EXPRESSCLUSTER X SingleServerSafe 5.2 for Windows Configuration Guide

Release 3

NEC Corporation

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CHAPTER

ONE

PREFACE

1.1 Who Should Use This Guide

The *Configuration Guide* is intended for system engineers who intend to introduce a system and system administrators who will operate and maintain the introduced system. It describes how to set up EXPRESSCLUSTER X SingleServerSafe.

1.2 How This Guide Is Organized

- 2. *EXPRESSCLUSTER X SingleServerSafe*: Provides a product overview of EXPRESSCLUSTER X SingleServerSafe.
- 3. *Creating configuration data*: Describes how to start the Cluster WebUI / WebManager and the procedures to create the configuration data by using a sample configuration.
- 4. *Group resource details*: Provides details on group resources, which are used as a unit for controlling an application by using EXPRESSCLUSTER X SingleServerSafe.
- 5. *Monitor resource details*: Provides details on monitor resources, which are used as a unit when EXPRESSCLUSTER X SingleServerSafe executes monitoring.
- 6. *Other setting details*: Provides details on the other settings for EXPRESSCLUSTER X SingleServerSafe.
- 7. *Monitoring details*: Provides details on how several types of errors are detected.
- 8. *Notes and Restrictions*: Describes known problems and how to prevent them.

1.3 Terms Used in This Guide

EXPRESSCLUSTER X SingleServerSafe, which is described in this guide, uses windows and commands common to those of the clustering software EXPRESSCLUSTER X to ensure high compatibility with EXPRESSCLUSTER X in terms of operation and other aspects. Therefore, cluster-related terms are used in parts of the guide.

The terms used in this guide are defined below.

Cluster, cluster system A single server system using EXPRESSCLUSTER X SingleServerSafe

Cluster shutdown, reboot Shutdown or reboot of a system using EXPRESSCLUSTER X SingleServerSafe

Cluster resource A resource used in EXPRESSCLUSTER X SingleServerSafe

Cluster object A resource object used in EXPRESSCLUSTER X SingleServerSafe

Failover group A group of group resources (such as applications and services) used in EXPRESSCLUSTER X SingleServerSafe

1.4 EXPRESSCLUSTER X SingleServerSafe Documentation Set

The EXPRESSCLUSTER X SingleServerSafe manuals consist of the three guides below. The title and purpose of each guide is described below:

EXPRESSCLUSTER X SingleServerSafe Installation Guide

> This guide is intended for system engineers who intend to introduce a system using EXPRESSCLUSTER X SingleServerSafe and describes how to install EXPRESSCLUSTER X SingleServerSafe.

EXPRESSCLUSTER X SingleServerSafe Configuration Guide

> This guide is intended for system engineers who intend to introduce a system using EXPRESSCLUSTER X SingleServerSafe and system administrators who will operate and maintain the introduced system. It describes how to set up EXPRESSCLUSTER X SingleServerSafe.

EXPRESSCLUSTER X SingleServerSafe Operation Guide

> This guide is intended for system administrators who will operate and maintain an introduced system that uses EXPRESSCLUSTER X SingleServerSafe. It describes how to operate EXPRESSCLUSTER X SingleServerSafe.

1.5 Conventions

In this guide, **Note**, **Important**, **See also** are used as follows:

Note: Used when the information given is important, but not related to the data loss and damage to the system and machine.

Important: Used when the information given is necessary to avoid the data loss and damage to the system and machine.

See also:

Used to describe the location of the information given at the reference destination.

The following conventions are used in this guide.

Convention	Usage	Example
Bold	Indicates graphical objects, such as fields, list boxes, menu selections, buttons, labels, icons, etc.	In User Name, type your name. On the File menu, click Open Database.
Angled bracket within the command line	Indicates that the value specified inside of the angled bracket can be omitted.	`clpstat -s [-h host_name]`
Monospace	Indicates path names, commands, system output (message, prompt, etc), directory, file names, functions and parameters.	`c:\Program files\ EXPRESSCLUSTER`
bold	Indicates the value that a user actually enters from a command line.	Enter the following: **clpcl -s -a**
italic	Indicates that users should replace italicized part with values that they are actually working with.	`clpstat -s [-h host_name]`

1.6 Contacting NEC

For the latest product information, visit our website below:

https://www.nec.com/global/prod/expresscluster/

CHAPTER

TWO

EXPRESSCLUSTER X SINGLESERVERSAFE

This chapter outlines the functions of EXPRESSCLUSTER X SingleServerSafe and describes the types of errors that can be monitored.

This chapter covers:

2.1 EXPRESSCLUSTER X SingleServerSafe

EXPRESSCLUSTER X SingleServerSafe is set up on a server. It monitors for application errors and hardware failures on the server and, upon detecting an error or failure, automatically restarts the failed application or reboots the server so as to ensure greater server availability.

With an ordinary server, if an application has ended abnormally, you need to restart it when you realize that it has ended abnormally.

There are also cases in which an application is not running stably but has not ended abnormally. Usually, such an error condition is not easy to identify.

For a hardware error, rebooting the server might achieve recovery if the error is temporary. However, hardware errors are difficult to notice. The abnormal behavior of an application often turns out to be due to a hardware error when the application is checked.

With EXPRESSCLUSTER X SingleServerSafe, specify the applications and hardware components to be monitored for automatic error detection. Upon detecting an error, EXPRESSCLUSTER X SingleServerSafe automatically restarts the application or server that caused the error to recover from the error.

2.2 How an error is detected in EXPRESSCLUSTER X SingleServerSafe

EXPRESSCLUSTER X SingleServerSafe performs several different types of monitoring to ensure quick and reliable error detection. The details of the monitoring functions are described below.

- Monitoring activation status of applications

  An error can be detected by starting up an application by using an application-starting resource (called application resource and service resource) of EXPRESSCLUSTER and regularly checking whether the process is active or not by using application-monitoring resource (called application monitor resource and service monitor resource). It is effective when the factor for application to stop is due to error termination of an application.

  Note:

  - If an application started directly by EXPRESSCLUSTER X SingleServerSafe starts and then ends a resident process to be monitored, EXPRESSCLUSTER X SingleServerSafe cannot detect an error in that resident process.
  - An internal application error (for example, application stalling and result error) cannot be detected.

- Monitoring applications and/or protocols to see if they are stalled or failed by using the monitoring option.

  You can monitor for the stalling and failure of applications including specific databases (such as Oracle, DB2), protocols (such as FTP, HTTP), and application servers (such as WebSphere, WebLogic) by introducing optional monitoring products of EXPRESSCLUSTER X SingleServerSafe. For details, see "5. *Monitor resource details*".

- Resource monitoring

  An error can be detected by monitoring the resources (applications, services, etc.) and LAN status by using the monitor resources of EXPRESSCLUSTER X SingleServerSafe. It is effective when the factor for application to stop is due to an error of a resource that is necessary for an application to operate.

CHAPTER

THREE

CREATING CONFIGURATION DATA

In EXPRESSCLUSTER X SingleServerSafe, data describing how a system is set up is called configuration data. Configuration data is created using Cluster WebUI. This chapter describes how to start the Cluster WebUI and the procedure for creating configuration data by using a sample cluster configuration.

This chapter covers:

3.1 Checking the values to be specified

Before creating configuration data by using the Cluster WebUI, check the values you are going to specify as the configuration data. Write down the values to make sure there is no missing information.

3.1.1 Sample environment

Sample configuration data values are shown below. The following sections describe step-by-step procedures for creating configuration data based on these conditions. When actually specifying the values, you might need to modify them according to the cluster you intend to create. For details about how to decide on the values, see "4. *Group resource details*" and "Monitor resource details."

Sample values of configuration data

Target	Parameter	Value
Server information	Server name	server1
	System drive	C:
group	Type	Failover
	Group name	failover1
	Startup server	server1
First group resources	Type	Application resources
	Group resource name	appli1
	Resident Type	Resident
	Start Path	Path of execution file
First monitor resource	Type	User mode monitor resources
	Monitor resource name	userw
	User Heartbeat Interval/Timeout	On
	Monitoring Method	keepalive
	Action When Timeout Occurs	Generating of intentional Stop Error
	Create a Dummy Thread	On
Second monitor resources	Type	IP monitor resources
	Monitor resource name	ipw1
	Monitor IP address	192.168.0.254 (gateway)
	Recovery Target	server1(server name)
	Reactivation threshold	-
	Final Action	Stop service and reboot OS
Third monitor resources	Type	Application monitor
	Monitor resource name	appliw1
	Target Resource	appli1
	Recovery Target:	failover1
	Reactivation threshold	3
	Final Action:	Stop service and reboot OS

Note: The values of "User mode monitor resources" for the first monitor resources are automatically specified.

3.2 Starting up the Cluster WebUI

The configuration data can be created by accessing the Cluster WebUI. This section describes the overview of the Cluster WebUI and how to create the configuration data.

3.2.1 What is Cluster WebUI?

The Cluster WebUI is a function for monitoring the server status, starting and stopping servers and groups, and collecting operation logs through a web browser.

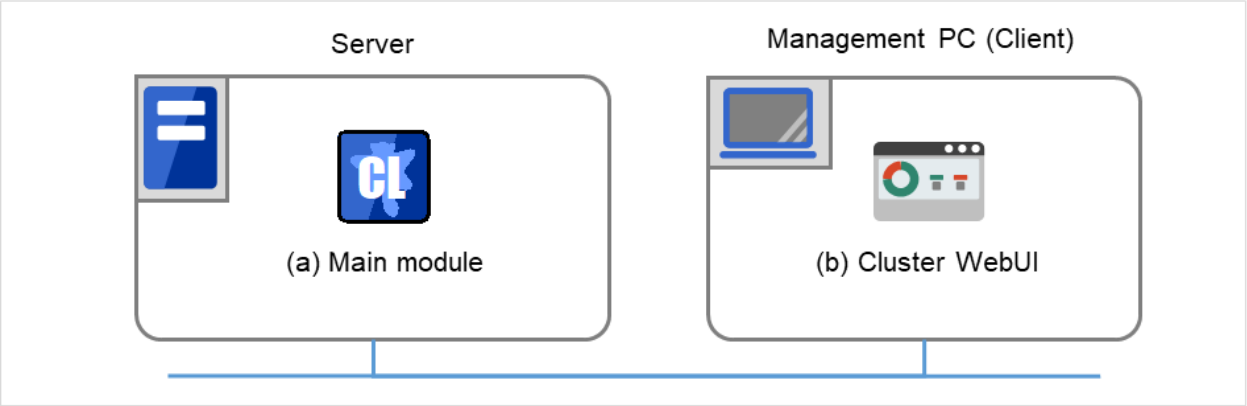


Fig. 3.1: Cluster WebUI

3.2.2 Starting the Cluster WebUI

The following describes how to start the Cluster WebUI.

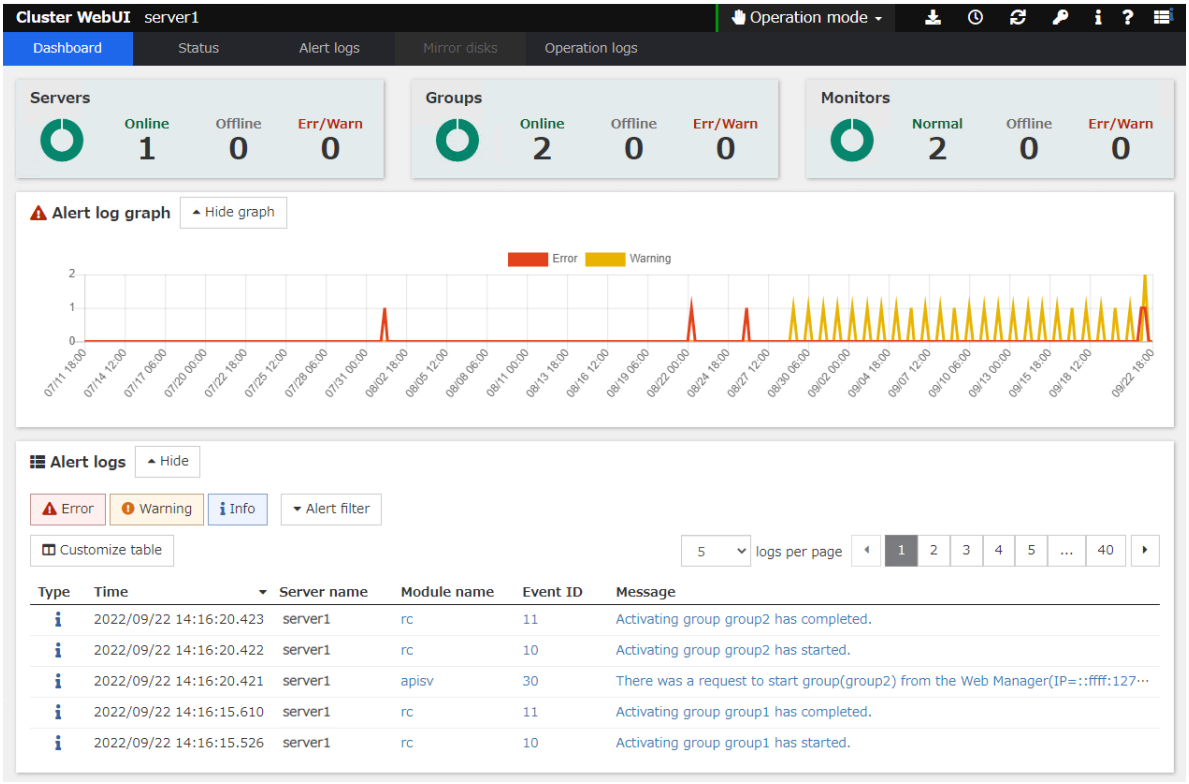
1. Start your Web browser.
   Enter the IP address and port number of the server where EXPRESSCLUSTER X SingleServerSafe is installed in the browser address bar.

   `http://ip-address:port/`

   ip-address Specify the IP address of a server where EXPRESSCLUSTER X SingleServerSafe is installed. In the case of a local server, a local host can be specified.

   port Specify the same port number as that specified for WebManager at installation (default: 29003).

2. The Cluster WebUI starts.



3. From the drop-down menu of the toolbar, select **Config Mode** to switch to the config mode.

   See also:

   To enable encrypted communication with EXPRESSCLUSTER Server, see "6.1.8. *WebManager tab*" in "6. *Other setting details*". Enter the following to perform encrypted communication.

   https://192.168.0.1:29003/

3.3 Creating the configuration data

Creating configuration data involves three steps: setting up the server, creating groups, and creating monitor resources. Use the creation wizard to create new configuration data. The procedure is described below.

Note: Most of the created configuration data can be modified later by using the rename function or property viewing function.

- 3.3.1. *Setting up the server*

  Set up the server on which to run EXPRESSCLUSTER X SingleServerSafe.

  - 3.3.1. *Setting up the server*
    Specify the server name to be configured.

- 3.3.2. *Setting up groups*

  Set up groups. Starting and stopping an application is controlled by a group. Create as many groups as necessary. Generally, you need as many groups as the number of applications you want to control. However, when you use script resources, you can combine more than one application into a single group.

  - 3.3.2. *Adding a group*
    Add a group.
  - 3.3.2. *Adding a group resource (application resource)*
    Add a resource that can start and stop an application.

- 3.3.3. *Setting up monitor resources*

  Add a monitor resource that monitors the specified target.
  Create as many resources as the number of targets you want to monitor.

  - 3.3.3. *Adding a monitor resource (IP monitor resource)*
    Add a monitor resource that performs monitoring.

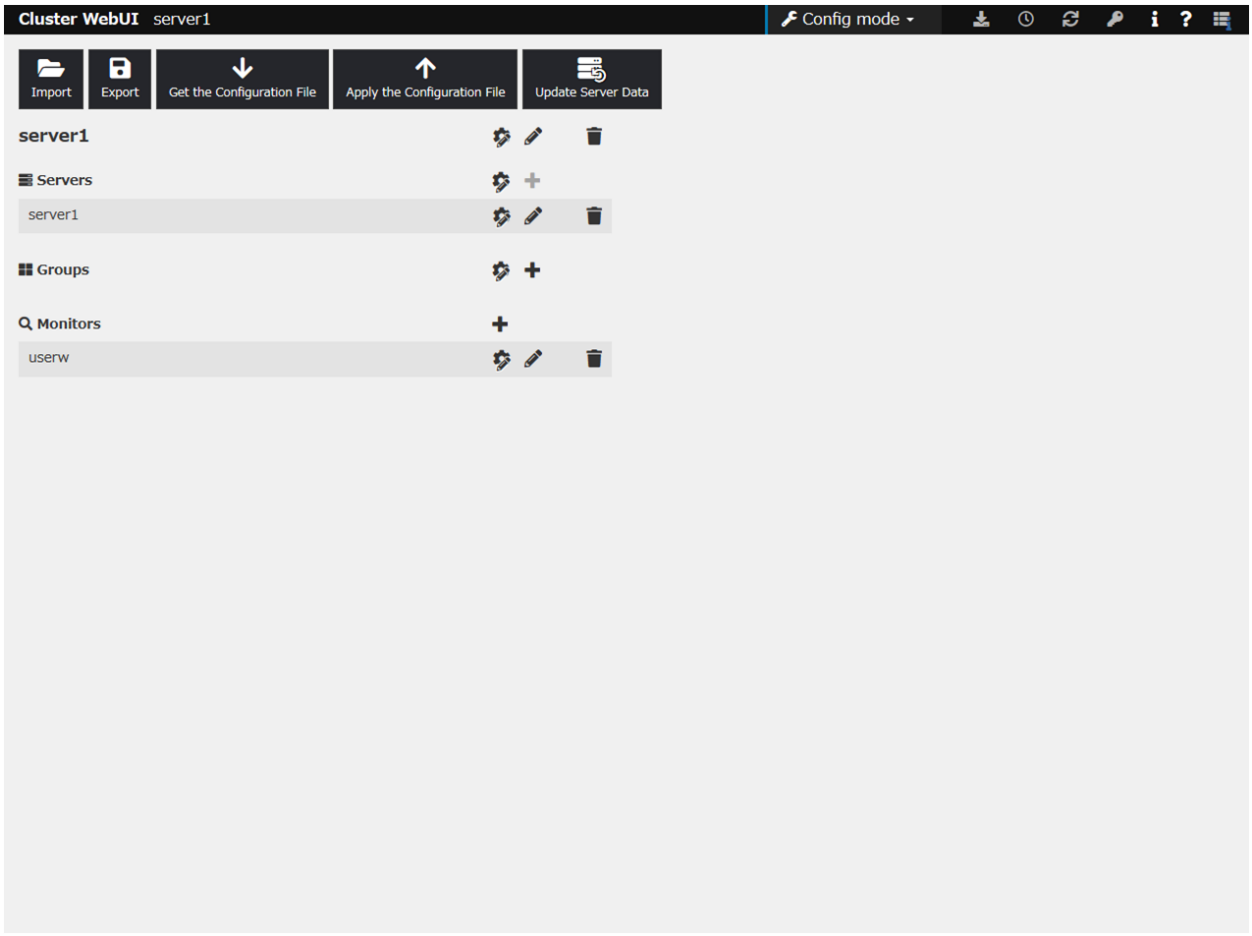
3.3.1 Setting up the server

Set up the server.

