disks or disk interfaces (HBA) which does not support it.
Even if hardware supports this command, its driver may not support it. Confirm the driver specifications, too.
 - + Compared to Dummy Read method, loads on the OS and disks are not heavy.
 - + In some cases, Test Unit Ready may not be able to detect actual I/O errors to media.
- * Dummy Read
 - + This method reads data of the specified size on the specified device (disk device or partition device). Based on the result (the size of actually read data), an abnormality is examined.
 - + This method examines if the specified size of data can be read. Validity of read data is not examined.
 - + The larger the size to read, the heavier the loads on the OS and disks.
 - + Note the followings in (3) about the size of data to be read.

(3) I/O size (1 to 9999999)

Enter the size of data for Dummy Read if Dummy Read is selected in Method.

- = Depending on shared disks and interfaces in your environment, the size of actually installed cache for reading varies.
- = Therefore, if the specified Dummy Read size is too small, Dummy Read may hit in cache, i.e. may not be able to detect I/O errors.
- = When you specify a Dummy Read size, confirm that by intentionally causing I/O errors, Dummy Read can detect I/O errors on shared disks with that size.



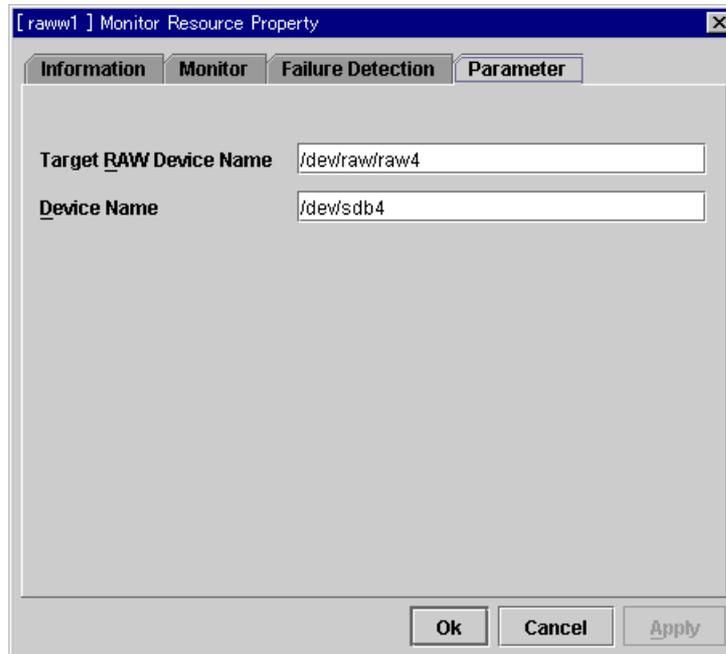
Note: the above figure illustrates a general image of shared disks. This is not always applicable to any array unit.

- * If you select a local disk on a server in Target Device Name, you can monitor the local disk. To monitor a local disk, “/dev/sda” by Dummy Read method, and to “Restart OS” at abnormality detection, the settings are as follows;

Setting Item	Setting Value	Remarks
Target device name	/dev/sda	A disk where the root file system is stored
Method	Dummy Read	Dummy Read method
Recovery object	Cluster	-
Final Action	Stop Cluster Daemon and OS Reboot	The OS will be restarted.

5.5.6 RAW monitor resource ~ For SE and LE ~

You specify raw device for the monitor target.



(1) Target RAW Device Name (up to 1023 byte)

Enter the name of a device used for a raw access.

The RAW device that is already registered in “Disk I/F List” and “Raw resource” of the server property cannot be registered.

The RAW device registered to the VxVM volume resource cannot be registered.

For details of the Raw device of VxVM volume resource, see a separate guide, “Resource Details”.

The name must begin with a “/.”

(2) Device Name (up to 1023 byte)

Specify the name of a real device used as the monitoring RAW device.

Specify only when performing monitoring by binding.

A partition which is mounted may not be monitored using RAW monitor resource.

If you want to monitor a mounted partition using the RAW monitor resource, specify the whole device.

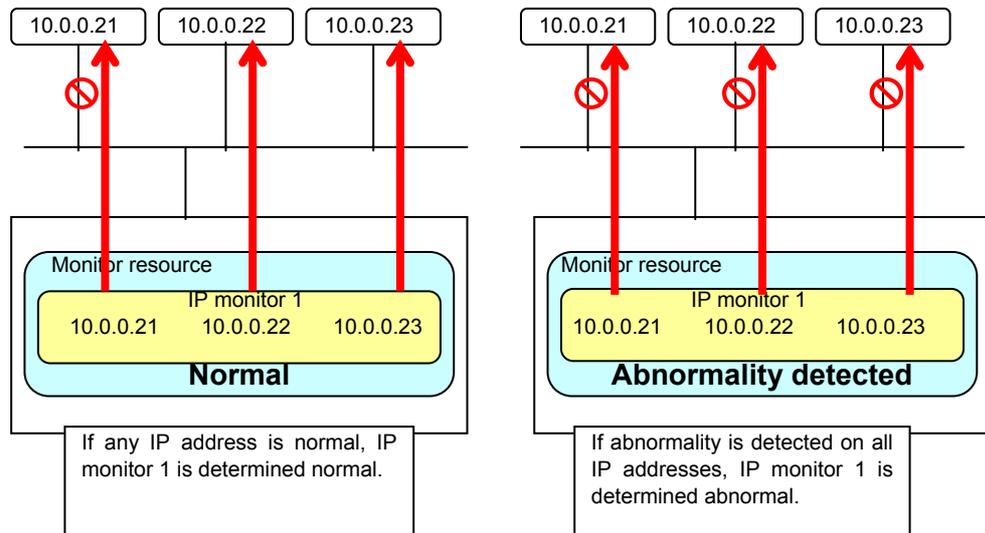
The name must begin with “/.”

For details, see a separate guide, “Resource Details”.

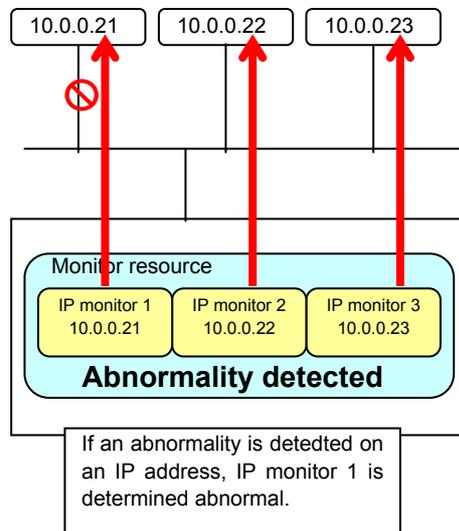
5.5.7 IP monitor resource

Specified IP addresses are monitored with the ping command. If no IP address responds among specified ones, an abnormality is determined.

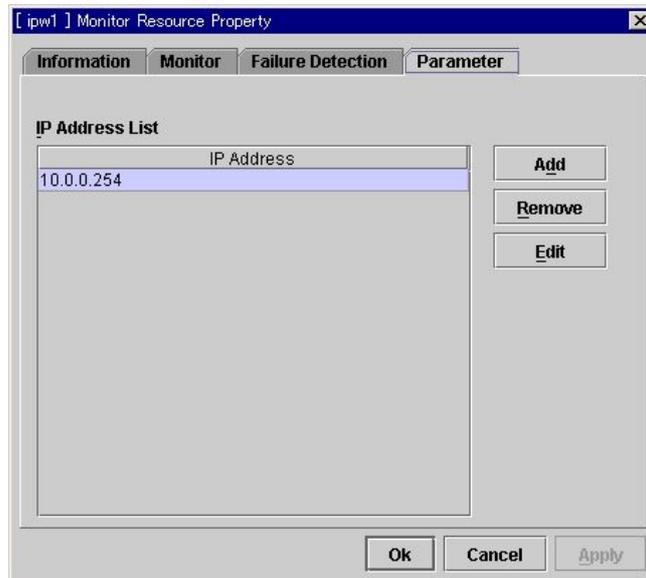
- * If you want to determine an abnormality when more than one IP addresses are all abnormal, register all those IP addresses in an IP monitor resource.



- * If you want to determine an abnormality when any IP address among more than one IP addresses is abnormal, create one IP monitor resource for each IP address.



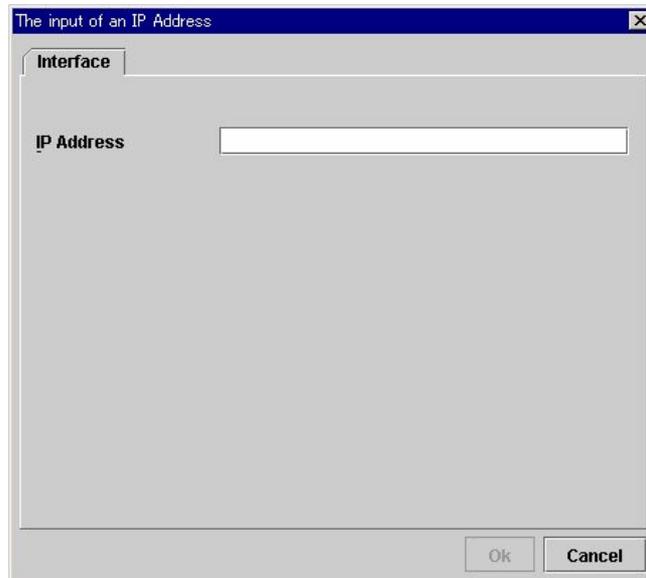
IP addresses to be monitored are listed in “IP Address List”.



(1)

Add

Click this to add an IP address to be monitored.
You see a dialog box where you can enter an IP address.



- A. IP Address
Enter an IP address to be monitored. Click [OK].
Enter a real IP address that exists on the public LAN.

(2) Remove

Click this to remove a selected IP address in “IP Address List” from the monitor target.

(3) Edit

You see a dialog box where you can enter an IP address.

The IP address selected in “IP Address List” is preset. Change the address and click [OK].

5.5.8 User space monitor resource

Stall in user space is determined as an abnormality. Because commands are issued to softdog device, if ExpressCluster failed to load the softdog driver, the user space monitor stops.

A command is repeatedly issued to the softdog driver at the heartbeat interval. If the user space monitor does not issue a command within the heartbeat timeout, the softdog driver will reset the OS.

There is no Detail tab for user space monitor resource.

- * By adding a cluster, a user space monitor resource is automatically created.
- * If not required, you have to remove it manually.
- * You can register only one user space monitor resource in a cluster.

5.5.9 Mirror disk monitor resource ~ For LE ~

Health of mirror partition device (Mirror Driver) is monitored.

This resource is automatically registered when adding a mirror disk resource. A corresponding mirror disk monitor resource is automatically registered for each mirror disk resource.

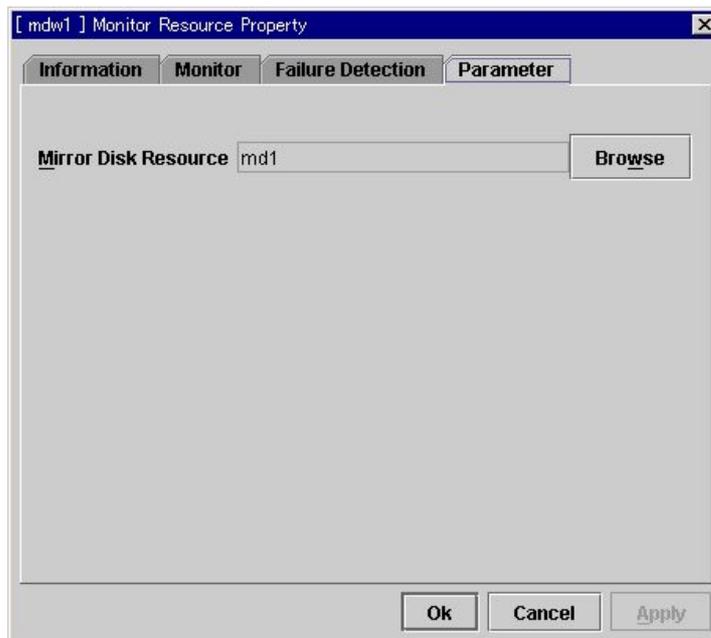


Do not change the settings in Failure Detection tab.

With these settings, you can send an alert message if an abnormality is determined.

<Abnormality detection>

Recovery object	Cluster name
Reactivation threshold	Zero (Never)
Failover threshold	Zero (Never)
Final Action	No operation



(1) Mirror Disk Resource

You see the mirror disk resource to be monitored.