Setting up the server

The server settings are automatically created when you reboot the OS after installing EXPRESSCLUSTER X SingleServerSafe. When you switch from the Cluster WebUI's operation mode window to the Config Mode window, you will see the created data.

The window is as follows:



3.3.2 Setting up groups

A group is a set of services and processes necessary to perform an independent operation in the system.
The procedure for adding a group is described below.

Adding a group

Set up a group.

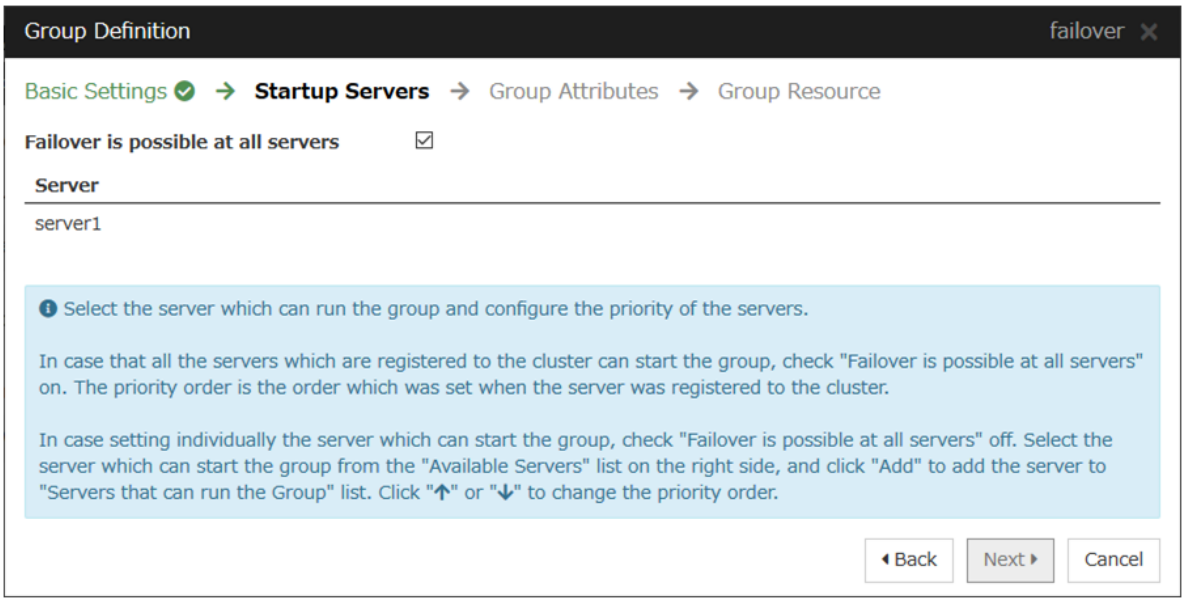
1. Click **Add group** in **Groups**.
2. The **Group Definition** dialog box is displayed.

   Choose one of the types below.

   Type:

   - Failover
     In general, specify this.

   Enter the group name (failover1) in the **Name** box, and click **Next**.
3. Make sure that the **Failover is possible on all servers** check box is selected, and then click **Next**.



4. This dialog box is used to specify the values of the failover group attributes. Click **Next** without specifying anything. The **Group Resource List** is displayed.

Adding a group resource (application resource)

Add an application resource that can start and stop the application.

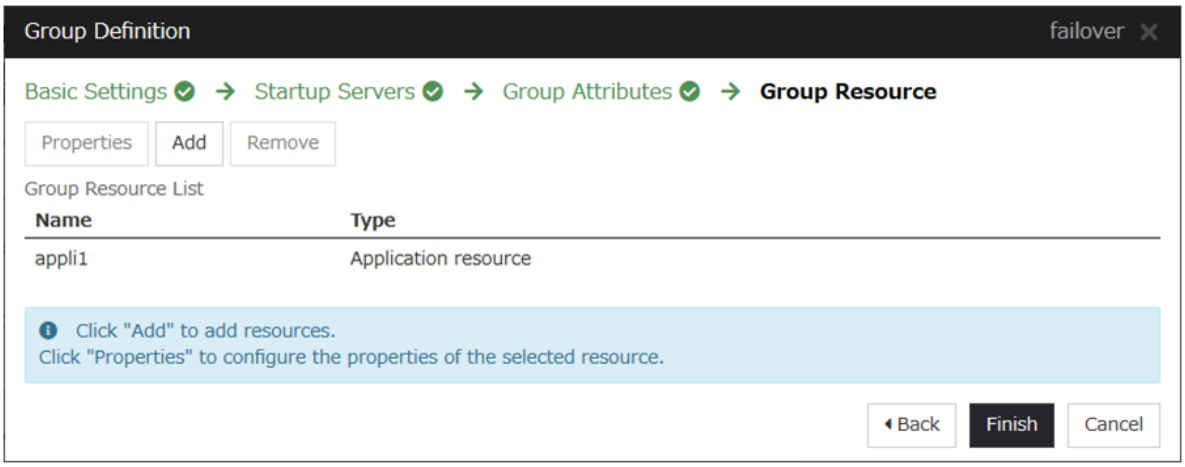
1. Click **Add** in **Group Resource List**.
2. The **Resource Definition of Group(failover1)** dialog box is displayed. Select the group resource type **(application resource)** in the **Type** box, and enter the group resource name appli1 in the **Name** box. Click **Next**.

   Note: The available types are **Application resource, Script resource,** and **Service resource**.

3. A page for setting up a dependency is displayed. Click **Next**.
4. **Recovery Operation at Activation Failure Detection** and **Recovery Operation at Deactivation Failure Detection** are displayed.
   Click **Next**.
5. Select **Resident** in the **Resident Type**. And specify the path of the execution file for the **Start Path**.

   Note: For the Start Path and Stop Path, specify an absolute path to the executable file or the name of the executable file of which the path configured with environment variable is effective. Do not specify a relative path. If it is specified, starting up the application resource may fail.

6. Click **Finish**.
   An application resource is added to the **Group Resource List**.



7. Click **Finish**.

3.3.3 Setting up monitor resources

Add a monitor resource that monitors the specified target.

Adding a monitor resource (IP monitor resource)

1. Click **Add monitor resource** in **Monitors**. The **Monitor Resource Definition** is displayed.
2. Select the monitor resource type **ip monitor** in the **Type** box, and enter the monitor resource name **ipw1** in the **Name** box. Click **Next**.

Note:

Monitor resources are displayed in **Type**. Select the resource you want to monitor.

If the licenses for optional products have not been installed, the resources and monitor resources corresponding to those licenses are not shown in the list on the Cluster WebUI.

If any monitor resources are not displayed in the list box of **Type** even though the licenses are registered, please click **Get License Info** button.

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3. Enter the monitor settings. Change nothing from the default values. Click **Next**.
4. The **IP Addresses** is displayed. Click **Add**.
5. Enter the IP address to be monitored **192.168.0.254** in the **IP Address** box, and then click **OK**.

Note: For monitoring target of the IP monitor resource, specify an IP address of the device (i.e., gateway) that is assumed to be always active on public LAN

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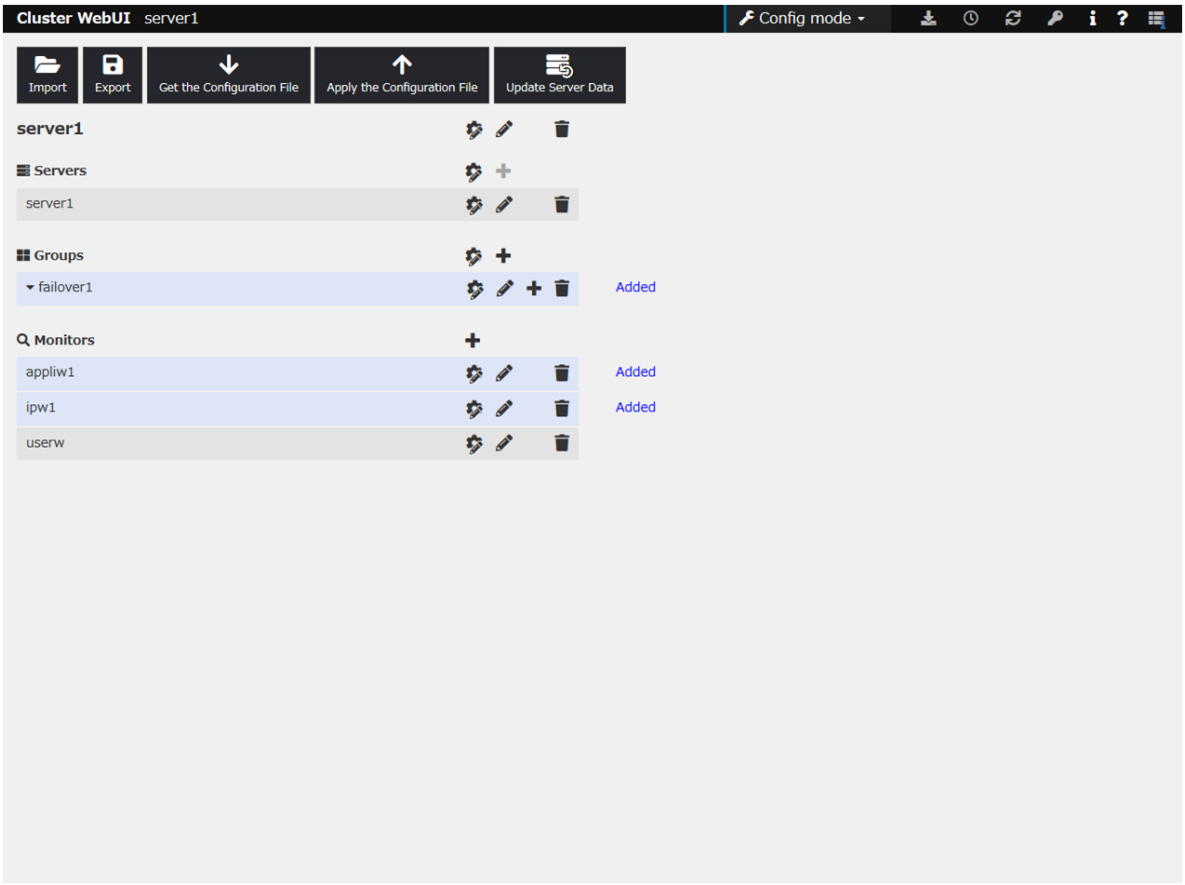
6. The entered IP address is set in the **IP Addresses**. Click **Next**.
7. Specify the recovery target. Click **Browse**.
8. Click failover1 in the displayed tree view. Click **OK**. "failover1" is set in the **Recovery Target**.
9. Click **OK**.
   After the settings are specified, the window appears as follows.



This concludes creating the configuration data. Proceed to the next section "3.4. *Saving configuration data*".

3.4 Saving configuration data

The created configuration data can be saved in a folder on your PC or in external media.
To save the configuration data, follow the procedure below.

1. Click **Export** in the config mode of Cluster WebUI.
2. Select a location to save the data and save it.

Note: One file (clp.conf) and one directory (scripts) are saved. If any of these are missing, the attempt to apply the configuration data will fail. Make sure to treat these two as a set. When new configuration data is edited, clp.conf.bak is created in addition to these two.

Note: If you specified a port number for **Port Number** that differed from the default value when installing EXPRESSCLUSTER X SingleServerSafe, click **Cluster Properties** and then the **Port No.** tab and change the value of **WebManager HTTP Port Number** to the same value as that specified at the time of installation, before saving the configuration data.

3.5 Checking configuration data

Before applying the cluster configuration data created on Cluster WebUI to the cluster servers, the cluster configuration data can be checked.

1. In the config mode of Cluster WebUI, click **Cluster Configuration Information Check**.
2. After the check is completed, the results are displayed in another window. It may take time for the check to be completed, depending on the settings for the created cluster configuration data.

Details of what is checked are as follows:

Cluster Properties

Check item	Description
Port No. tab : port number check	Checks whether the range of automatically assigned communication port numbers managed by the OS does not overlap with that used by EXPRESSCLUSTER.

Unrecommended settings check

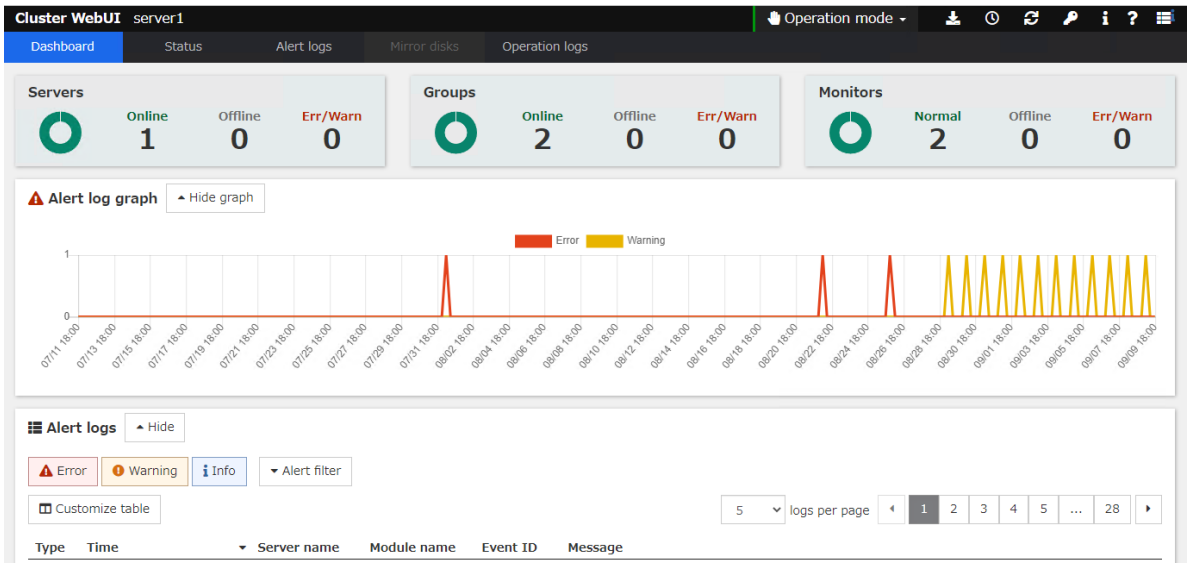
Check item	Description
Recovery action check for deactivation failure	Checks whether any setting other than **No operation** is set for the final action on the deactivation failure of each group resource.

Note: For the outputted message, refer to "Details on checking cluster configuration data".

3.6 Applying configuration data

After creating configuration data by using the config mode of Cluster WebUI, apply the configuration data to the server.
To apply the configuration data, follow the procedure below.

1. Click **Apply the Configuration File** in the config mode of Cluster WebUI.
2. Depending on the difference between the existing configuration data and the configuration data you are uploading, a pop-up window might be displayed to prompt you to check the operation necessary to upload the data.
   If there is no problem with the operation, click **OK**.
   When the upload ends successfully, a popup message saying "The application finished successfully." is displayed. Click OK.
   If the upload fails, perform the operations by following the displayed message.
3. The status will be displayed on the Cluster WebUI.



For how to operate and check the Cluster WebUI, see the online manual from the ? button on the upper right of the screen.

CHAPTER

FOUR

GROUP RESOURCE DETAILS

This chapter provides details about group resources.

EXPRESSCLUSTER X SingleServerSafe uses windows common to those of the clustering software EXPRESSCLUSTER X to ensure high compatibility with EXPRESSCLUSTER X in terms of operation and other aspects.

This chapter covers:

4.1 Group resources

The following resources can be defined as group resources.

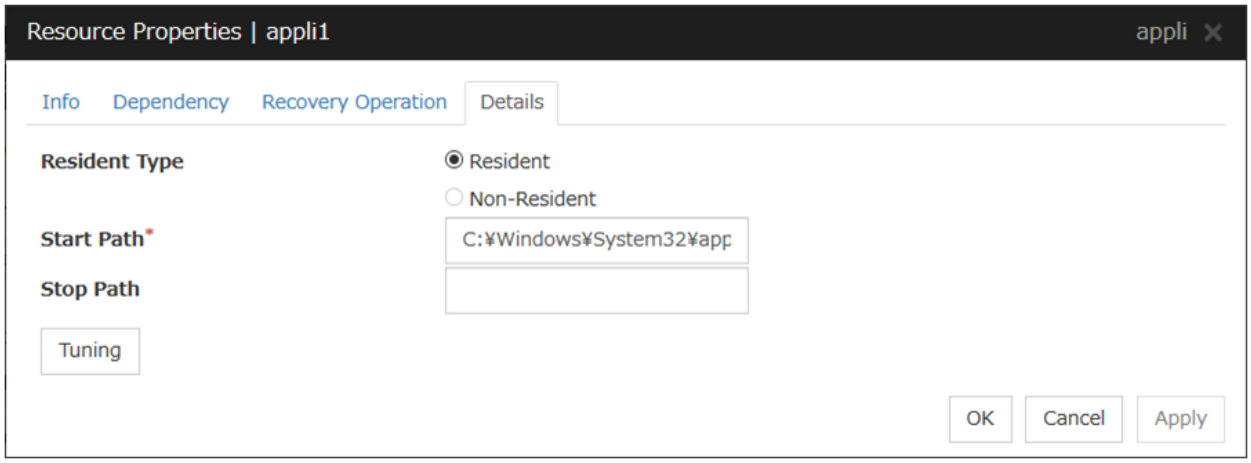
Group resource name	Function	Abbreviation
Application resource	Provides a mechanism for starting and stopping an application (including a user-created application).	appli
Script resource	Provides a mechanism for starting and stopping a script (BAT) such as a user-created script.	script
Service resource	Provides a mechanism for starting and stopping a service such as a database or Web service.	service

4.2 Setting up application resources

You can register applications that are to be managed by EXPRESSCLUSTER X SingleServerSafe and executed when a group starts or stops. It is also possible to register your own applications in application resources.