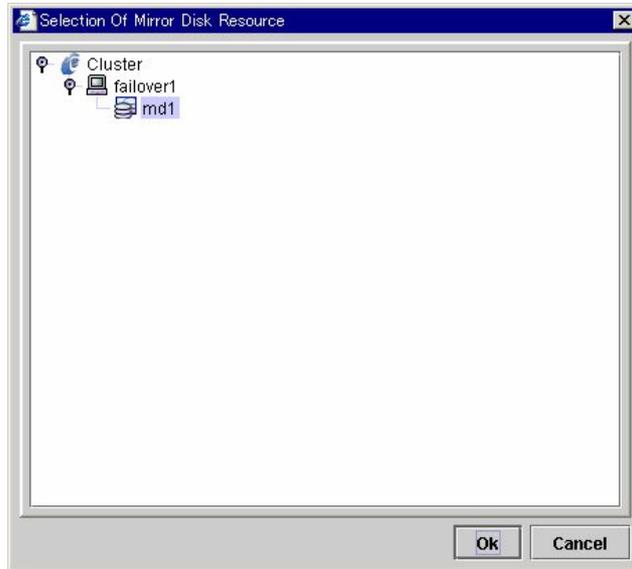
(2) Browse

Click this. Then, you see a dialog box where you can select a mirror disk resource to be monitored.

Mirror disk resources registered in the cluster are displayed in a tree view.

You can select only mirror disk resources in this view.

Select a mirror disk resource. Click [OK].



5.5.10 Mirror disk connect monitor resource ~ For LE ~

The network for mirroring is monitored. If mirroring data cannot be sent/received through the specified mirror disk connect, an abnormality is determined.

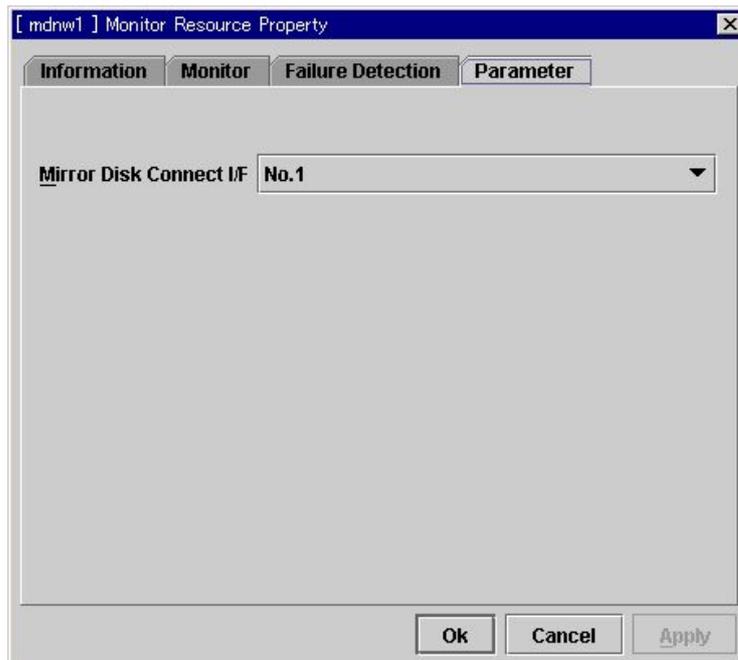
This resource is automatically registered when adding the first mirror disk resource. Because mirror disk resources share a mirror disk connect interface, only one interface is automatically registered.



Do not change the settings in Failure Detection tab.

With these settings, you can send an alert message if an abnormality is determined.

<Abnormality detection>	
Recovery object	Cluster name
Reactivation threshold	Zero (Never)
Failover threshold	Zero (Never)
Final Action	No operation



(1) Mirror Disk Connect I/F

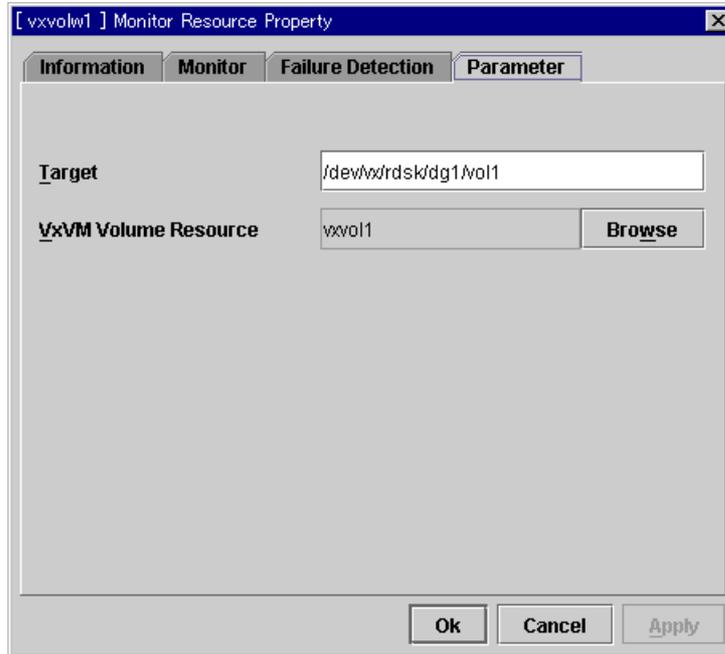
You select a mirror disk connect interface to be monitored.

The numbers you can select here correspond to the interface numbers you specified on Mirror Connect I/F tab in Server Property.

For this version, only one interface is available.

5.5.11 VxVM Volume monitor resource ~ For SE ~

You specify a VxVM volume device for the monitor target.



(1) **Target (up to 1023 byte)**

Set the name of a volume RAW device of the VxVM volume resource set in step (2). If the file system of the volume RAW device is not vxfs, it may not be monitored using the VxVM volume monitor resource.

The name must begin with a “/.”

(2) **VxVM Volume Resource** **SuspendResume**

Displays the VxVM volume resource for which it depends when monitoring a VxVM volume device.

Monitoring is performed after activating the VxVM volume resource displayed here.

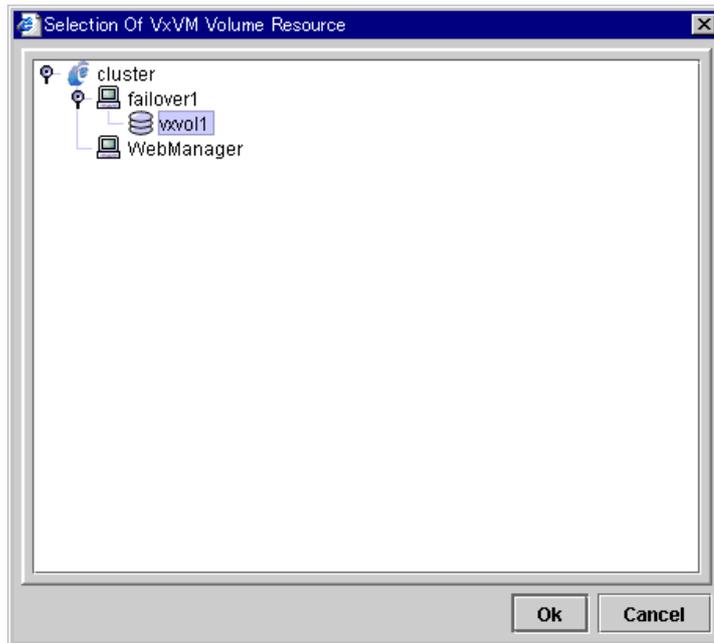
(3) Browse

Sets up the VXVM volume resource which monitors after the “Selection Of VxVM Volume Resource” dialog is displayed.

The VxVM volume resource which is registered in a cluster will be displayed as a tree.

Only a VxVM volume resource may be selected.

Select a VxVM volume resource and click [OK].



5.5.12 VxVM Daemon monitor resource ~ For SE ~

Monitors a VxVM config daemon.

There is no detailed setting for the VxVM daemon monitor resource.

- * It is created automatically when a VxVM disk group resource is added.
- * If it is not necessary, you must delete the VxVm daemon monitor resource.
- * Only one VxVM daemon monitor resource can be registered in a cluster.
- * Do not make any changes to a recover target.
- * Select "Do Nothing" for the final action if you do not want to perform a recovery action.

6 JavaVM SECURITY SETTINGS

6.1 Linux OS Settings

Do either of the followings depending on whether or not your home directory (~) has .java.policy file.

* **Make sure to exit from all browsers before you start the following steps.**

(1) If your home directory does not have .java.policy file,

1. Find the .java.policy file in the etc directory (/opt/nec/clptrek/etc) in the installation folder of Trekking Tool. Copy it to the home directory.

(2) If your home directory have .java.policy file,

1. Open .java.policy file in the home directory by a text editor.
2. Add the following lines to the end of the file.

```
/* ExpressCluster Trekking Tool for Linux */  
grant codeBase "file:/opt/nec/clptrek/clptrek.jar" {  
    permission java.security.AllPermission;  
};
```

3. Save the changes and exit from the editor.

6.2 Windows OS Settings

Do either of the followings depending on whether or not your home directory (~) has .java.policy file.

* **Make sure to exit from all browsers before you start the following steps.**

(1) If your home directory does not have .java.policy file

1. Find the java_pol.zip in the etc directory (c:\Program Files\nec\clptrek\etc) where Trekking Tool was expanded. Expand it to a directory.

2. Open .java.policy file by a text editor such as Notepad.

```
/* ExpressCluster Trekking Tool for Linux */  
grant codeBase "file:/C:/Program Files/nec/clptrek/clptrek.jar" {  
    permission java.security.AllPermission;  
};
```

3. Change the underlined text following "file: /" in the second line to the directory where Trekking Tool was expanded. Delimit paths not with "\", but with "/".

4. Save the changes and exit from the editor.

5. Copy the .java.policy file you added lines to the home directory.

(2) If your home directory have .java.policy file,

1. Open .java.policy file by a text editor such as Notepad.

2. Add the following lines to the end of the file.

```
/* ExpressCluster Trekking Tool for Linux */  
grant codeBase "file:/C:/Program Files/nec/clptrek/clptrek.jar" {  
    permission java.security.AllPermission;  
};
```

3. Change the underlined text following "file: /" in the second line to the directory where Trekking Tool was expanded. Delimit paths not with "\", but with "/".

4. Save the changes and exit from the editor.

* **Home directory**

If the OS is installed in C drive and you have logged in as USERNAME, the home directory will be as follows. However, depending on the environment, it will be a different one.

+ For Windows2000/XP:

= [C:\Documents and Settings\USERNAME]

+ For WindowsNT:

= [C:\Winnt\Profiles\USERNAME]

7 FUNCTIONAL DIFFERENCES OF TREKKING TOOLS BETWEEN LINUX AND WINDOWS

- * Reading/Writing the cluster configuration data
Only for Linux, you can select a file format to read/write data in a floppy disk.
For details, see Section 4.1 “File Menu”.
- * Script editor for exec resources
The default scrip editor is vi editor for Linux, and Notepad for Windows.
Default settings on Linux use xterm for terminal, therefore, multi-byte characters cannot be properly displayed.
For details, see Section 5.4.5.1(3) “Change”.

8 APPENDIX

8.1 Selecting Applications

Before you introduce ExpressCluster, it is essential to select applications whose availability you want to improve. Also, you have to examine if selected applications are appropriate to running in an ExpressCluster environment.

Read the following sections carefully to determine if your selected applications are appropriate for clustering.

8.2 Applications in ExpressCluster Environment

This section describes notes and restrictions on applications that can run in an ExpressCluster environment.

8.2.1 Server application

Notes and restrictions vary depending on how a cluster application stands by. Details of notes are provided in Section 8.2.2 “Notes on server applications”.

- * For uni-directional standby [Active-Passive], note items numbered: 1 2 3 4 5
An application can run on only an active server in the cluster.
- * For multi-directional standby [Active-Active], note items numbered: 1 2 3 4 5
An application can run on more than one active servers in the cluster.
- * On co-existing behaviors, note items numbered: 4 2 3 4 5
In this operation style, the cluster system does not fail over applications. They co-exist and run.

8.2.2 Notes on server applications

(1) Data recovery after failures

If an application was updating a file exactly when an error occurred, the file update may not be completed and its data may be inconsistent. This may be a problem when the application on the standby server accesses the file.

The same can happen on non-clustered servers (standby servers) if one goes down and is rebooted. Basically, applications should be ready to handle this kind of errors. On top of this, applications that run in a cluster system should be able to recover this kind of errors without human interventions, i.e. from a script.

If the file system on shared disks or mirror disks requires fsck, ExpressCluster performs fsck.

(2) Termination of applications

When ExpressCluster stops or moves (online failback) a business application group, it unmounts the file system used by the business application group. Therefore, you have to give exit commands to applications so that they stop accessing files on shared disks and mirror disks by giving instruction.

Usually, you give exit commands to applications in their Stop Scripts, however, if an exit command completes asynchronously (with termination of the application), you have to be careful.

(3) Location to store data

ExpressCluster can pass the following data between servers;

- + Data on shared disks or mirror disks

Applications should be able to distinguish data to be passed and not be passed between servers.