Applications are programs that are executable from the command line and have an extension such as exe, cmd, or bat.

4.2.1 Details tab



Resident Type (default: **Resident**)

Specify the type of the application. Choose one of the types below.

- **Resident**
  Select this when the application resides in EXPRESSCLUSTER.
- **Non-resident**
  Select this when the application does not reside in EXPRESSCLUSTER (and control returns to the system immediately after the application is executed).

Start Path (within 1023 bytes)

Specify the name of the file that can be run when the application resource is started.

Stop Path (within 1023 bytes)

Specify the name of the file that can be run when the application resource is stopped.

The operation is as described below if the resident type is Resident.

- If the stop path is not specified
  The application started by EXPRESSCLUSTER in the inactive state is stopped.
- If the stop path is specified
  The application started by executing the application specified for the stop path in the inactive state is stopped.

Note: For the **Start Path** and **Stop Path**, specify an absolute path to the executable file or the name of the executable file of which the path configured with environment variable is effective. Do not specify a relative path. If it is specified, starting up the application resource may fail.

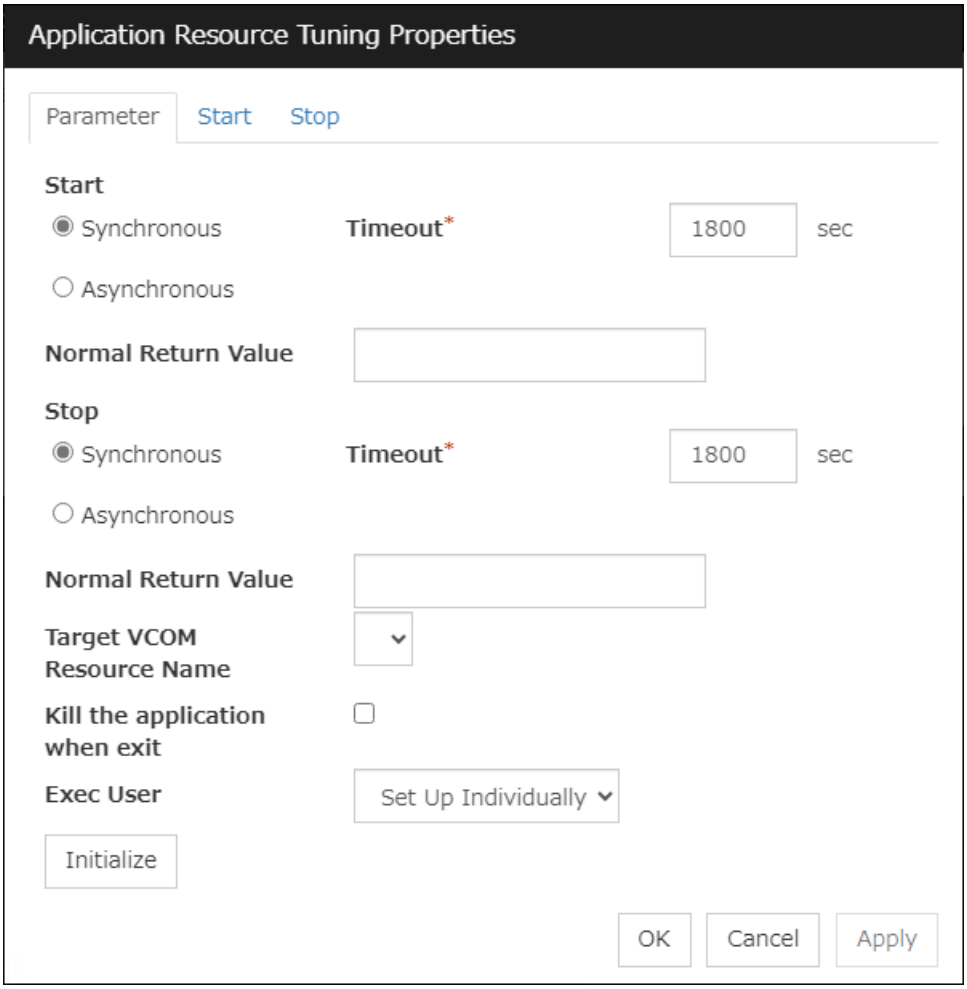
Tuning

Use this button to display the **Application Resource Tuning Properties** dialog box. Configure the detailed settings for the application resources.

Application Resource Tuning Properties

Parameter tab

Detailed parameter settings are displayed on this tab.



Synchronous (Start)

This setting is not available for a resident application.
If the application is non-resident, select this to wait for the application to stop when it is run.

Asynchronous (Start)

This setting is not available for a resident application.
If the application is non-resident, select this so as not to wait for the application to stop when it is run.

Normal Return Value (Start) (Within 1023 bytes)

This entry field cannot be entered when **Asynchronous** is selected.
Specify what error code returned from the executable file set by **Start Path** is normal when **Resident Type** is **Non-resident**.

- When there is no value
  The return value is ignored.
- When there is a value
  Observe the following input rules.
  - Values can be separated by commas (for example, 0, 2, 3).
  - Values can be specified using a hyphen (for example, 0-3).

Note: In case that a batch file is specified as the executable file, an error cannot be detected when 1 is specified as **Normal Return Value** because 1 is returned when an error occurs with cmd.exe which executes the batch file.

Synchronous (Stop)

If the application is resident, and the stop path is not specified, select this to wait for the currently running application to stop. If the application is resident, and the stop path is specified, select this to wait for the application specified for the stop path to stop.
If the application is non-resident, select this to wait for the application to stop when it is run.

Asynchronous (Stop)

If the application is resident, select this so as not to wait for the currently running application or the application specified for the stop path to stop.
If the application is non-resident, select this so as not to wait for the application to stop when it is run.

Normal Return Value (Stop) (Within 1023 bytes)

This entry field cannot be entered when **Asynchronous** is selected.
Specify what error code returned from the executable file set by **Stop Path** is normal when **Resident Type** is **Non-resident**.

- When there is no value
  The return value is ignored.
- When there is a value
  Observe the following input rules.
  - Values can be separated by commas (for example, 0, 2, 3).
  - Values can be specified using a hyphen (for example, 0-3).

Note: In case that a batch file is specified as the executable file, an error cannot be detected when 1 is specified as **Normal Return Value** because 1 is returned when an error occurs with cmd.exe which executes the batch file.

Timeout (Start) (1 to 9999)

This setting is not available for a resident application.
Configure the timeout value to wait (synchronous) for a non-resident application to stop when the application is run. A value can be entered only when **Synchronous** is selected. If the application does not stop within the timeout value set here, it is considered as an error.

Timeout (Stop) (1 to 9999)

For a resident application, configure the timeout value to wait (Synchronous) for the currently running application or the application specified for the stop path to stop.

Configure the timeout value to wait (synchronous) for currently running resident application(s) to stop or for a non-resident application to stop when the application is run.

The timeout value can be set only when **Synchronous** is selected. If the application does not stop within the timeout value set here, it is considered as an error.

Target VCOM Resource Name

Not used.

Kill the application when exit

Specify whether or not to forcibly terminate the application as termination of deactivation. If this is selected, the application is forcibly terminated instead of normal termination. This is effective only when **Resident Type** is set to **Resident** and the stop path is not specified.

Exec User

Specify a user who executes the application. The user can be selected from the users registered in the **Account** tab of **Cluster Properties**.

With **Set Up Individually** specified, the settings of the user in the **Start** and **Stop** tabs are applied.

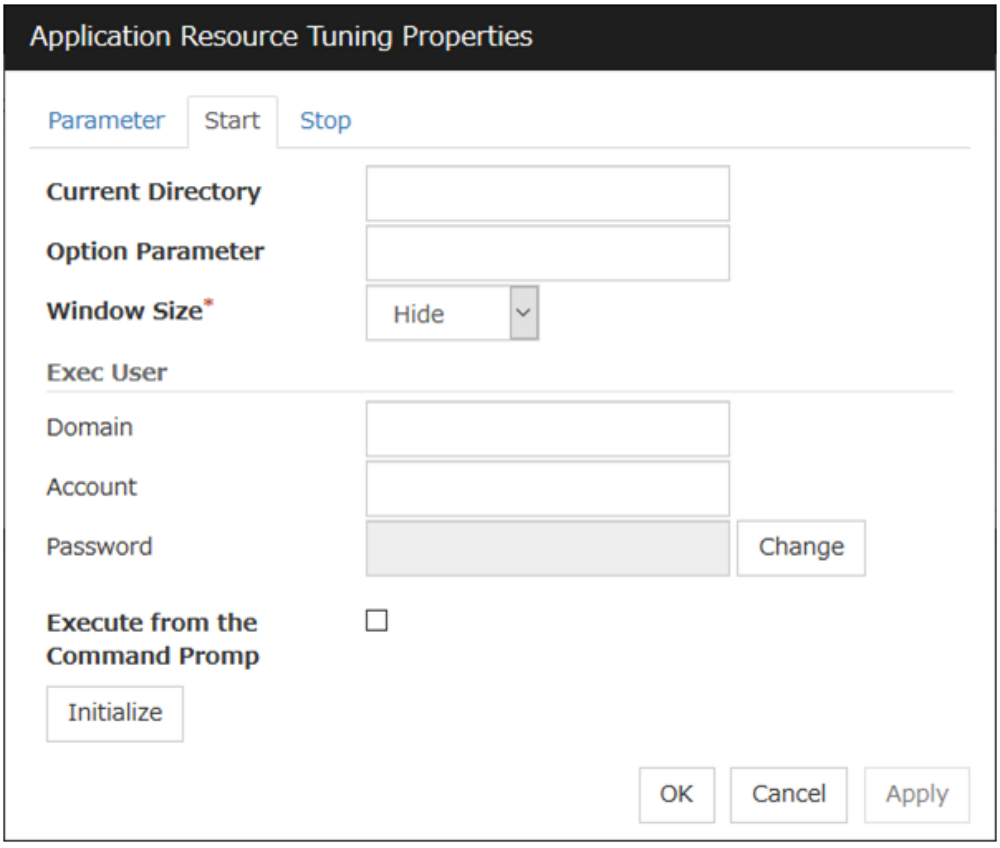
With any value other than **Set Up Individually** specified, the settings in the **Start** and **Stop** tabs are not used: Those of the user specified for this parameter are applied.

Initialize

Click **Initialize** to reset the values of all items to their default values.

Start and Stop tabs

A detailed setting for starting and stopping the application is displayed.



Current Directory (Within 1023 bytes)

Specify a directory for running the application.

Option Parameter (Within 1023 bytes)

Enter parameters to be entered for the application. If there are multiple parameters, delimit parameters with spaces. For a parameter that includes a space, enclose the parameter with double quotation marks.

Example: "param 1" param2

Window Size

Select the size of the window for running the application from the following:

- **Hide**
  The application is not displayed.
- **Normal**
  The application is displayed in a regular window size.
- **Maximize**
  The application is displayed in a maximum window size.
- **Minimize**
  The application is displayed in a minimum window size.

Exec User Domain

Specify the domain of a user account that runs the application.
In the case of **Stop** tab, it is unnecessary to stop and/or resume the group.

Exec User Account

Specify the user account that runs the application.

In the case of **Stop** tab, it is unnecessary to stop and/or resume the group.

Exec User Password

Specify the password for the user account that runs the application.

In the case of **Stop** tab, it is unnecessary to stop and/or resume the group.

Execute from the Command Prompt

Specify whether to run the application from the command prompt (cmd.exe). Specify this when running an application (such as JavaScript and VBScript) whose extension is other than exe, cmd, or bat.

Initialize

Click **Initialize** to reset the values of all items to their default values.

4.3 Setting up script resources

You can register scripts that are to be managed by EXPRESSCLUSTER X SingleServerSafe and executed when a group starts or stops. It is also possible to register your own scripts for script resources.
Start and stop scripts are provided for script resources. These are executed when starting and stopping a group, respectively. Their file names are fixed.

start.bat Start script
stop.bat Stop script

Group A start script: a sample of stop.bat

```
rem ************************************************************
rem *                          START.BAT                       *
rem ************************************************************

rem Allot a process by referencing environment variables for script starting␣
↪factors.
IF "%CLP_EVENT%"=="START" GOTO NORMAL
IF "%CLP_EVENT%"=="FAILOVER" GOTO FAILOVER
IF "%CLP_EVENT%"=="RECOVER" GOTO RECOVER


rem EXPRESSCLUSTER is not running.
GOTO no_clp


:NORMAL
IF "%CLP_DISK%"=="FAILURE" GOTO ERROR_DISK

    rem Write the normal startup process of an operation here.
    rem This process is executed at the following timing:
    rem
    rem Normal startup
    rem


rem Allot a process by referencing environmental variables for a server␣
↪where the script is run.
IF "%CLP_SERVER%"=="OTHER" GOTO ON_OTHER1

    rem Write a process to be executed only if an operation is normally␣
↪started on the primary server.
    rem
    rem This process is executed at the following timing:
    rem
    rem Normal startup
    rem

GOTO EXIT


:ON_OTHER1

rem Write a process to be executed only if an operation is normally started␣
↪on other than the primary server.
rem
rem
rem This process is not executed by EXPRESSCLUSTER X SingleServerSafe.
rem

GOTO EXIT


:FAILOVER

rem Handle an error by referencing environmental variables for DISK␣
↪connection data.
```

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```
IF "%CLP_DISK%"=="FAILURE" GOTO ERROR_DISK

    rem Write the startup process of an operation.
    rem
    rem This process is not executed by EXPRESSCLUSTER X SingleServerSafe.
    rem


rem Allot a process by referencing environmental variables for a server␣
↪where the script is run.
IF "%CLP_SERVER%"=="OTHER" GOTO ON_OTHER2

    rem Write a process to be executed only if an operation is started on␣
↪the primary server.
    rem
    rem
    rem This process is not executed by EXPRESSCLUSTER X SingleServerSafe.
    rem

GOTO EXIT


:ON_OTHER2

rem Write process to be executed only if an operation is started on other␣
↪than the primary server.
rem
rem
rem This process is not executed by EXPRESSCLUSTER X SingleServerSafe.
rem


GOTO EXIT


:RECOVER

rem Write the recovery process after the resumption of a cluster.
rem This process is executed at the following timing:
rem
rem Resumption of the cluster
rem

GOTO EXIT


:ERROR_DISK

rem Write disk-related error handling processes.

:no_clp

:EXIT
exit
```

Group A stop script: a sample of stop.sh

```
rem ************************************************************
rem *                          STOP.BAT                        *
rem ************************************************************

rem Allot a process by referencing environment variables for script starting␣
↪factors.
IF "%CLP_EVENT%"=="START" GOTO NORMAL
IF "%CLP_EVENT%"=="FAILOVER" GOTO FAILOVER


rem EXPRESSCLUSTER is not running.
GOTO NO_CLP


:NORMAL
rem Handle an error by referencing environmental variables for DISK␣
↪connection data.
IF "%CLP_DISK%"=="FAILURE" GOTO ERROR_DISK

    rem Write the normal shutdown process of an operation here.
    rem This process is executed at the following timing:
    rem
    rem Normal shutdown
    rem


rem Allot a process by referencing environmental variables for a server␣
↪where the script is run.
IF "%CLP_SERVER%"=="OTHER" GOTO ON_OTHER1

    rem Write a process to be executed only if an operation is processed on␣
↪the primary server.
    rem
    rem This process is executed at the following timing:
    rem
    rem Normal shutdown
    rem

GOTO EXIT


:ON_OTHER1

rem Write a process to be executed only if an operation is normally shut␣
↪down on other than the primary server.
rem
rem
rem This process is not executed by EXPRESSCLUSTER X SingleServerSafe.
rem

GOTO EXIT


:FAILOVER

rem Handle an error by referencing environmental variables for DISK␣
↪connection data.
```

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```
IF "%CLP_DISK%"=="FAILURE" GOTO ERROR_DISK

    rem Describe the normal shutdown process after the failover.
    rem
    rem This process is not executed by EXPRESSCLUSTER X SingleServerSafe.
    rem


rem Allot a process by referencing environmental variables for a server␣
↪where the script is run.
IF "%CLP_SERVER%"=="OTHER" GOTO ON_OTHER2

    rem Write a process to be executed only if an operation is terminated on␣
↪the primary server.
    rem
    rem
    rem This process is not executed by EXPRESSCLUSTER X SingleServerSafe.
    rem

GOTO EXIT


:ON_OTHER2

rem Write a process to be executed only if an operation is terminated on␣
↪other than the primary server after the failover.
rem
rem
rem This process is not executed by EXPRESSCLUSTER X SingleServerSafe.
rem

GOTO EXIT


:ERROR_DISK

rem Write disk-related error handling processes.

:NO_CLP

:EXIT
exit
```

4.3.1 Tips for creating scripts

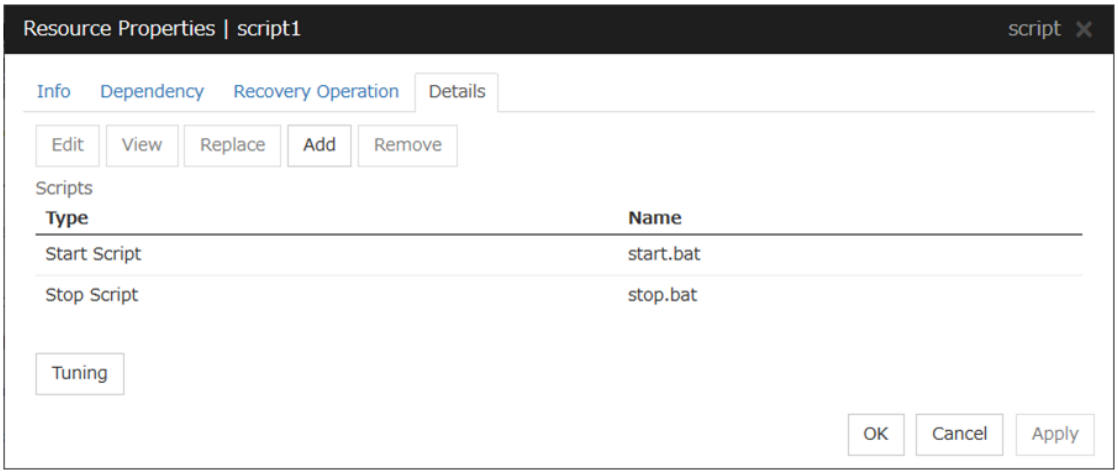
- The clplogcmd command, though which message output on the alert log is possible, is available.