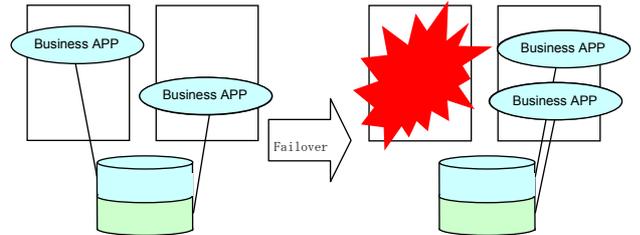
Data type	Example	Where to store
Data to pass	User data, etc.	On shared disks or mirror disk
Data not to pass	Programs, configuration data	On server's local disks

(4) More than one business application groups

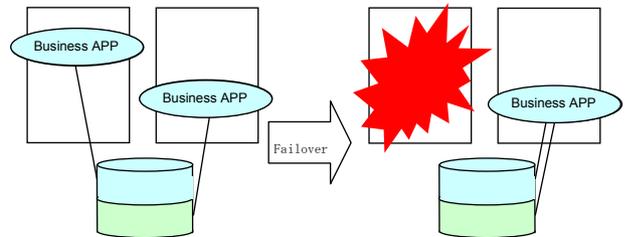
For multi-directional standby operation style, you have to assume (in case of degeneration due to a failure) that more than one business application groups are active by the same application on a server.

Applications should be able to take over the passed resources and run more than one business application groups on a single server by one of the following methods.
The same is true for mirror disks, too.

- * Starting up more than one instances
This method invokes a new instance (process). More than one applications should be able to coexist and run.

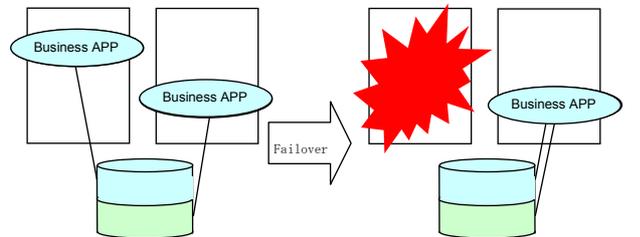


- * Restarting the application
This method stops the application which was originally working. By restarting it, added resources become available.



By restarting the business APP, data is passed.

- * Adding dynamically
This method adds resources in running applications automatically or by instructions from script.



By dynamically adding data in the running business APP, data is passed.

(5) Interference with applications (compatibility)

In some cases, ExpressCluster functions and OS functions (required for ExpressCluster functions and behaviors) interfere each other, which may cause applications or ExpressCluster not to be able to work properly.

- * Access control of switching partitions and mirror partitions
Inactive shared disks are not writable.
Inactive mirror disks are not readable or writable.
Applications are not allowed to access inactive shared disks or mirror disks (i.e. they do not have access rights).
Normally, applications that is started up by their cluster scripts can assume that when they are started up, switching partitions and mirror partitions which they have to access are already accessible.
- * Multi-home environment and transfer of IP addresses
In cluster systems, a server usually has more than one IP addresses, and an IP address (such as floating IP address) moves between servers.
- * Access to shared disks or mirror disks from applications
Stop of business application groups is not notified to coexisting applications. Therefore, if such an application is accessing a switching partition or mirror partition used by a business application group at the time when the business application group stops, unmount will fail.

Some of applications like a system monitoring service periodically access all disk partitions. To use such applications in your cluster environment, they need a function that allows you to scope monitoring partitions.

8.2.3 Countermeasures to notes and restrictions

Numbers corresponding to numbers in Section 8.2.2		
Problems	Problems	
If an error occurs while updating a data file, the application does not work properly on the standby server.	If an error occurs while updating a data file, the application does not work properly on the standby server.	(1)
Even if you stopped an application, it keeps accessing shared disks or mirror disk for a certain period of time.	Even if you stopped an application, it keeps accessing shared disks or mirror disk for a certain period of time.	(2)
You cannot start more than one groups of the same application on a server.	You cannot start more than one groups of the same application on a server.	(4)

8.3 How To Determine Application's Style

Based on information in Sector 8.2, determine your applications' style.

- * Which application is started, and when.
- * What actions are required at startup and failover.
- * What kind of data should be placed in shared disks and mirror disk.

Also, your system operation should contain,

- * Backup of shared disks and mirror disk on regular basis.

8.4 Parameters List

Parameters you can specify in Trekking Tool and their default values are listed below. “How to reflect [1]-[5]” represent the way you reflect changes of parameters on servers. Applicable method is marked with “O”. For details of [1]-[5], see Chapter 1 “Overview.”

8.4.1 For SE and XE

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Cluster Properties						
Information Tab						
Name	-			O		
Comment	-					O
Heartbeat I/F Tab						
Order (Up, Down)	-			O		
Type (Add, Remove)	-			O		
Master Server Tab	-					
Order (Up, Down)	The order you added servers			O		
Timeout Tab						
Synchronize Wait Time	5 [min]					O
Heartbeat Interval	3 [sec]			O		
Heartbeat Timeout	90 [sec]			O		
Server Internal Timeout	180 [sec]			O		
Port No. Tab						
Server Internal Port Number	29001			O	O	
Data Transfer Port Number	29002	O				
WebManager HTTP Port Number	29003				O	
Heartbeat Port Number	29002			O		
Alert Sync Port Number	29003				O	
Monitor Tab						
Shutdown Monitor	On					O
Mail Report Tab						
Mail Address	Blank (Function disabled)					O
Subject	CLUSTERPRO					O
WebManager Tab						
Enable WebManager Server	On (Cannot deselect)				O	
Connectable Client Number	64				O	
Connection is restricted by Client IP Address	Off				O	
Connection Permit Client IP Address List (Add, Remove, Edit)	-				O	
WebManager Tuning Properties						
Behavior Tab						
Client Session Timeout	30 [sec]				O	
Alert Viewer Maximum Record Number	300				O	
Screen Data Refresh Interval	90 [sec]				O	

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Alert Log Tab						
Enable Alert Daemon	On (Cannot deselect)				<input type="radio"/>	
Preserve Maximum Alert Record Number	10000				<input type="radio"/>	
Alert Sync Method	Unicast (Cannot change)				<input type="radio"/>	
Alert Sync Communication Timeout	30 (sec)				<input type="radio"/>	
Add server						
Remove server	-			<input type="radio"/>	<input type="radio"/>	
Server Properties						
Information Tab						
Name	-			<input type="radio"/>		
Comment	-					<input type="radio"/>
Interconnect LAN I/F Tab						
I/F No. (Add, Remove)	The order you added I/Fs			<input type="radio"/>		
IP Address (Edit, Up, Down)	-			<input type="radio"/>		
Public LAN I/F Tab						
I/F No. (Add, Remove)	The order you added I/Fs			<input type="radio"/>		
IP Address (Edit, Up, Down)	-			<input type="radio"/>		
COM I/F Tab						
I/F No. (Add, Remove)	The order you added I/Fs			<input type="radio"/>		
Device (Edit, Up, Down)	-			<input type="radio"/>		
Disk I/F Tab						
I/F No. (Add, Remove)	The order you added I/Fs			<input type="radio"/>		
Device (Edit, Up, Down)	-			<input type="radio"/>		
Raw Device (Edit, Up, Down)	-			<input type="radio"/>		
Add group						
Remove group	-		<input type="radio"/>			
Group Properties						
Information Tab						
Name	-		<input type="radio"/>			
Comment	-					<input type="radio"/>
Startup Server Tab						
Order (Up, Down)	The order you added to "Servers Which Can Be Started".			<input type="radio"/>		
Name (Add, Remove)	-			<input type="radio"/>		
Attributes Tab						
Startup Attribute	Auto Startup			<input type="radio"/>		
Failover Exclusive Attribute	Off			<input type="radio"/>		
Auto Failback Attribute	Manual Failback			<input type="radio"/>		