4.3.2 Notes on script resources

Stop the processing by using the exit command in the script activated through the start command, when the start command is used in the start/stop script.

4.3.3 Details tab

The default script file names, **start.bat** and **stop.bat**, are listed on **Scripts**.



Add

Use this button to add a script other than **start.bat** script and **stop.bat** script.

Note:

Do not use 2-byte characters for the name of a script to be added.
Do not use "& (ampersand)" nor "= (equal mark)" for the name of a script to be added.

Remove

Use this button to delete a script. The **start.bat** script and **stop.bat** script cannot be deleted.

View

Use this button to display the selected script file. You cannot display the script file if it is currently displayed or edited.

Edit

Use this button to edit the selected script file. Click **Save** to apply the change. You cannot modify the name of the script file.

Replace

Opens the **Open** dialog box, where you can select a file.

Note: The file will not be deleted even if you delete a script file from the Cluster WebUI. If the cluster configuration data is reloaded by restarting the Cluster WebUI after deleting the script file, the deleted script file will be displayed in the **Scripts**.

The content of the script file selected in the **Resource Properties** is replaced with the one selected in the **Open** dialog box. You cannot replace the script file if it is currently displayed or edited. Select a script file only. Do not select binary files (applications), and so on.

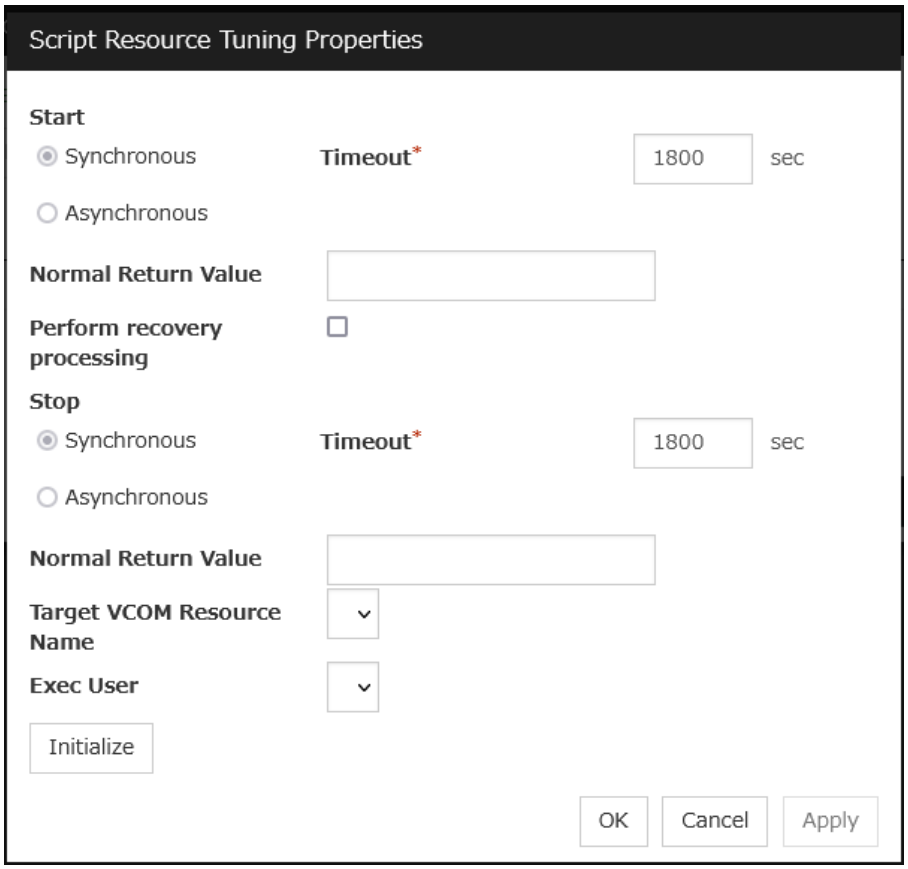
Tuning

Open the **Script Resource Tuning Properties** dialog box. You can make advanced settings for the script resource.

Script Resource Tuning Properties

Parameter tab

Detailed parameter settings are displayed on this tab.



Common to all start scripts and stop scripts

Synchronous

Select this button to wait for a script to end when it is run.

Asynchronous

This cannot be selected.

Normal Return Value

Configure what error code from the script is normal.

- When there is no value
  The return value is ignored.
- When there is a value

Observe the following input rules.

– Values can be separated by commas (for example, 0, 2, 3).

– Values can be specified using a hyphen (for example, 0-3).

Note:

When specifying a value to **Normal Return Value**, set the same value to start script and stop script.
An error cannot be detected when 1 is specified as **Normal Return Value** because 1 is returned when an error occurs with cmd.exe which executes the script.

Perform recovery processing

Specify whether to run a start script or not in any of the following timings:

- When the server is recovered
- When a monitor resource error is detected
- When the group resource activation terminates due to an error

When executed as the recovery operation, RECOVER is set for CLP_EVENT, the environment variable.

Timeout (1 to 9999)

When you want to wait for a script to end (when selecting **Synchronous**), specify how many seconds you want to wait before a timeout. This box is enabled when **Synchronous** is selected. If the script does not complete within the specified time, it is determined as an error.

Target VCOM Resource Name

Not used.

Exec User

Specify a user who executes the script. The user can be selected from the users registered in the **Account** tab of **Cluster Properties**.

If no user is specified, the script is run by the local system account.

Initialize

Click **Initialize** to reset the values of all items to their default values.

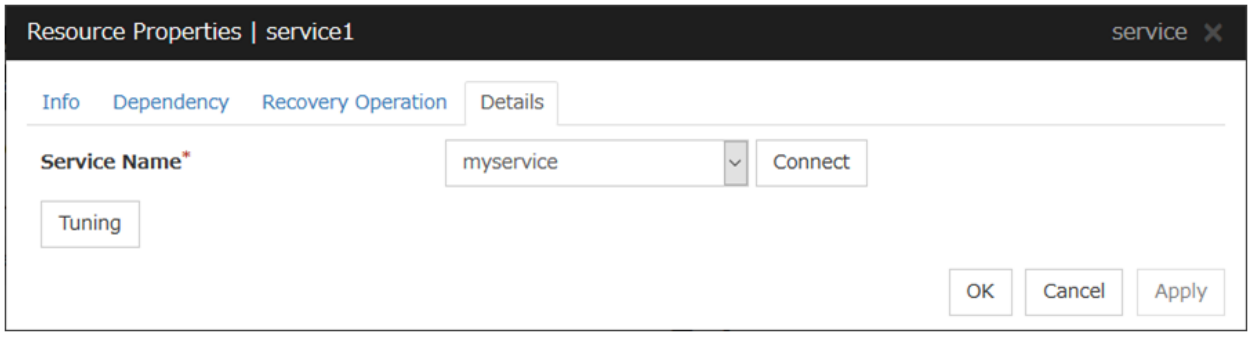
4.4 Setting up service resources

You can register services that are to be managed by EXPRESSCLUSTER X SingleServerSafe and executed when a group starts or stops. It is also possible to register your own services to service resources.
A service resource refers to a service managed by the OS service control manager.

4.4.1 Notes on service resources

- Generally, the service executed by the service resource is set to manual start. In case of the service which is executed by automatic start or the service which may be executed by other than the service resource, it is necessary to check on **Do not assume it as an error when the service is already started** which is described below in **Service** tab of **Service resource tuning properties**. If this check box is off, activation fails when executing service start processing by the service resource to the service which has already been executed.
- The service executed by the service resource is not controlled by applications other than EXPRESSCLUSTER. Therefore, it is recommended to set the recovery operation not to be performed by the service control manager.
  If a service is set to restart upon the recovery operation by the service control manager, an unexpected action might be performed due to duplication with the recovery operation by EXPRESSCLUSTER.

4.4.2 Details tab



Service Name (within 1023 bytes)

Specify the service name or service display name used in the service resource.
Combo box options display the list of the service display names of the services collected from the server.

Connect

Collects the service list from the server and updates the service display name list to be displayed in the **Service Name** combo box.

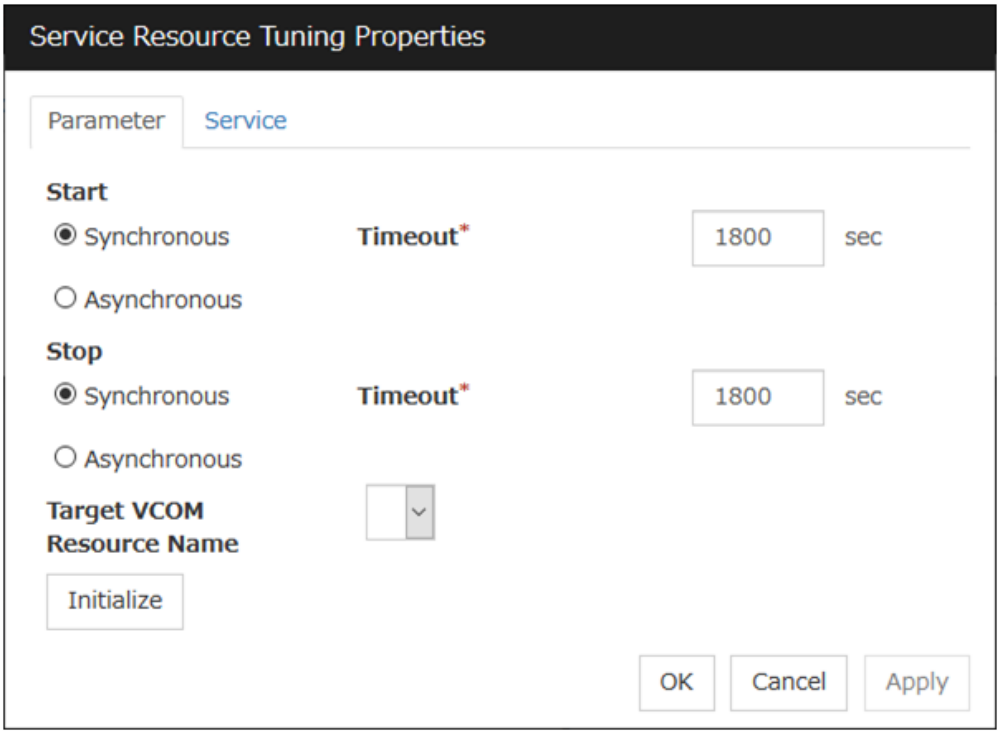
Tuning

Open the **Service Resource Tuning Properties** dialog box. You can make advanced settings for the service resource.

Service Resource Tuning Properties

Parameter tab

Detailed parameter settings are displayed on this tab.



Synchronous

When the service is started up, it waits for "Started." Typically, the status changes from "Stopping" to "Started" when the service is started.

When stopping the service, it waits for that the status of service becomes "Stopped." Typically, the status changes from "Stopping" to "Stopped" when the service is stopped.

Asynchronous

No synchronization is performed.

Timeout (1 to 9999)

Specify the timeout for the status of the service to become "Started" at the time starting the service. The timeout can be specified only when **Synchronous** is selected. If the status of the service does not change to "Started" within the timeout, it is determined as an error.

Specify the timeout for the stats of the service to become "Stopped" at the time stopping the service. The timeout can be specified only when **Synchronous** is selected. If the status of the service does not change to "Stopped" within the timeout, it is determined as an error.

Target VCOM Resource Name

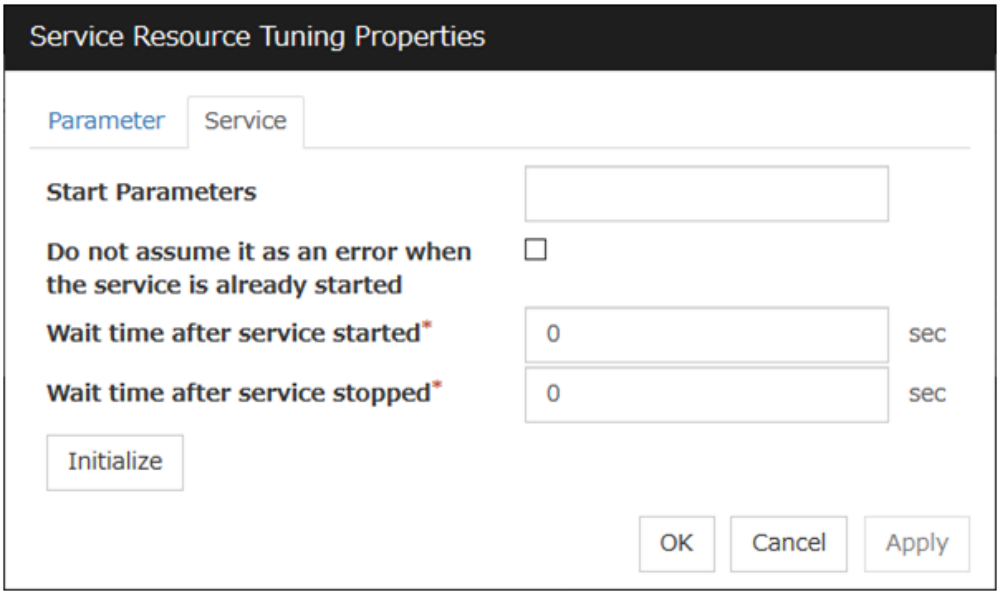
Not used.

Initialize

Click **Initialize** to reset the values of all items to their default values.

Service tab

The settings for the service are displayed.



Start Parameters (Within 1023 bytes)

Specify a parameter for the service. When there are multiple parameters, leave a space between parameters. For a parameter that includes a space, enclose the parameter by double quotation marks. Note that backslash \ cannot be used.

Example: "param 1" param2

Do not assume it as an error when the service is already started

- When selected
  When the service is started, if the service is already started up, activation status is kept.
- When cleared
  When the service is started, if the service is already started up, it is considered as activation error.

Wait after the service is started (0 to 9999)

Specify the time to wait after the service is started.

The service resource activation will be completed after waiting for the specified time.

Wait after the service is stopped (0 to 9999)

Specify the time to wait after the service is stopped.

The service resource deactivation will be completed after waiting for the specified time.

Initialize

Click **Initialize** to reset the values of all items to their default values.

CHAPTER

FIVE

MONITOR RESOURCE DETAILS

This chapter provides details about monitor resources. A monitor resource is the unit used when EXPRESSCLUSTER X SingleServerSafe performs monitoring.

EXPRESSCLUSTER X SingleServerSafe uses windows common to those of the clustering software EXPRESSCLUSTER X to ensure high compatibility with EXPRESSCLUSTER X in terms of operation and other aspects.

This chapter covers:

5.1 Monitor resources

The following resources can be defined as monitor resources:

Monitor resource name	Function	Monitor Timing: (Default values are shown in bold.)	Target Resource:
Application monitor resource	Monitors application resources.	When activated (Fixed)	appli
Service monitor resource	Monitors service resources.	Always or **when activated**	All resources
Disk RW monitor resource	Monitors disk devices by writing dummy data to the file system.	Always or **when activated**	All resources
IP monitor resource	Monitors IP addresses and communication paths by using the ping command and checking whether there is a response .	**Always** or when activated	All resources
NIC Link Up/Down monitor resource	Acquires the NIC link status to monitor whether the link is up or down.	**Always** or when activated	All resources
Custom monitor resource	Performs monitoring by executing any script.	**Always** or when activated	All resources
Multi target monitor resource	Performs monitoring by using multiple monitor resources in combination.	When activated (Fixed)	All resources
Eternal link monitor resource	Specifies the action to take when an error message is received and how the message is displayed on the Cluster WebUI.	Always (Fixed)	None
Process Name monitor resource	Monitors monitor the process of specified processes.	**Always** or when activated	All resources
DB2 monitor resource	Provides a mechanism for monitoring an IBM DB2 database.	When activated (Fixed)	All resources
FTP monitor resource	Provides a mechanism for monitoring an FTP server.	When activated (Fixed)	All resources
HTTP monitor resource	Provides a mechanism for monitoring an HTTP server.	When activated (Fixed)	All resources
IMAP4 monitor resource	Provides a mechanism for monitoring an IMAP server.	When activated (Fixed)	All resources
ODBC monitor resource	Provides a mechanism for monitoring an ODBC accessible database.	When activated (Fixed)	All resources

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Table 5.1 – continued from previous page

Monitor resource name	Function	Monitor Timing: (Default values are shown in bold.)	Target Resource:
Oracle monitor resource	Provides a mechanism for monitoring an Oracle database.	When activated (Fixed)	All resources
POP3 monitor resource	Provides a mechanism for monitoring a POP server.	When activated (Fixed)	All resources
PostgreSQL monitor resource	Provides a mechanism for monitoring a PostgreSQL database.	When activated (Fixed)	All resources
SMTP monitor resource	Provides a mechanism for monitoring an SMTP server.	When activated (Fixed)	All resources
SQL Server monitor resource	Provides a mechanism for monitoring an SQL server database.	When activated (Fixed)	All resources
Tuxedo monitor resource	Provides a mechanism for monitoring a Tuxedo application server.	When activated (Fixed)	All resources
WebLogic monitor resource	Provides a mechanism for monitoring a WebLogic application server.	When activated (Fixed)	All resources
WebOTX monitor resource	Provides a mechanism for monitoring a WebOTX application server.	When activated (Fixed)	All resources
WebSphere monitor resource	Provides a mechanism for monitoring a WebSphere application server.	When activated (Fixed)	All resources
JVM monitor resources	Provides a mechanism for monitoring a Java VM.	**Always** or when activated	All resources
System monitor resources	Provides a mechanism for monitoring a System Resource.	Always (Fixed)	All resources
Process resource monitor resources	Provides a mechanism for monitoring process resources.	Always (Fixed)	All resources
User mode monitor resource	Provides a mechanism for monitoring any user space stalls.	Always (Fixed)	None

5.1.1 Monitor resources that require a license

Monitor resources listed below require a license since they are optional products.
To use these monitor resources, obtain and register a product license.

Optional product name	Monitor resource name
EXPRESSCLUSTER X Database Agent 5.2 for Windows	DB2 monitor resources
	ODBC monitor resources
	Oracle monitor resources
	PostgreSQL monitor resources
	SQL Server monitor resources
EXPRESSCLUSTER X Internet Server Agent 5.2 for Windows	FTP monitor resources
	HTTP monitor resources
	IMAP4 monitor resources
	POP3 monitor resources
	SMTP monitor resources
EXPRESSCLUSTER X Application Server Agent 5.2 for Windows	Tuxedo monitor resources
	WebSphere monitor resources
	WebLogic monitor resources
	WebOTX monitor resources
EXPRESSCLUSTER X Java Resource Agent 5.2 for Windows	JVM monitor resources
EXPRESSCLUSTER X System Resource Agent 5.2 for Windows	System monitor resources
	Process resource monitor resources

For the procedure for registering a license, see the "Installation Guide".