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Add resource	-		○			
Remove resource	-		○			
Group Resource Common Properties						
Information Tab						
Name	-		○			
Comment	-					○
Exec Resource Properties						
Dependence Tab						
Default dependence is followed	On • floating IP resources • disk resources • RAW resources ^a • VxVM disk group resources ^a • VxVM volume resources ^a			○		
Depended Resources	-			○		
Setting Tab						
Activity Retry Threshold	0[time]			○		
Failover Threshold	1[time]			○		
Final Action when detecting activity failure	No Operation (Next Resources Are Not Activated)			○		
Deactivity Retry Threshold	0[time]			○		
Final Action when detecting deactivity failure	Stop Cluster Daemon And OS Shutdown			○		
Detail Tab						
Kind (User Application, Generated script by trekking tool)	Generated script by trekking tool					○
User Application	The input of the path to application (Edit)	-				○
Generated script by trekking tool	Script codes (edit)	-				○
Exec Resource Tuning Properties						
Parameter Tab						
Start Script Synchronous, Asynchronous	Synchronous					○
Start Script Timeout	1800[sec]					○
Stop Script Synchronous, Asynchronous	Synchronous					○
Stop Script Timeout	1800[sec]					○
Maintenance Tab						
Log Output Path	Blank (/dev/null)					○

^a It doesn't apply to XE.

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Disk Resource Properties						
Dependence Tab						
Default dependence is followed	On • floating IP resources			○		
Depended Resource (Add, Remove)	-			○		
Setting Tab						
Activity Retry Threshold	0[time]			○		
Failover Threshold	1[time]			○		
Final action when detecting activity failure	No Operation (Next Resources Are Not Activated)			○		
Deactivity Retry Threshold	0[time]			○		
Final Action when detecting deactivity	Stop Cluster Daemon And OS Shutdown			○		
Detail Tab						
Device Name	-		○			
Mount Point	-		○			
File System	-					○
Disk Type	Disk (cannot change)		○			
Disk Resource Tuning Properties						
Mount Tab						
Mount Option	rw					○
Timeout	60 [sec]					○
Retry Count	3 [sec]					○
Unmount Tab						
Timeout	60 [sec]					○
Retry Count	3 [time]					○
Force Operation When Detecting Failure	Kill					○
Fsck Tab						
Fsck Option	-y					○
Fsck timeout	1800[sec]					○
Floating IP Resource Properties						
Dependence Tab						
Default dependence is followed	On (No default is set)			○		
Depended Resources (Add, Remove)	-			○		
Setting Tab						
Activity Retry Threshold	5 [time]			○		
Failover Threshold	1 [time]			○		
Final Action when detecting activity failure	No Operation (Next Resources Are Not Activated)			○		
Deactivity Retry Threshold	0 [time]			○		
Final Action when detecting deactivity failure	Stop Cluster Daemon And OS Shutdown			○		
Detail Tab						
IP Address	-		○			

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Floating IP Resource Tuning Properties						
Parameter Tab						
Ping Timeout	1 [sec]					○
ARP Count	1 [time]					○
Raw Resource Properties ^a						
Dependence Tab						
Default dependence is followed	On • floating IP resources			○		
Depended Resource (Add, Remove)	-			○		
Setting Tab						
Activity Retry Threshold	0[time]			○		
Failover Threshold	1[time]			○		
Final action when detecting activity failure	No Operation (Next Resources Are Not Activated)			○		
Deactivity Retry Threshold	0[time]			○		
Final Action when detecting deactivity	Stop Cluster Daemon And OS Shutdown			○		
Detail Tab						
Device Name	-		○			
Raw Device Name	-		○			
Disk Type	disk (fixed)		○			
VxVM Disk Group Resource Properties ^a						
Dependence Tab						
Default dependence is followed	On • floating IP resources			○		
Depended Resource (Add, Remove)	-			○		
Setting Tab						
Activity Retry Threshold	0[time]			○		
Failover Threshold	1[time]			○		
Final action when detecting activity failure	No Operation (Next Resources Are Not Activated)			○		
Deactivity Retry Threshold	0[time]			○		
Final Action when detecting deactivity	Stop Cluster Daemon And OS Shutdown			○		
Detail Tab						
Disk Group Name	-		○			
VxVM Disk Group Resource Tuning Properties						
Parameter Tab						
Clear Host ID	On					○
Force	Off					○

^a It doesn't apply to XE.

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
VxVM Volume Resource Properties ^a						
Dependence Tab						
Default dependence is followed	On • floating IP resources • VxVM disk group resources			0		
Depended Resource (Add, Remove)	-			0		
Setting Tab						
Activity Retry Threshold	0[time]			0		
Failover Threshold	1[time]			0		
Final action when detecting activity failure	No Operation (Next Resources Are Not Activated)			0		
Deactivity Retry Threshold	0[time]			0		
Final Action when detecting deactivity	Stop Cluster Daemon And OS Shutdown			0		
Detail Tab						
Volume Device Name	-					0
Volume Raw Device Name	-					0
Mount Point	-		0			
File System	vxfs					0
VxVM Volume Resource Tuning Properties						
Mount Tab						
Mount Option	rw					0
Timeout	60 [sec]					0
Retry Count	3 [time]					0
Unmount Tab						
Timeout	60 [seconds]					0
Retry Count	3 [times]					0
Force Operation When Detecting Failure	kill					0
Fsck Tab						
Fsck Option	-y					0
Fsck Timeout	1800 [sec]					0
Add monitor resource						
-						
Remove monitor resource						
-						
Monitor Resources Common Properties						
Information Tab						
Name	-			0		
Comment	-					0

^a It doesn't apply to XE.