5.1.2 Applications supported by monitoring options

The following applications are the target monitoring options that are supported.

x86_64 version

Monitor resource	Application to be monitored	EXPRESSCLUSTER Version	Remarks
Oracle monitor	Oracle Database 19c (19.3)	13.00 or later	
DB2 monitor	DB2 V11.5	13.00 or later	
PostgreSQL monitor	PostgreSQL 14.1	13.00 or later	
	PostgreSQL 15.1	13.10 or later	
	PostgreSQL 16.3	13.21 or later	
	PowerGres on Windows V13	13.00 or later	
SQL Server monitor	SQL Server 2019	13.00 or later	
	SQL Server 2022	13.10 or later	
Tuxedo monitor	Tuxedo 12c Release 2 (12.1.3)	12.00 or later	
	Tuxedo 22c (22.1.0)	13.20 or later	

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Table 5.3 – continued from previous page

Monitor resource	Application to be monitored	EXPRESSCLUSTER Version	Remarks
WebLogic monitor	WebLogic Server 11g R1	12.00 or later	
	WebLogic Server 11g R2	12.00 or later	
	WebLogic Server 12c R2 (12.2.1)	12.00 or later	
	WebLogic Server 14c (14.1.1)	12.20 or later	
WebSphere monitor	WebSphere Application Server 8.5	12.00 or later	
	WebSphere Application Server 8.5.5	12.00 or later	
	WebSphere Application Server 9.0	12.00 or later	
WebOTX monitor	WebOTX Application Server V9.1	12.00 or later	
	WebOTX Application Server V9.2	12.00 or later	
	WebOTX Application Server V9.3	12.00 or later	
	WebOTX Application Server V9.4	12.00 or later	
	WebOTX Application Server V9.5	12.00 or later	
	WebOTX Application Server V10.1	12.00 or later	
	WebOTX Application Server V10.3	12.30 or later	
	WebOTX Application Server V11.1	13.20 or later	
JVM monitor	WebLogic Server 11g R1	12.00 or later	
	WebLogic Server 12c R2 (12.2.1)	12.00 or later	
	WebLogic Server 14c (14.1.1)	12.20 or later	
	WebOTX Application Server V9.1	12.00 or later	
	WebOTX Application Server V9.2	12.00 or later	
	WebOTX Application Server V9.3	12.00 or later	
	WebOTX Application Server V9.4	12.00 or later	
	WebOTX Application Server V9.5	12.00 or later	
	WebOTX Application Server V10.1	12.00 or later	
	WebOTX Application Server V10.3	12.30 or later	

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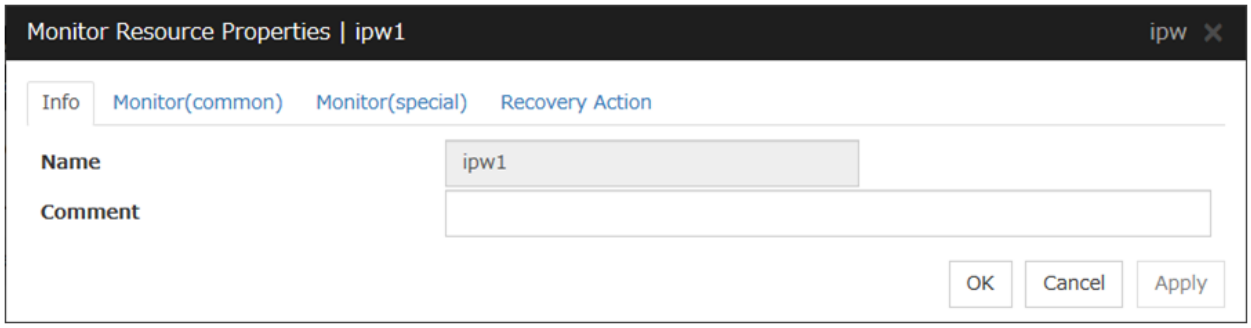
Table 5.3 – continued from previous page

Monitor resource	Application to be monitored	EXPRESSCLUSTER Version	Remarks
	WebOTX Application Server V11.1	13.20 or later	
	WebOTX Enterprise Service Bus V8.4	12.00 or later	
	WebOTX Enterprise Service Bus V8.5	12.00 or later	
	WebOTX Enterprise Service Bus V10.3	12.30 or later	
	WebOTX Enterprise Service Bus V11.1	13.20 or later	
	Apache Tomcat 8.5	12.00 or later	
	Apache Tomcat 9.0	12.00 or later	
	Apache Tomcat 10.0	13.02 or later	
	WebSAM SVF for PDF 9.1	12.00 or later	
	WebSAM SVF for PDF 9.2	12.00 or later	
	WebSAM SVF PDF Enterprise 10.1	13.10 or later	
	WebSAM Report Director Enterprise 9.1	12.00 or later	
	WebSAM Report Director Enterprise 9.2	12.00 or later	
	WebSAM RDE SUITE 10.1	13.10 or later	
	WebSAM Universal Connect/X 9.1	12.00 or later	
	WebSAM Universal Connect/X 9.2	12.00 or later	
	WebSAM SVF Connect SUITE Standard 10.1	13.10 or later	
System monitor	N/A	12.00 or later	
Process resource monitor	N/A	12.10 or later	

5.2 Monitor resource properties

5.2.1 Info tab



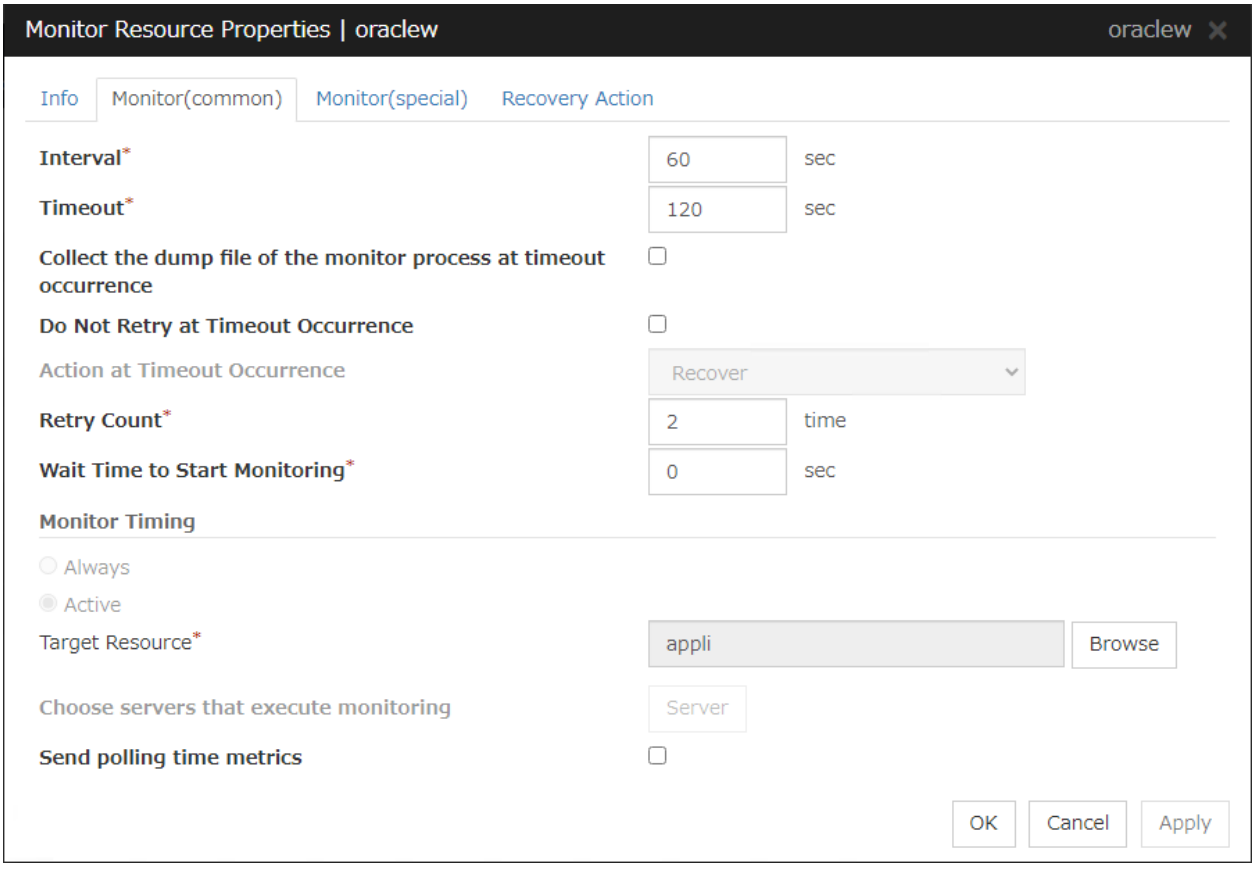
Name

The monitor resource name is displayed.

Comment (Within 127 bytes)

Enter a comment for the monitor resource. Use only one-byte alphabets and numbers.

5.2.2 Monitor (common) tab



Interval (1 to 999)

Specify the interval to check the status of monitor target.

Timeout (5 to 999)

When the normal status cannot be detected within the time specified here, the status is determined to be error.

Collect the dump file of the monitor process at timeout occurrence (for Oracle monitor resource only)

Specify whether collecting the dump file of the EXPRESSCLUSTER monitoring process when time out occurs. This item is not displayed with the monitor resource which has no dump collecting function.
The collected dump file is saved in `work\rm\resource name\errinfo.cur` folder under EXPRESSCLUSTER install folder. When collection is executed more than once, the folder names of the past collection information are renamed as errinfo.1, errinfo.2. And the folders are saved by 5 generations from the latest information.

Do Not Retry at Timeout Occurrence

If you enabled this option: Immediately after a timeout of the monitor resource, the action selected in **Action at Timeout Occurrence** is performed.

Action at Timeout Occurrence

Select an action in response to a timeout of the monitor resource. The timeout occurrence resets the retry counter.
This can be set only when the **Do Not Retry at Timeout Occurrence** function is enabled.

- **Recover**
  Performs a recovery action when the monitor resource times out.
- **Do not recover**
  Does not perform a recovery action even if the monitor resource times out.
- **Generate an intentional stop error**
  Makes an intentional stop error.

Note: For the following monitor resources, the **Do Not Retry at Timeout Occurrence** and **Action at Timeout Occurrence** functions cannot be set.

- Custom monitor resource (only when Monitor Type is **Asynchronous**)
- multi target monitor resource
- eternal link monitor resource
- JVM monitor resource
- System monitor resource
- Process resource monitor resource
- User mode monitor resource

Retry Count (0 to 999)

Specify how many times an error should be detected in a row after the first one is detected before the status is determined as error.
If you set this to zero (0), the status is determined as error at the first detection of an error.

Wait Time to Start Monitoring (0 to 9999)

Set the wait time to start monitoring.

Monitor Timing:

Set the monitoring timing.

- **Always**
  Monitoring is always performed.
- **While Activated**
  Monitoring is not started until the specified resource is activated.
  Clicking **Browse** for **Monitor Timing** displays a window for selecting the monitor target.

  Select the resource to be monitored, and then click **OK**.

Target Resource:

The resource which will be monitored while activated is shown.

Browse

Click this button to open the dialog box to select the target resource. Server names and resource names are displayed in a tree. Select the target resource, and then click **OK**.

Choose servers that execute monitoring

Not used.

Send polling time metrics

Enable or disable sending metrics: data on the monitoring process time taken by the monitor resource.

- If the check box is checked:
  The metrics are sent.
- If the check box is not checked:
  The metrics are not sent.

Note:

For using the Amazon CloudWatch linkage function, enabling this option allows you to send data on the monitoring process time taken by any monitor resource.

Send polling time metrics cannot be set for the following monitor resources:

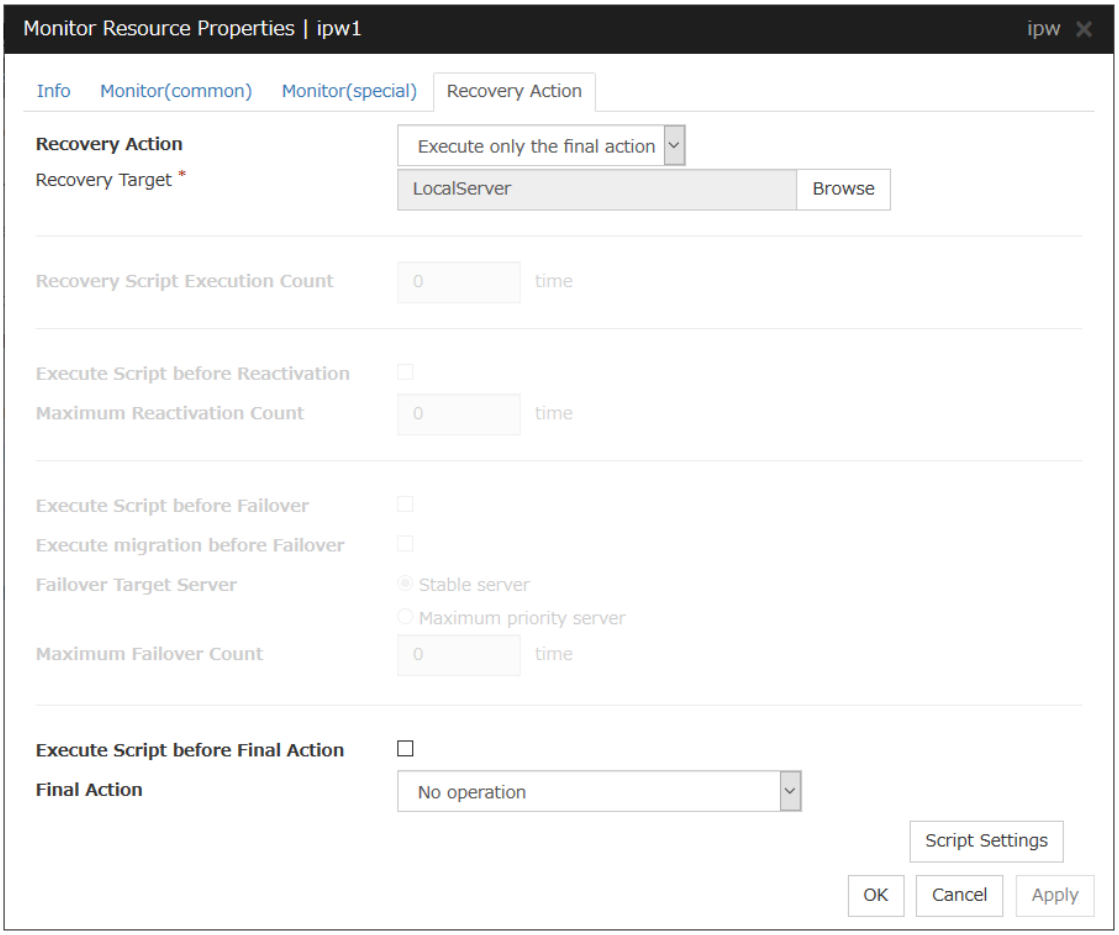
- Eternal link monitor resource

5.2.3 Monitor (special) tab

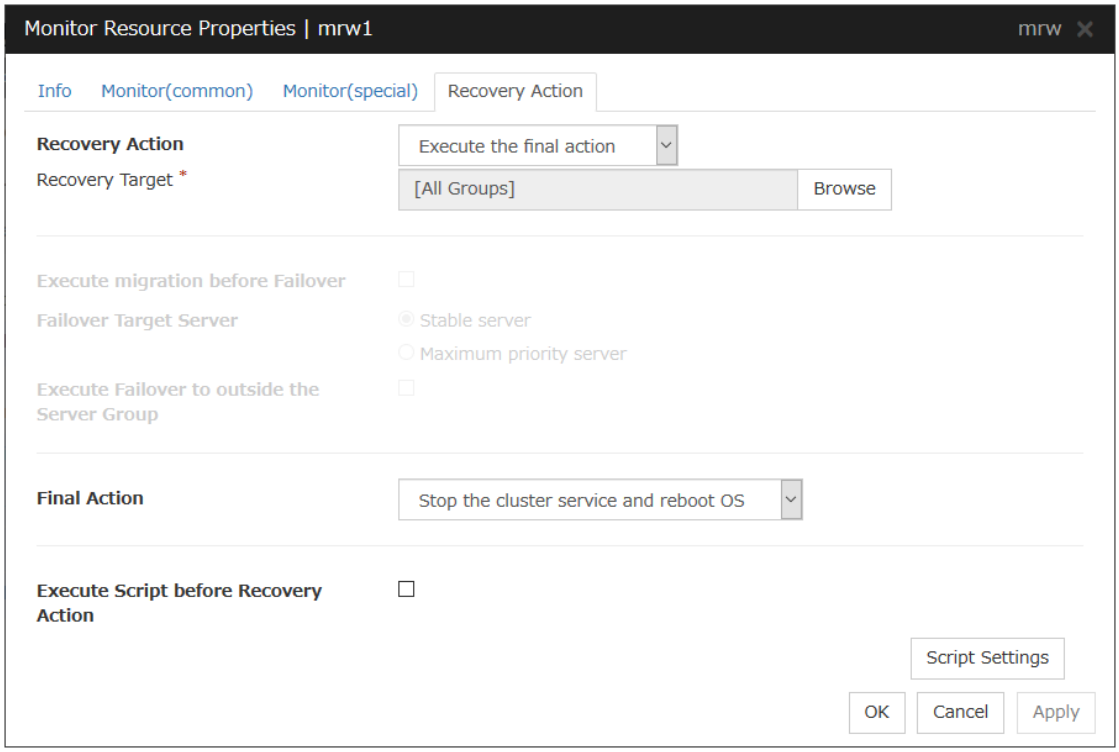
Some monitor resources require the parameters at the monitoring operation to be configured. The parameters are described in the explanation part about each resource.

5.2.4 Recovery Action tab

Ordinary monitor resource (except Eternal Link Monitor resource)



Eternal Link Monitor



In this dialog box, you can configure the recovery target and an action to be taken at the time when an error is detected. By setting this, it allows failover of the group, restart of the resource or the group when an error is detected. However, recovery will not occur if the recovery target is not activated.

Recovery Action

Specify the operation to perform when an error is detected.

- **Restart the recovery target**
  The group or group resource selected as the recovery target is reactivated. If reactivation fails, or if the same error is detected after reactivation, the action selected for **Final Action** is performed.
- **Execute Only Final Action**
  The action selected for **Final Action** is performed.
- **Custom**
  The group or group resource selected as the recovery target is reactivated repeatedly until the maximum reactivation count is reached. If the maximum reactivation count is reached while reactivation continues to fail or the same error continues to be detected after reactivation, the action selected for **Final Action** is performed.

Recovery Target

This field displays the object of the target to be recovered upon detection of an error.

Browse

Click this button to open the dialog box in which you can select the target resource. LocalServer, All Groups, and the group names and resource names that are registered in the cluster are shown in a tree view. Select the target resource and click **OK**.

Recovery Script Execution Count (0 to 99)

Specify the number of times to allow execution of the script configured by **Script Settings** when an error is detected. If this is set to zero (0), the script does not run.

Execute Script before Reactivation

Specify whether to run the script before reactivation.

Maximum Reactivation Count (0 to 99)

When **Custom** is selected for **Recovery Action**, specify the maximum number of times the recovery target is to be reactivated. If this is set to zero (0), no reactivation is executed. For Eternal Link Monitor resource, this parameter can not be set.

Execute Script before Failover

Not used.

Failover Target Server:

Not used.

Maximum Failover Count

Not used.

Execute Script before Final Action

Select whether script is run or not before executing final action.

- When selected
  A script/command is run before executing final action. To configure the script/command setting, click **Settings**.
- When cleared
  Any script/command is not run.

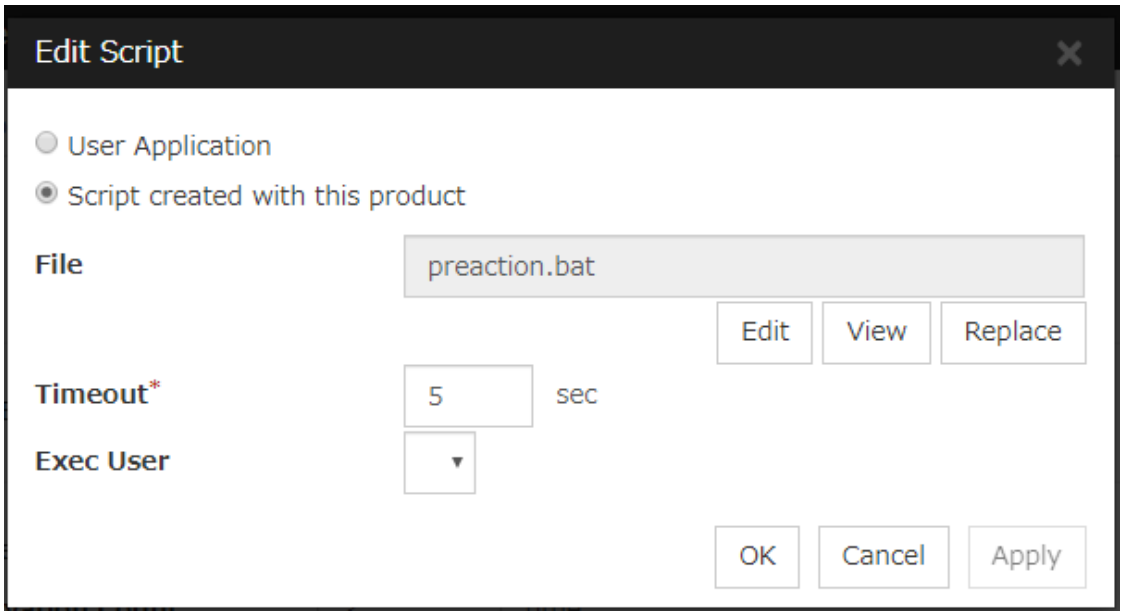
Execute Script before Recovery Action

Select whether script is run or not before executing recovery action.
This can be set only for an eternal link monitor resource.

- When selected
  A script/command is run before executing recovery action. To configure the script/command setting, click **Script Settings**.
- When cleared
  Any script/command is not run.

Script Settings

Click here to display the **Edit Script** dialog box. Set the recovery script/command.



User Application

Use an executable file (executable batch file or execution file) on the server as a script. For the file name, specify an absolute path or name of the executable file of the local disk on the server. If you specify only the name of the executable file, you must configure the path with environment variable in advance. If there is any blank in the absolute path or the file name, put them in double quotation marks (" ") as follows.

Example:

```
"C:\Program Files\script.bat"
```

If you want to execute VBScript, enter a command and VBScript file name as follows.

Example:

```
cscript script.vbs
```

Each executable file is not included in the cluster configuration information of the Cluster WebUI. They must be prepared on each server since they cannot be edited or uploaded by the Cluster WebUI.

Script created with this product

Use a script file which is prepared by the Cluster WebUI as a script. You can edit the script file with the Cluster WebUI if you need. The script file is included in the cluster configuration information.

File (Within 1023 bytes)

Specify a script to be executed (executable batch file or execution file) when you select **User Application**.

View

Click here to display the script file when you select **Script created with this product**.

Edit

Click here to edit the script file when you select **Script created with this product**. Click **Save** to apply the change. You cannot modify the name of the script file.

Replace

Click here to replace the contents of a script file with the contents of the script file which you selected in the file selection dialog box when you select **Script created with this product**. You cannot replace the script file if it is currently displayed or edited. Select a script file only. Do not select binary files (applications), and so on.

Timeout (1 to 9999)

Specify the maximum time to wait for completion of script to be executed. The default value is set as 5.

Exec User

Specify a user who executes the script. The user can be selected from the users registered in the **Account** tab of **Cluster Properties**.
If no user is specified, the script is run by the local system account.

Final Action

Select the recovery action to perform after a recovery attempt through reactivation fails.
Select the final action from the following:

- No Operation
  No action is taken.

Note: Use No Operation to:

- Suppress the final action temporarily
- Show only alerts on detection of an error
- Take the final action practically with multi-target monitor resources

---

- Stop Resource
  When a group resource is selected as a recovery target, the selected group resource and group resources that depend on the selected group resource are stopped.
  This option is disabled when "LocalServer", "All Groups", or a group is selected.
- Stop Group
  When a group or group resource is selected as a monitor target, this option stops the group or the group that the group resource belongs. When **All Groups** is selected, all the groups running on the server of which a monitor resource has detected an error are stopped. This is disabled when a LocalServer is selected as a recovery target.
- Stop cluster service
  EXPRESSCLUSTER X SingleServerSafe is stopped.
- Stop cluster service and shutdown OS
  EXPRESSCLUSTER X SingleServerSafe is stopped, and the OS is shut down.
- Stop cluster service and reboot OS
  EXPRESSCLUSTER X SingleServerSafe is stopped, and the OS is rebooted.
- Generating of intentional Stop Error
  A stop error is intentionally generated for the server.

5.3 Setting up application monitor resources

Application monitor resources monitor application resources. Monitoring starts when the application resource is activated. The application resource can be monitored if it is specified as a Resident type resource.

5.3.1 Monitoring by application monitor resources

They regularly monitor whether applications are active or not. When they detect that applications do not exist, it is determined to be an error.

5.3.2 Note on application monitor resources

An application monitor resource monitors a successfully activated application resource. The application resource can be monitored if it is specified as a resident type resource.

Application monitor resources are automatically registered when the resident type is set to **Resident** on addition of an application resource. Application monitor resources corresponding to an application resource are automatically registered.

Application monitor resources are initially defaulted, so configure appropriate resource settings as needed.

On addition of an application resource whose resident type is **Non-Resident**, application monitor resources cannot be added to it.

5.4 Setting up service monitor resources

Service monitor resources monitor service resources or services.

5.4.1 Monitoring by service monitor resources

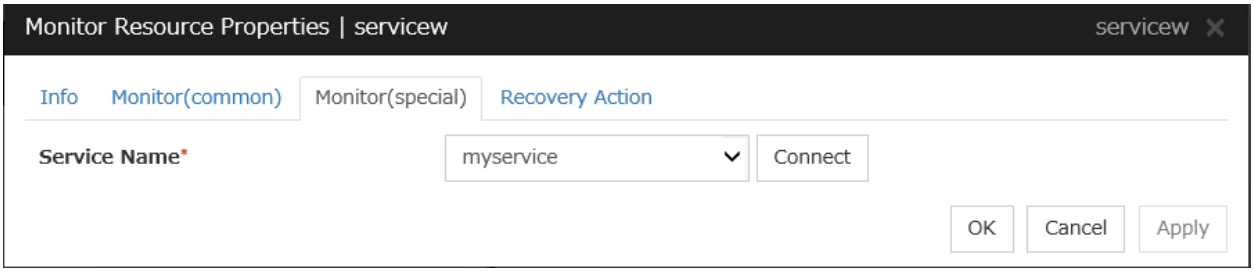
They regularly check the service status with the service control manager and if the status of the service resource becomes Stopped, it is considered as an error.

5.4.2 Note on service monitor resources

If you select **When activated** in **Monitor Timing** and specify a service resource in **Target Resource**, the **Service Name** of the service resource is applied to that of the service monitor resource.

Adding a service resource will automatically register a service monitor resource corresponding to the service resource.

5.4.3 Monitor (special) tab



Service Name (Within 1023 bytes)

Specify the service name or service display name used in the service resource.

Combo box options display the list of the service display names of the services collected from the server.

The service name cannot be changed, if you select **When activated** in **Monitor Timing** and specify a service resource in **Target Resource**.

Connect

Collects the service list from all the servers and updates the service display name list to be displayed in the **Service Name** combo box.

5.5 Setting up disk RW monitor resources

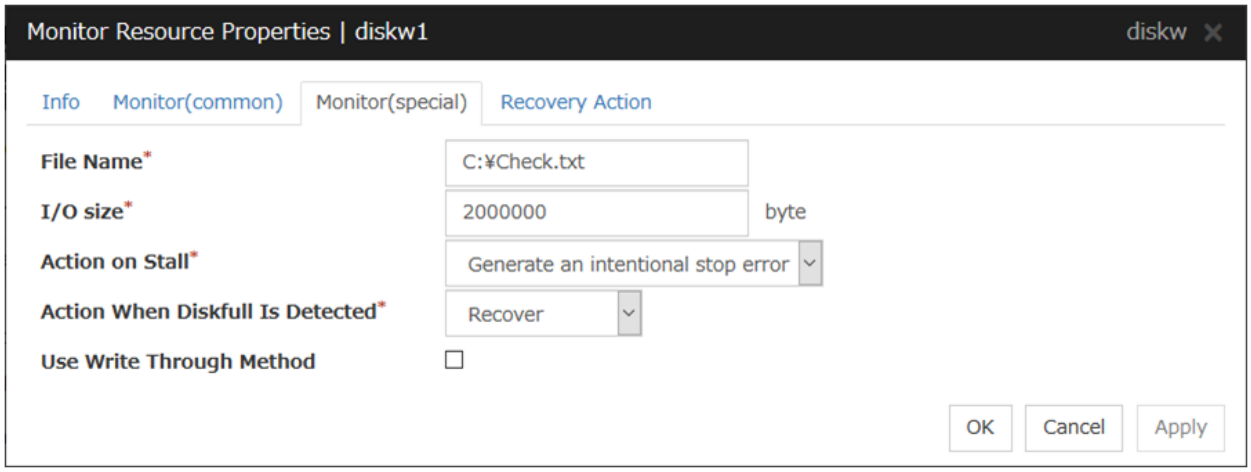
Disk RW monitor resources monitor disk devices by writing dummy data to the file system.

5.5.1 Monitoring by disk RW monitor resources

Disk RW monitor resources write data to the specified file system (basic volume or dynamic volume) with the specified I/O size and evaluate the result.
They solely evaluate whether data was written with the specified I/O size but do not evaluate validity of data. (Created file is deleted after writing)
OS and disk get highly loaded if the size of I/O is large.
Depending on the shared disk and interfaces in your environment, various caches for reading may be implemented. Because of this, if the size of I/O is small, a cache hit may occur and an error in writing may not get detected.
Intentionally generate a disk error to confirm that the size of I/O is sufficient to detect an error.

Note: If you want multipath software to initiate a path failover when a disk path is not connected, specify a longer monitoring timeout time (for which the default value is 300 seconds) for the disk RW monitor resource than the path failover time.

5.5.2 Monitor (special) tab



File Name (within 1023 bytes)

Enter the file name to access. This file is created upon monitoring and deleted after I/O completes.

Note: Specify an absolute path for the file name. If a relative path is specified for the file name, the disk RW monitor resource may monitor the unexpected place.

Important: Do not specify any existing file for the file name. If an existing file is specified for the file name, the data of the file is lost.

I/O size (1 to 9999999; default: 2000000)

Specify the I/O size for the disk to monitor.

Action on Stall

Specify the action to take when stalling is detected.
Stalling is detected if I/O control is not returned from the OS within the time specified in **Timeout** of the **Monitor (common)** tab.

- **No Operation**
  No action is taken.
- **HW Reset**
  Reset the hardware.
- **Generate an intentional stop error** (default)
  Intentionally cause a stop error.

Action When Diskfull Is Detected

Select the action when diskfull (state in which the disk being monitored has no free space) is detected

- Recover
  The disk monitor resource recognizes an error upon the detection of disk full.
- Do not recover
  The disk monitor resource recognizes a caution upon the detection of disk full.

Use Write Through Method

Applies the Write Through method to the monitor I/O method.

- If the Write Through method is enabled, the error detection precision of the disk RW monitor will improve. However, the I/O load on the system may increase.

5.6 Setting up IP monitor resources

IP monitor resource is a monitor resource which monitors IP addresses by using the ping command depending on whether there is a response or not.

5.6.1 Monitoring by IP monitor resources

IP monitor resource monitors specified IP addresses by using the ping command. If all IP addresses do not respond, the status is determined to be error.

- If you want to establish error when all of the multiple IP addresses have error, register all those IP addresses with one IP monitor resource.

  The following figure is an example where all the IP addresses are registered with one IP monitor resource. If any one of the specified IP addresses is normal, IP monitor 1 is determined to be normal.

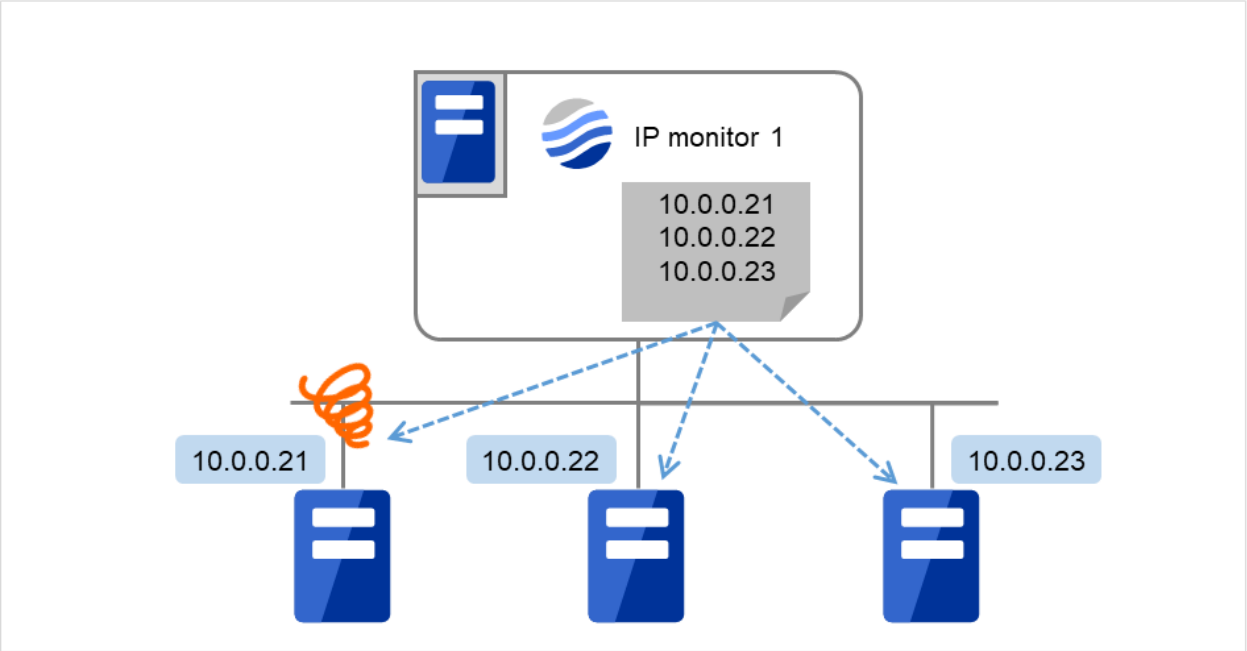


Fig. 5.1: Registering all the IP addresses with one IP monitor resource (in a normal case)

The following figure is an example where all the IP addresses are registered with one IP monitor resource. If all of the specified IP addresses have an error, IP monitor 1 is determined to have an error.

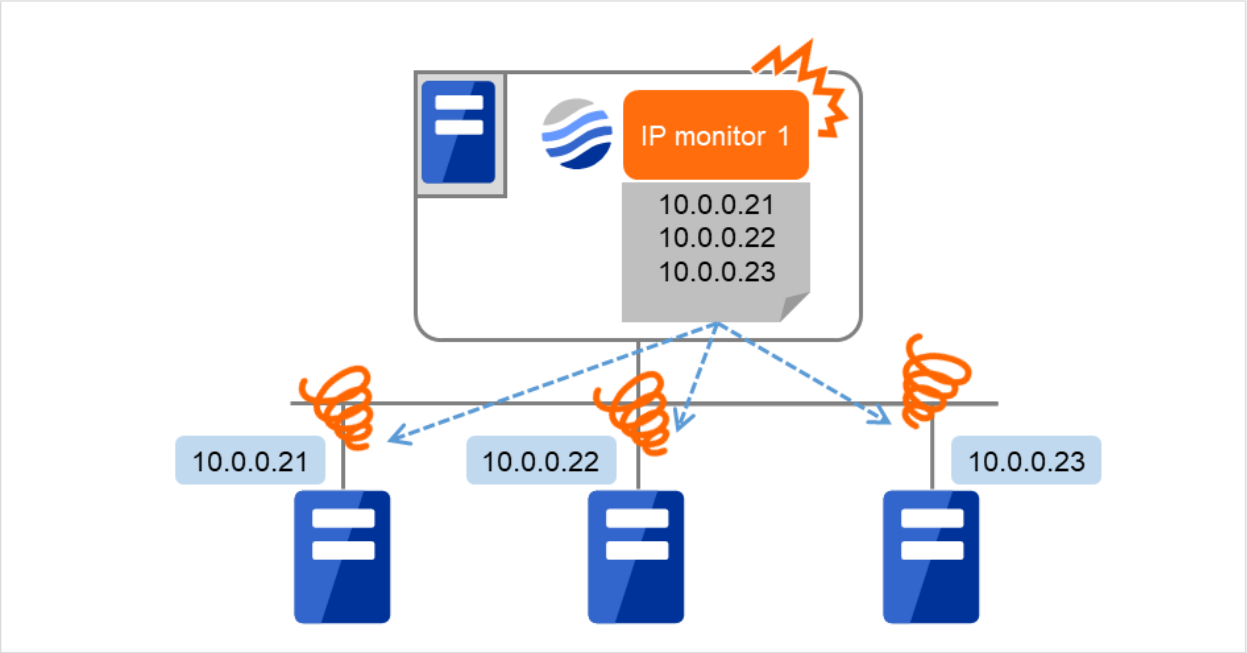


Fig. 5.2: Registering all the IP addresses with one IP monitor resource (when an error is detected)

- If you want to establish error when any one of IP addresses has an error, create one IP monitor resource for each IP address.