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Disk Monitor Resource Properties						
Monitor Tab						
Interval	60 [sec]			0		
Timeout	120 [sec]			0		
Retry Count	0 [time]			0		
Failure Detection Tab						
Recovery Object	-			0		
Re-activation Threshold	3 [times] (if the recovery object is other than clusters)			0		
Failover Threshold	1 [time] (if the recovery object is other than clusters)			0		
Final Action	No operation			0		
Parameter Tab						
Target Device Name	-					0
Method	Dummy Read					0
I/O size	2000000 [bytes]					0
IP Monitor Resource Properties						
Monitor Tab						
Interval	30 [time]			0		
Timeout	30 [time]			0		
Retry Count	0 [time]			0		
Failure Detection Tab						
Recover Object	-			0		
Re-activation Threshold	3 [times] (if the recovery object is other than clusters)			0		
Failover Threshold	1 [time] (if the recovery object is other than clusters)			0		
Final Action	No operation			0		
Parameter Tab						
IP address (Add, Remove, Edit)	-					0
Pid Monitor Resource Properties						
Monitor Tab						
Interval	5[sec]			0		
Timeout	60[sec]			0		
Retry Count	0[time]			0		
Failure Detection Tab						
Recovery Object	-			0		
Re-activation Threshold	3 [times] (if the recovery object is other than clusters)			0		
Failover Threshold	1 [time] (if the recovery object is other than clusters)			0		
Final Action	No operation			0		
Parameter Tab						
Application	-					0

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
User Space Monitor Resource Properties						
Information tab only						
RAW Monitor Resource Properties ^a						
Monitor Tab						
Interval	60 [sec]			○		
Timeout	120 [sec]			○		
Retry Count	0 [time]			○		
Failure Detection Tab						
Recover Object	-			○		
Re-activation Threshold	3 [times] (if the recovery object is other than clusters)			○		
Failover Threshold	1 [time] (if the recovery object is other than clusters)			○		
Final Action	No operation			○		
Parameter Tab						
Target RAW Device Name	-					○
Device Name	-					○
VxVM Volume Monitor Resource Properties ^a						
Monitor Tab						
Interval	60 [sec]			○		
Timeout	120 [sec]			○		
Retry Count	0 [time]			○		
Failure Detection Tab						
Recover Object	-			○		
Re-activation Threshold	3 [times] (if the recovery object is other than clusters)			○		
Failover Threshold	1 [time] (if the recovery object is other than clusters)			○		
Final Action	No operation			○		
Parameter Tab						
Target	-					○
VxVM Volume Resource	-			○		
VxVM Daemon Monitor Resource Properties ^a						
Monitor Tab						
Interval	60 [sec]			○		
Timeout	120 [sec]			○		
Retry Count	0 [time]			○		

^a It doesn't apply to XE.

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Failure Detection Tab						
Recover Object	Cluster name					
Re-activation Threshold	0 [time]			0		
Failover Threshold	0 [time]			0		
Final Action	Stop Cluster Daemon and OS Reboot			0		

8.4.2 For LE

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Cluster Properties						
Information Tab						
Name	-			○		
Comment	-					○
Heartbeat I/F Tab						
Order (Up, Down)	-			○		
Type (Add, Remove)	-			○		
Master Server Tab	-					
Order (Up, Down)	The order you added servers			○		
Timeout Tab						
Synchronize Wait Time	5 [min]					○
Heartbeat Interval	3 [sec]			○		
Heartbeat Timeout	90 [sec]			○		
Server Internal Timeout	180 [sec]			○		
Port No. Tab						
Server Internal Port Number	29001			○	○	
Data Transfer Port Number	29002	○				
WebManager HTTP Port Number	29003				○	
Mirror Agent port number	29004	○				
The mirror driver port number	29005	○				
Heartbeat Port Number	29002			○		
Alert Sync Port Number	29003				○	
Monitor Tab						
Shutdown Monitor	On					○
Mail Report Tab						
Mail Address	Blank (Function disabled)					○
Subject	CLUSTERPRO					○
WebManager Tab						
Enable WebManager Server	On (cannot deselect)				○	
Connectable Client Number	64				○	
Connection is restricted by Client IP Address	Off				○	
Connection Permit Client IP Address List (Add, Remove, Edit)	-				○	
WebManager Tuning Properties						
Behavior Tab						
Client Session Timeout	30 [sec]				○	
Alert Viewer Maximum Record Number	300				○	
Screen Data Refresh Interval	90 [sec]				○	

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Alert Log Tab						
Enable Alert Daemon	On (cannot deselect)				<input type="radio"/>	
Preserve Maximum Alert Record Number	10000				<input type="radio"/>	
Alert Sync Method	unicast(cannot change)				<input type="radio"/>	
Alert Sync Communication Timeout	30(sec)				<input type="radio"/>	
Mirror Tab						
Auto Mirror Recovery	On					<input type="radio"/>
Request Queue Maximum Number	2048	<input type="radio"/>				
Connect timeout	10	<input type="radio"/>				
Send timeout	30	<input type="radio"/>				
Receive timeout	100	<input type="radio"/>				
Add server						
	-	<input type="radio"/>				
Remove server						
	-	<input type="radio"/>				
Server Properties						
Information Tab						
Name	-	<input type="radio"/>				
Comment	-					<input type="radio"/>
Interconnect LAN I/F Tab						
I/F No. (Add, Remove)	The order you added I/Fs			<input type="radio"/>		
IP Address (Edit, Up, Down)	-			<input type="radio"/>		
Public LAN I/F Tab						
I/F No. (Add, Remove)	The order you added I/Fs			<input type="radio"/>		
IP Address (Edit, Up, Down)	-			<input type="radio"/>		
COM I/F Tab						
I/F No. (Add, Remove)	The order you added I/Fs			<input type="radio"/>		
Device (Edit, Up, Down)	-			<input type="radio"/>		
Mirror Connect I/F Tab						
I/F No. (Add, Remove)	The order you added I/Fs	<input type="radio"/>				
IP Address (Edit, Up, Down)	-	<input type="radio"/>				
Add group						
	-			<input type="radio"/>		
Remove group						
	-		<input type="radio"/>			
Group Properties						
Information Tab						
Name	-		<input type="radio"/>			
Comment	-					<input type="radio"/>
Startup Server Tab						
Order (Up, Down)	The order you added to "Servers Which Can Be Started".			<input type="radio"/>		
Name (Add, Remove)	-			<input type="radio"/>		