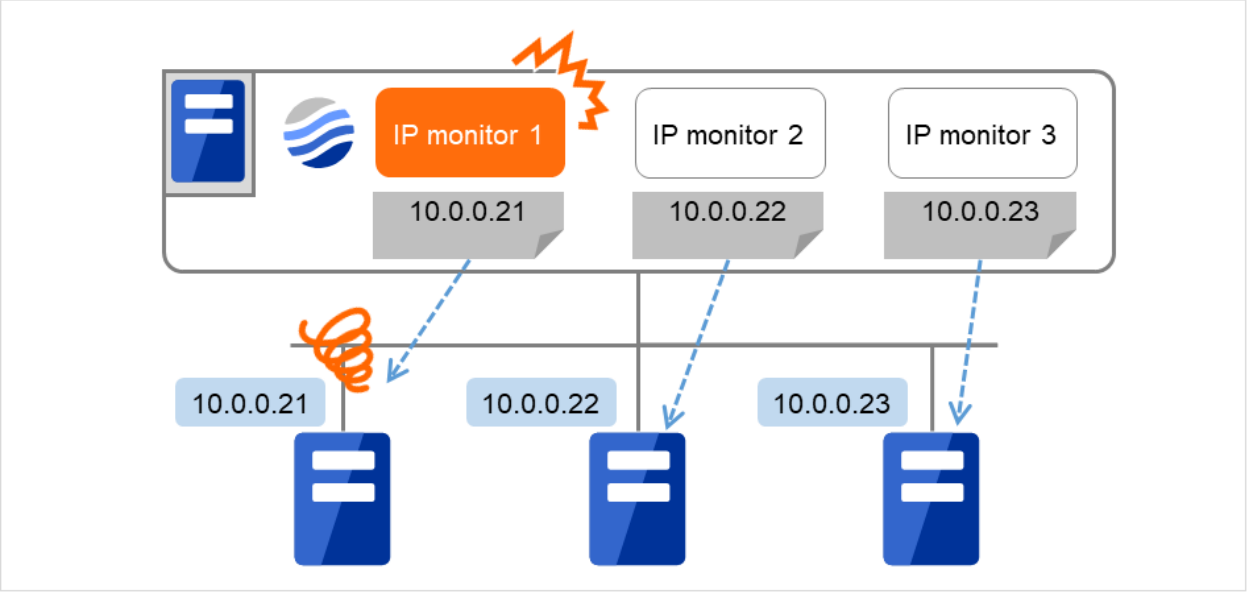
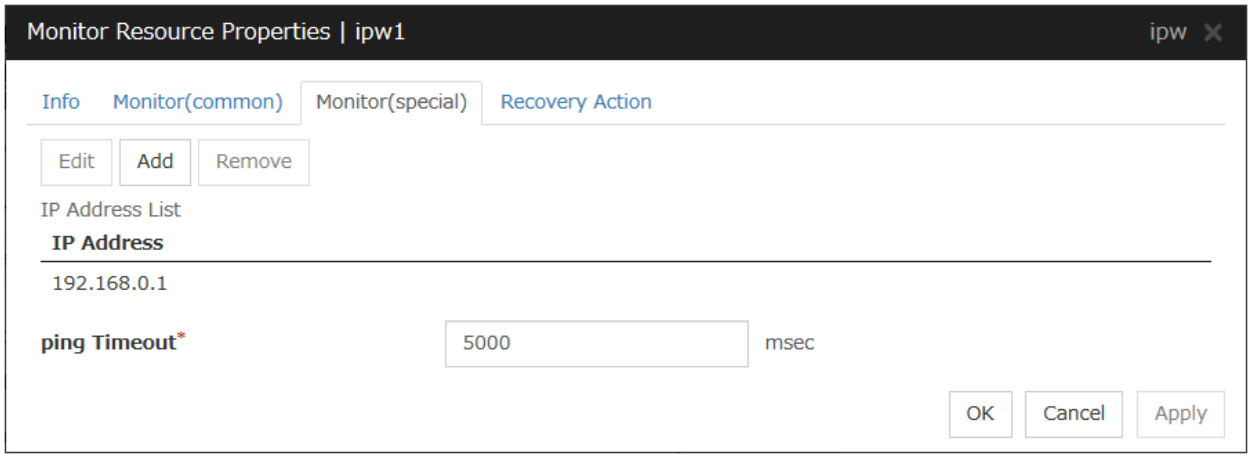


Fig. 5.3: Registering a different IP address with each of the IP monitor resources (when an error is detected)

5.6.2 Monitor (special) tab

IP addresses to be monitored are listed in **IP Addresses**.



Add

Click **Add** to add an IP address to be monitored. Click **Edit** to display the **IP Address Settings** dialog box.

Remove

Click **Remove** to remove an IP address selected in **IP Addresses** from the list so that it will no longer be monitored.

Edit

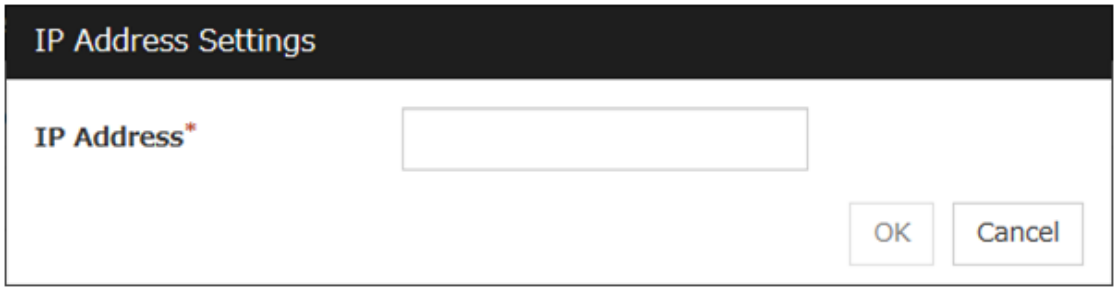
Click **Edit** to display the **IP Address Settings** dialog box. The dialog box shows the IP address selected in **IP Addresses** on the **Parameter** tab. Edit the IP address, and then click **OK**.

Ping Timeout (1 to 999,999; default: 1,000)

Specify the timeout of the ping to be sent to monitor the IP address in milliseconds.

IP Address Settings

The detailed setting for interface is displayed.



IP Address (within 255 bytes)

Enter an IP address to be monitored in this field, and then click **OK**. Enter an IP address that is always available for communication.

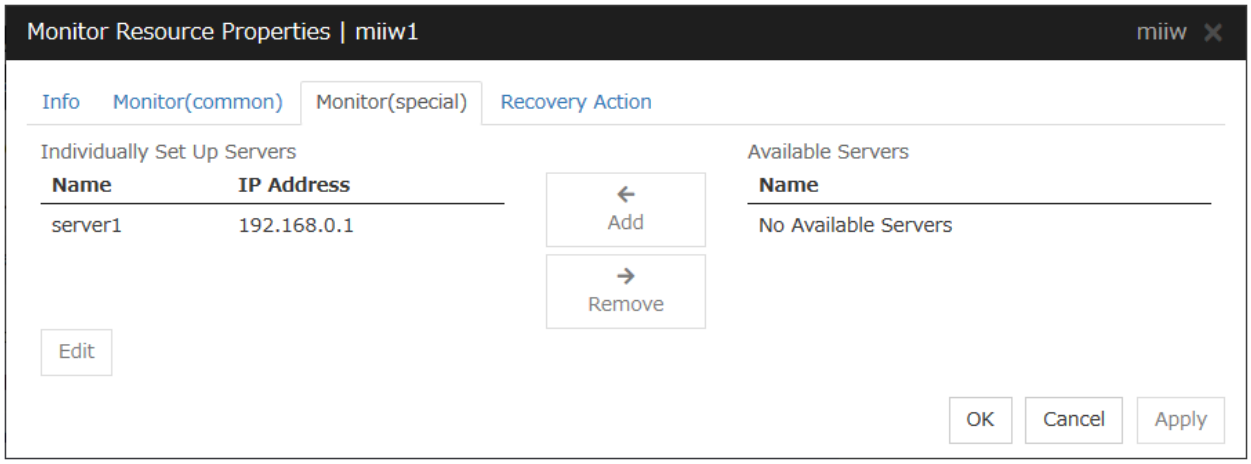
5.7 Setting up NIC link up/down monitor resources

The NIC Link Up/Down monitor resource obtains the information on how the specified NIC is linked and monitors the linkage is up or down by using WMI.

5.7.1 Configuration and range of NIC link up/down monitoring

- When you are monitoring any NIC directly connected to another server by using a LAN cable, an error is detected if the other server goes down (because a link cannot be established).

5.7.2 Monitor (special) tab



Add

Add the server to be monitored to the list of monitoring servers. Click **Edit** to display the **IP Address Settings** dialog box.

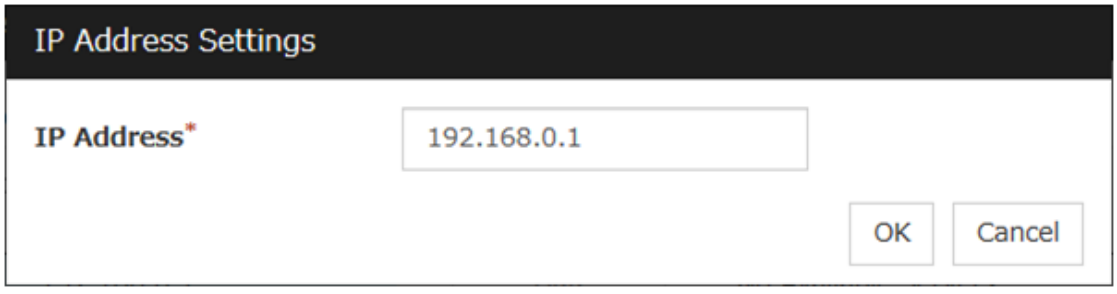
Remove

Delete the server to be monitored from the list of monitoring servers.

Edit

Edit the IP address of the NIC of the server to be monitored.

IP Address Settings



IP Address (within 47 bytes)

Specify the IP address of the NIC to be monitored.

5.8 Setting up custom monitor resources

Custom monitor resources monitor system by executing an arbitrary script.

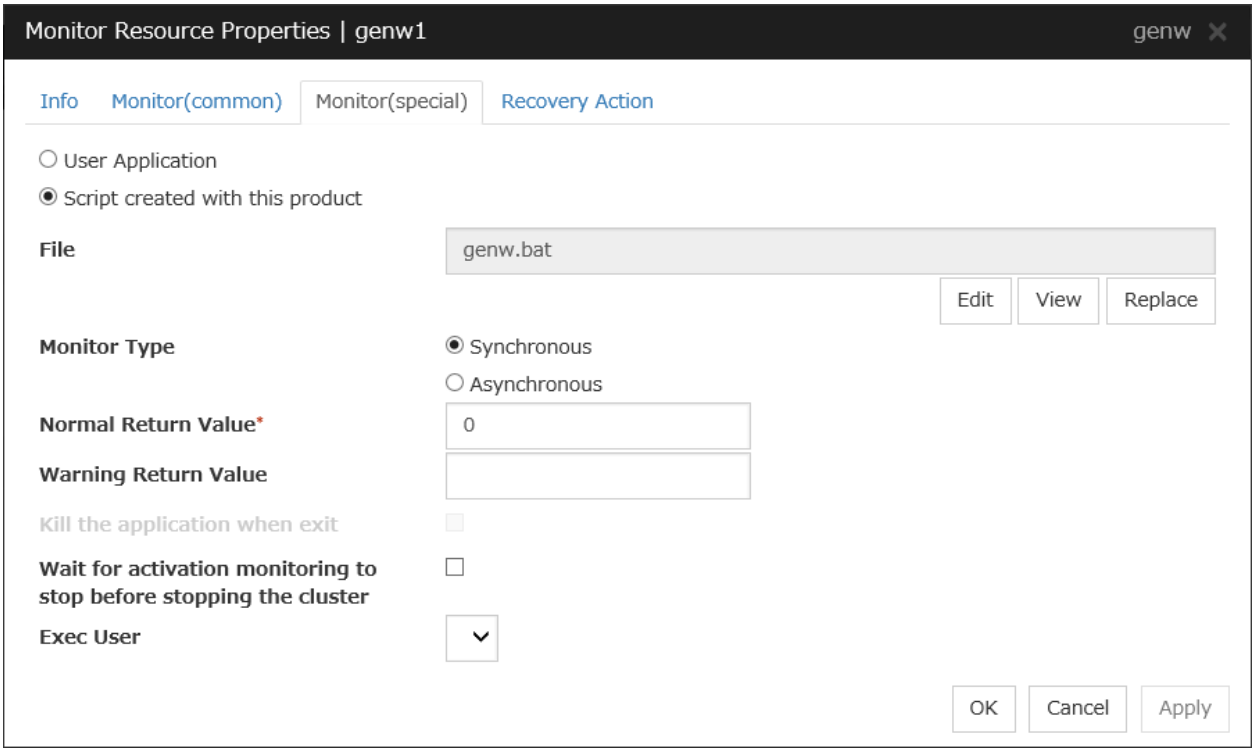
5.8.1 Monitoring by custom monitor resources

Custom monitor resources monitor system by an arbitrary script.
When **Monitor Type** is **Synchronous**, custom monitor resources regularly run a script and detect errors from its error code.
When **Monitor Type** is **Asynchronous**, custom monitor resources run a script upon start monitoring and detect errors if the script process disappears.

5.8.2 Note on custom monitor resources

- When a command for outputting a message (standard output, error output) in response to the prompt is executed as part of a batch file, the batch file may stop during execution of the command. Therefore, specify (perform redirection to) a file or nul as the message output destination.
- When the monitor type is set to **Asynchronous**, configure for the timeout a larger value than the waiting time for the monitor start.

5.8.3 Monitor (special) tab



User Application

Use an executable file (executable batch file or execution file) on the server as a script. For the file name, specify an absolute path or name of the executable file of the local disk on the server.

These executable files are not included in the configuration data of the Cluster WebUI. They must be prepared on the server since they cannot be edited or uploaded by the Cluster WebUI.

Script created with this product

Use a script file which is prepared by the Cluster WebUI as a script. You can edit the script file with the Cluster WebUI if you need. The script file is included in the configuration data.

File (within 1023 bytes)

Specify the script to be executed (executable shell script file or execution file) when you select User Application with its absolute path on the local disk of the server.However, no argument can be specified after the script.

View

Click here to display the script file when you select **Script created with this product**.

Edit

Click here to edit the script file when you select **Script created with this product**. Click **Save** to apply the change. You cannot modify the name of the script file.

Replace

Click here to replace the content of the script file with that of the script file you selected in the file selection dialog box, when **Script created with this product** is selected. You cannot replace the script file if it is currently displayed or edited. Select a script file only. Do not select binary files (applications), and so on.

Monitor Type

Select a monitor type.

- **Synchronous** (default)
  Custom monitor resources regularly run a script and detect errors from its error code.
- **Asynchronous**
  Custom monitor resources run a script upon start monitoring and detect errors if the script process disappears.

Normal Return Value (within 1023 bytes)

When **Asynchronous** is selected for **Monitor Type**, set the values of script error code to be determined as normal. If you want to set two or more values here, separate them by commas like 0,2,3 or connect them with a hyphen to specify the range like 0-3.

Default value: 0

Warning Return Value (within 1023 bytes)

When **Asynchronous** is selected for **Monitor Type**, set the values of script error code to be determined as warning. If you want to set two or more values here, separate them by commas like 0,2,3 or connect them with a hyphen to specify the range like 0-3.

If **Warning Return Value** is set to the same value as **Normal Return Value**, it is regarded as normal.

Forcibly Terminate Application When Stopping

Specify whether or not to forcibly terminate the application as termination of monitoring stop. If this is selected, the application is forcibly terminated instead of normal termination. This is effective only when **Monitor Type** is set to **Asynchronous**.

Exec User

Specify a user who executes the script. The user can be selected from the users registered in the **Account** tab of **Cluster Properties**.

If no user is specified, the script is run by the local system account.

Wait for activation monitoring to stop before stopping the cluster

The cluster stop waits until the custom monitor resource is stopped. This is effective only when the monitoring timing is set to **Active**.

5.9 Setting up multi target monitor resources

The multi target monitor resource monitors more than one monitor resources.

5.9.1 Note on the multi target monitor resource

- The multi target monitor resources regard the offline status of registered monitor resources as being an error. For this reason, for a monitor resource that performs monitoring when the target is active is registered, the multi target monitor resource might detect an error even when an error is not detected by the monitor resource. Do not, therefore, register monitor resources that perform monitoring when the target is active.

5.9.2 Status of the multi target monitor resource

The status of the multi target monitor resource is determined by the status of registered monitor resources.
The table below describes status of multi target monitor resource when the multi target monitor resource is configured as follows:

The number of registered monitor resources 2
Error Threshold 2
Warning Threshold 1

The table below describes status of a multi target monitor resource:

	Monitor resource1 status (Normal (normal))	Monitor resource1 status (Error (error))	Monitor resource1 status (Offline (offline))
Monitor resource2 status (Normal (normal))	Normal (normal)	Caution (caution)	Caution (caution)
Monitor resource2 status (Error (error))	Caution (caution)	Error (error)	Error (error)
Monitor resource2 status (Offline (offline))	Caution (caution)	Error (error)	Normal (normal)

- Multi target monitor resource monitors status of registered monitor resources.
  If the number of the monitor resources with the error status exceeds the error threshold, multi target monitor

resource detects an error.