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Attribute Tab						
Startup Attribute	Auto Startup			○		
Failover Exclusive Attribute	Off			○		
Auto Failback Attribute	Manual Failback			○		
Add resource						
	-		○			
Remove resource						
	-		○			
Add resource (Mirror disk resource)						
	-	○				
Remove resource (Mirror disk resource)						
	-	○				
Group Resource Common Properties						
Information Tab						
Name	-		○			
Name (Mirror disk resources)	-	○				
Comment	-					○
Exec Resource Properties						
Dependence Tab						
Default dependence is followed	On + Mirror disk resources + floating IP resources			○		
Depended Resources (Add, Remove)	-			○		
Setting Tab						
Activity Retry Threshold	0[time]			○		
Failover Threshold	1[time]			○		
Final Action when detecting activity failure	No Operation (Next Resources Are Not Activated)			○		
Deactivity Retry Threshold	0[time]			○		
Final Action when detecting deactivity failure	Stop Cluster Daemon And OS Shutdown			○		
Detail Tab						
Kind (User Application, Generated script by trekking tool)	Generated script by trekking tool					○
User Application	The input of the path to application (Edit)	-				○
Generated script by trekking tool	Script codes (edit)	-				○
Exec Resource Tuning Properties						
Parameter Tab						
Start Script Synchronous, Asynchronous	Synchronous					○
Start Script Timeout	1800[sec]					○
Stop Script Synchronous, Asynchronous	Synchronous					○
Stop Script Timeout	1800[sec]					○

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Maintenance Tab						
Log Output Path	Blank (/dev/null)					○
Disk Resource Properties						
Dependence Tab						
Default dependence is followed	On + Floating IP resource			○		
Depended Resources (Add, Remove)	-			○		
Setting Tab						
Activity Retry Threshold	0[time]			○		
Failover Threshold	1[time]			○		
Final action when detecting activity failure	No operation (The next resources are not activated)			○		
Deactivity Retry Threshold	0[time]			○		
Final Action when detecting deactivity	Stop Cluster Daemon And OS Shutdown			○		
Detail Tab						
Mirror Partition Device Name ^a	-	○				
Mirror Mount Point	-	○				
Data Partition Device Name ^a	-	○				
Cluster Partition Device Name ^a	-	○				
Disk Device Name ^a	-	○				
File System ^a	ext3	○				
Mirror Data Port Number ^a	29051 -	○				
Mirror Disk Resources Tuning Properties						
Mount Tab						
Mount Option	rw	○				
Timeout	60 [sec]					○
Retry Count	3 [sec]					○
Unmount Tab						
Timeout	60 [sec]					○
Retry Count	3 [time]					○
Force Operation When Detecting Failure	Kill					○
Fsck Tab						
Fsck Option	-y					○
Fsck timeout	1800[sec]					○
Floating IP Resource Properties						
Dependence Tab						
Default dependence is followed	On (No default is set)			○		
Depended Resources (Add, Remove)	-			○		

^a Change after understanding a separate guide "Maintenance".

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Setting Tab						
Activity Retry Threshold	5 [time]			○		
Failover Threshold	1 [time]			○		
Final Action when detecting activity failure	No Operation (Next Resources Are Not Activated)			○		
Deactivity Retry Threshold	0 [time]			○		
Final Action when detecting deactivity failure	Stop Cluster Daemon And OS Shutdown			○		
Detail Tab						
IP Address	-		○			
Floating IP Resource Tuning Properties						
Parameter Tab						
Ping Timeout	1 [sec]					○
ARP Count	1 [time]					○
Add monitor resource						
Remove monitor resource						
Monitor Resource Common Properties						
Information Tab						
Name	-			○		
Comment	-					○
Disk Monitor Resource Properties						
Monitor Tab						
Interval	60 [sec]			○		
Timeout	120 [sec]			○		
Retry Count	0 [time]			○		
Failure Detection Tab						
Recovery Object	-			○		
Re-activation Threshold	3 [times] (if the recovery object is other than clusters)			○		
Failover Threshold	1 [time] (if the recovery object is other than clusters)			○		
Final Action	No operation			○		
Parameter Tab						
Target Device Name	-					○
Method	Dummy Read					○
I/O Size	2000000[byte]					○
IP Monitor Resource Properties						
Monitor Tab						
Interval	30 [time]			○		
Timeout	30 [time]			○		
Retry Count	0 [time]			○		

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Failure Detection Tab						
Recover Object	-			○		
Re-activation Threshold	3 [times] (if the recovery object is other than clusters)			○		
Failover Threshold	1 [time] (if the recovery object is other than clusters)			○		
Final Action	No operation			○		
Parameter Tab						
IP address (Add, Remove, Edit)	-					○
Pid monitor resource Properties						
Monitor Tab						
Interval	5[sec]			○		
Timeout	60[sec]			○		
Retry Count	0[time]			○		
Failure Detection Tab						
Recover Object	-			○		
Re-activation Threshold	3 [times] (if the recovery object is other than clusters)			○		
Failover Threshold	1 [time] (if the recovery object is other than clusters)			○		
Final Action	No operation			○		
Parameter Tab						
Application	-					○
Mirror Disk Monitor Resource Properties						
Monitor Tab						
Interval	10[sec]			○		
Timeout	60[sec]			○		
Retry Count	0[time]			○		
Failure Detection Tab						
Recover Object	Cluster name					
Re-activation Threshold	0[time]					
Failover Threshold	0[time]					
Final Action	No operation					
Parameter Tab						
Mirror Disk Resources	Mirror disk resource name					○
Mirror Disk Connect Monitor Resource Properties						
Monitor Tab						
Interval	60[sec]			○		
Timeout	120[sec]			○		
Retry Count	0[time]			○		

Parameters	Default	How to reflect				
		[1]	[2]	[3]	[4]	[5]
Failure Detection Tab						
Recovery Object	Cluster name					
Re-activation Threshold	0[time]					
Failover Threshold	0[time]					
Final Action	No operation					
Parameter Tab						
mirror disk connect I/F	No.1					O
User space monitor resource Properties						
Information tab only						
Raw Monitor Resource Properties						
Monitor Tab						
Interval	60[sec]			O		
Timeout	120[sec]			O		
Retry Count	0[time]			O		
Failure Detection Tab						
Recover Object	-			O		
Re-activation Threshold	3 [times] (if the recovery object is other than clusters)			O		
Failover Threshold	1 [time] (if the recovery object is other than clusters)			O		
Final Action	No operation			O		
Parameter Tab						
Target RAW Device Name	-					O
Device Name	-					O

8.5 Upper Limits Of Registration

8.5.1 For SE

	You can register up to
Cluster	1
Server	32
Group	64
Group resource	128 (per group)
Monitor resource	128
Heartbeat resource	64

8.5.2 For XE

	You can register up to
Cluster	1
Server	32
Group	64
Group resource	128 (per group)
Monitor resource	128
Heartbeat resource	64

8.5.3 For LE

	You can register up to
Cluster	1
Server	2
Group	32
Group resource	16 (per group)
Monitor resource	64
Heartbeat resource	32
Mirror disk resource	8 (per cluster)