If the number of the monitor resources with the caution status exceeds the caution threshold, the status of the multi target monitor resource becomes caution.

If all registered monitor resources are in the status of stopped (offline), the status of multi-target monitor resource becomes normal.

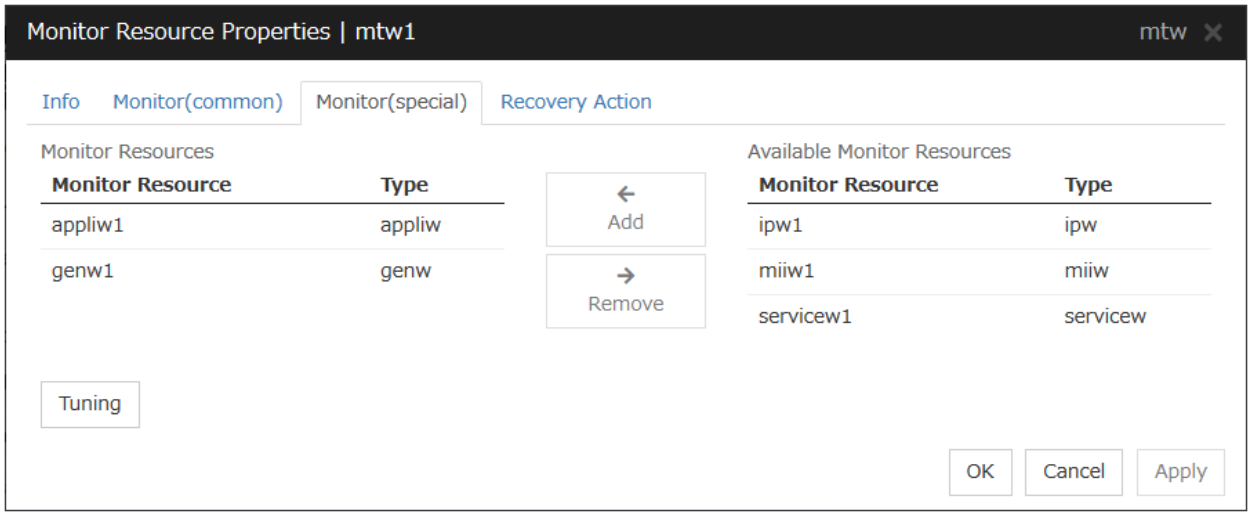
Unless all the registered monitor resources are stopped (offline), the multi target monitor resource recognizes the stopped (offline) status of a monitor resource as error.

- If the status of a registered monitor resource becomes error, actions for the error of the monitor resource are not executed.

  Actions for error of the multi target monitor resource are executed only when the status of the multi target monitor resource becomes error.

5.9.3 Monitor (special) tab

Monitor resources are grouped and the status of the group is monitored. You can register up to 64 monitor resources in the **Monitor Resources**.
When the only one monitor resource set in the **Monitor Resources** is deleted, the multi target monitor resource is deleted automatically.



Add

Click **Add** to add a selected monitor resource to **Monitor Resources**.

Remove

Click **Remove** to delete a selected monitor resource from Monitor Resources.

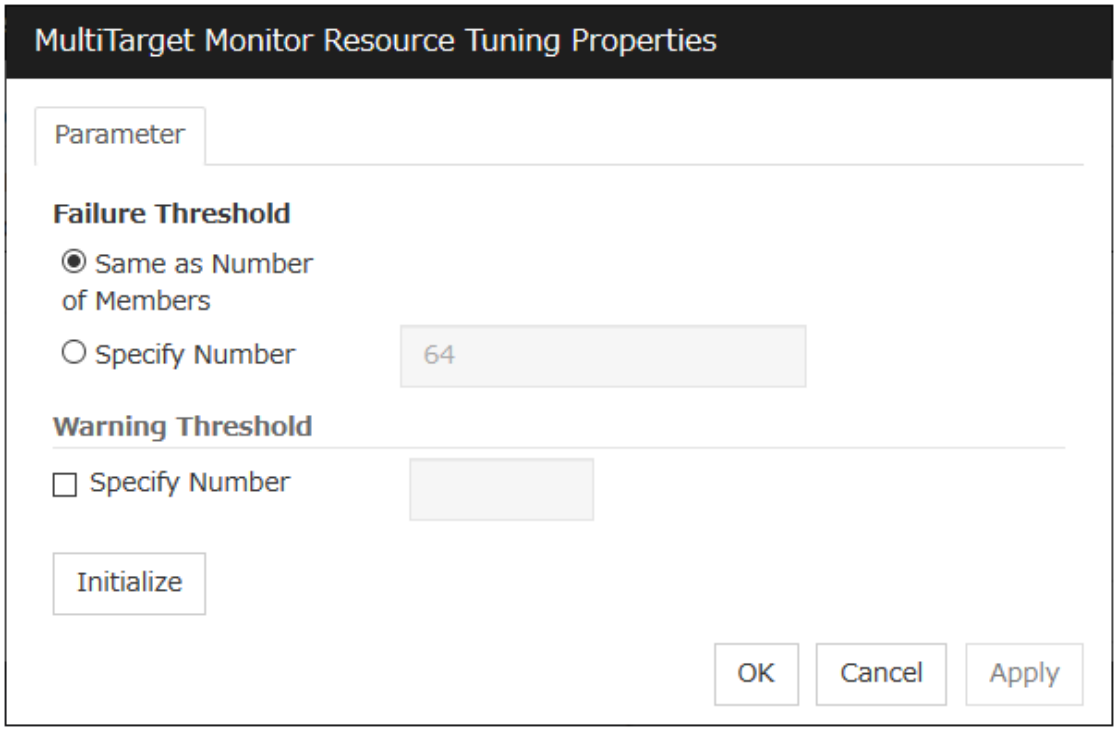
Tuning

Use this button to display the **MultiTarget Monitor Resource Tuning Properties** dialog box. You can make advanced settings for the multi target monitor resource.

MultiTarget Monitor Resource Tuning Properties

Parameter tab

The detailed setting for parameters is displayed.



Error Threshold

Select the condition for multi target monitor resources to be determined as an error.

- **Same as Number of Members**

  The status of multi target monitor resources becomes "Error" when all monitor resources specified to be under the multi target monitor resource are failed, or when "Error" and "Offline" co-exist.

  The status of multi target monitor resources becomes "Normal" when the status of all monitor resources specified to be under the multi target monitor resource are "Offline".

- **Specify Number**

  The status of multi target monitor resources becomes "Error" when the number of monitor resources specified in **Error Threshold** becomes "Error" or "Offline."

  Specify how many of the monitor resources specified under the multi target monitor resource need to have the "Error" or "Offline" status before the status of the multi target monitor resource is judged to be "Error".

  This can be set when **Specify Number** is selected for **Error Threshold**.

Warning Threshold

- When selected:

  When the status of some monitor resources among those specified to be under the multi target monitor resource, specify how many monitor resources need to be "Error" or "Offline" to determine that the status of multi target monitor resource is "Caution".

- When cleared:

  Multi target monitor resources do not display an alert.

Initialize

Used for initializing the value to the default value. Click Initialize to initialize all the items to their default values.

5.10 Setting up eternal link monitor resources

Eternal link monitor resources are passive monitors. They do not perform monitoring by themselves.
When an error message issued using the clprexec command is received from an outside source, the eternal link monitor resources change their status and perform recovery from the error.

5.10.1 Monitoring by eternal link monitor resources

When an error message is received from an outside source, the resource recovers the eternal link monitor resource whose monitor type and monitor target have been reported. (The monitor target can be omitted.)
If there are multiple eternal link monitor resources whose monitor types and monitor targets have been reported, each monitor resource is recovered.

The following figure is an example of the configuration where an eternal link monitor resource is used. The eternal link monitor resource, when notified of the occurrence of an error, changes its status and executes the recovery action in response to error detection.

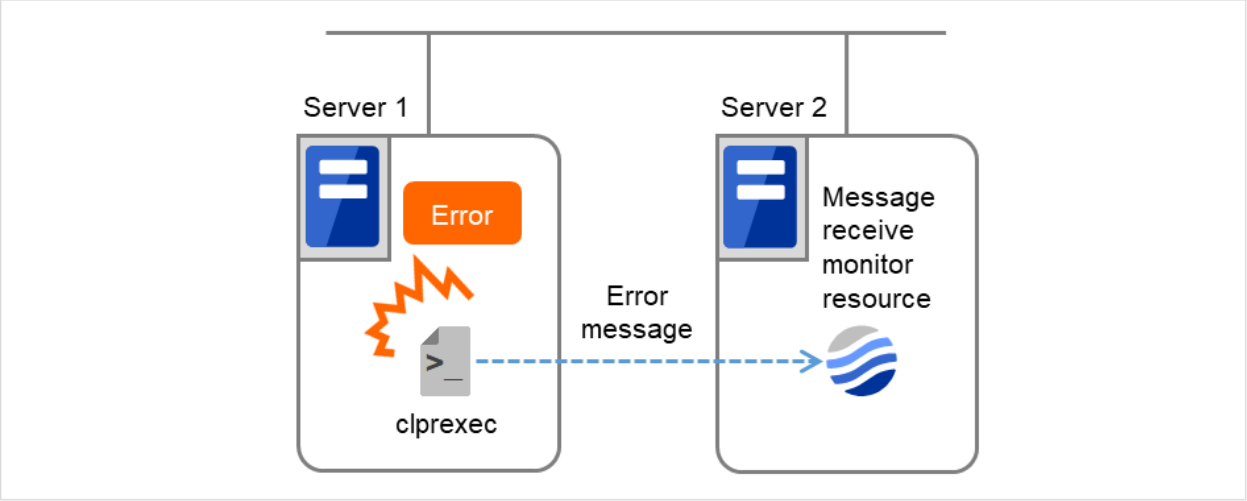
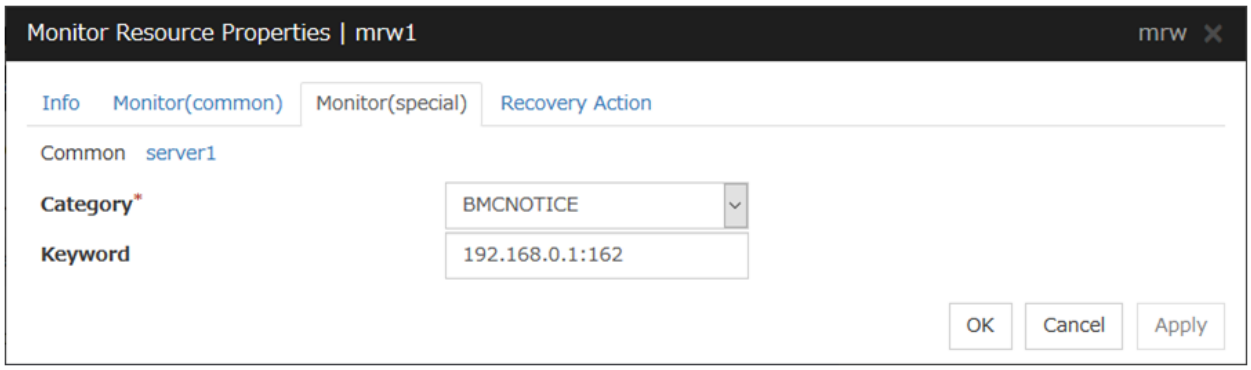


Fig. 5.4: A configuration where an eternal link monitor resource is used

5.10.2 Notes on eternal link monitor resources

- If an eternal link monitor resource is paused when an error message is received from outside, error correction is not performed.
- If an error message is received from outside, the status of the eternal link monitor resource becomes "error". The error status of the eternal link monitor resource is not automatically restored to "normal". To restore the status to normal, use the clprexec command. For details about the clprexec command, see "EXPRESSCLUSTER X SingleServerSafe command reference" in the "EXPRESSCLUSTER X SingleServerSafe Operation Guide".
- If an error message is received when the eternal link monitor resource is already in the error status due to a previous error message, recovery from the error is not performed.

5.10.3 Monitor (special) tab



For **Category** and **Keyword**, specify a keyword passed using the -k parameter of the clprexec command. **Monitor Target** can be omitted.

Category (within 32 bytes)

Specify the category specified with -k argument of clprexec command. You can specify any character string.

Keyword (within 1,023 bytes)

Specify the keyword specified with -k argument of clprexec command.

5.11 Setting up process name monitor resources

Process name monitor resources monitor the process of arbitrary process name.

5.11.1 Notes on process name monitor resources

If you set 1 for **Minimum Process Count**, and if there are two or more processes having the name specified for the monitor target, only one process is selected according to the following conditions and is subject to monitoring.

1. When the processes are in a parent-child relationship, the parent process is monitored.
2. When the processes are not in a parent-child relationship, the process having the earliest activation time is monitored.
3. When the processes are not in a parent-child relationship and their activation times are the same, the process having the lowest process ID is monitored.

If monitoring of the number of started processes is performed when there are multiple processes with the same name, specify the process count to be monitored for **Minimum Process Count**. If the number of processes with the same name falls short of the specified minimum count, an error is recognized. You can set 1 to 999 for **Minimum Process Count**. If you set 1, only one process is selected for monitoring.

Up to 1023 bytes can be specified for the monitor target process name. To specify a monitor target process with a name that exceeds 1023 bytes, use a wildcard (*).
If the name of the target process is 1023 bytes or longer, only the first 1023 bytes will be recognized as the process name. When specifying a process name by using a wild card (such as *), specify a character string that appears in the first 1023 bytes of the process name.

If the name of the target process is too long, the process name is output to the log file with the latter part omitted.

Use the following command to check the name of a process that is actually running and specify the name for the monitor target process name.

EXPRESSCLUSTER installation path\bin\GetProcess.vbs

When the above command is executed, GetProcess_Result.txt is output to the folder in which the command is executed. Open GetProcess_Result.txt and specify the CommandLine section of the process being displayed. If the output information includes double quotations (""), specify the section including the double quotations.

Example of output file

```
20XX/07/26 12:03:13
Caption     CommandLine
services.exe    C:\WINDOWS\system32\services.exe
svchost.exe     C:\WINDOWS\system32\svchost -k rpcss
explorer.exe    C:\WINDOWS\Explorer.EXE
```

To monitor svchost.exe shown in the above command output information, specify `C:\WINDOWS\system32\svchost -k rpcss` as the monitor target process name.

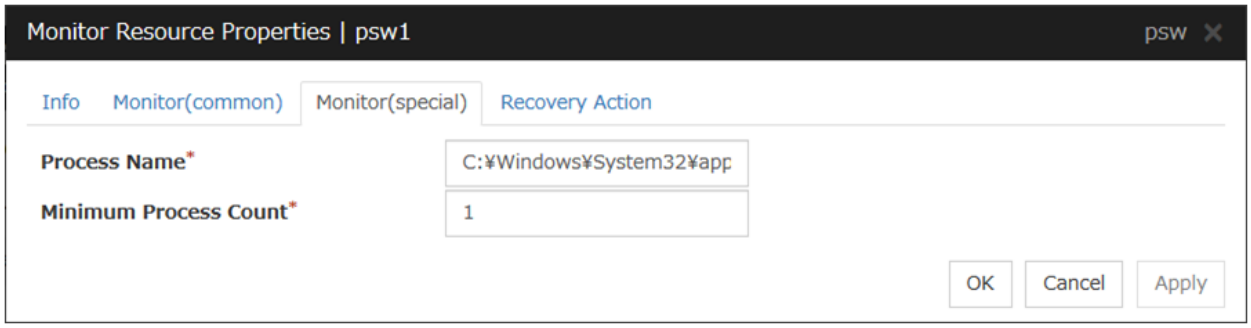
The process name specified for the name of the target process specifies the target process, using the process arguments as part of the process name. To specify the name of the target process, specify the process name containing the arguments. To monitor only the process name with the arguments excluded, specify it with the wildcard (*) using right truncation or partial match excluding the arguments.

5.11.2 Monitoring by process name monitor resources

Those processes having the specified process name are monitored.If Minimum Process Count is set to 1, the process ID is determined by the process name, and the error state is determined if the process ID vanishes. Process stalls cannot be detected.

If **Minimum Process Count** is set to a value greater than 1, the number of processes that have the specified process name are monitored. The number of processes to be monitored is calculated using the process name, and if the number falls below the minimum count, an error is recognized. Process stalls cannot be detected.

5.11.3 Monitor (special) tab



Process Name (within 1023 bytes)

Specify the name of the process to be monitored. You must specify the process name.
Default value: None

Wild cards can be used to specify process names in the three patterns described below. Patterns other than these cannot be used.

- prefix search : <character string included in process name>*
- suffix search : *<character string included in process name>
- partial search : *<character string included in process name>*

Minimum Process Count (1 to 999)

Set the process count to be monitored for the monitor target process. If the number of processes having the specified monitor target process name falls short of the set value, an error is recognized.

5.12 Setting up DB2 monitor resources

DB2 monitor resources monitor DB2 database that runs on the server.

5.12.1 Notes on DB2 monitor resources

For the supported version of DB2, see " 5.1.2. *Applications supported by monitoring options*" in "5. *Monitor resource details*".

DLL interface (DB2CLI.DLL/DB2CLI64.DLL) needs to be installed on servers where monitoring is performed because DB2 CLI is used for monitoring.

For target monitoring resources, specify a service resource or a script resource that starts DB2. Monitoring starts after the target resource is activated; however, if the database cannot be started right after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring.**

A monitor table is created when monitoring starts. When monitoring is stopped due to the group stopping, the monitor table is deleted. When monitoring is temporarily stopped or when server fails before the failover group stops due to system error, the monitor table will not be deleted. Note that, if the server is shut down due to a system failure or other cause before the group is stopped, the monitor table is not deleted. In this case, an alert message saying that "a monitor table exists" might be displayed next time monitoring is started. This is not an error.

DB2 may output operation logs for each monitoring. Configure DB2 settings if this needs to be adjusted.

Regarding the monitor levels described in the next section "5.12.2. *Monitoring by DB2 monitor resources*", note the following:
At "Level 1", a monitor error occurs if there is no monitor table at the start of monitoring. Create a monitor table as shown below.
At "Level 2", if there is no monitor table at the start of monitoring, EXPRESSCLUSTER automatically creates a monitor table. At the same time, a message notifying that there is no monitor table is displayed in the Cluster WebUI alert log.

Selectable monitor level	Prior creation of a monitor table
Level 1 (monitoring by select)	Required
Level 2 (monitoring by update/select)	Optional

Create a monitor table using either of the following methods:

(In the following example, the monitor table is named DB2WATCH):

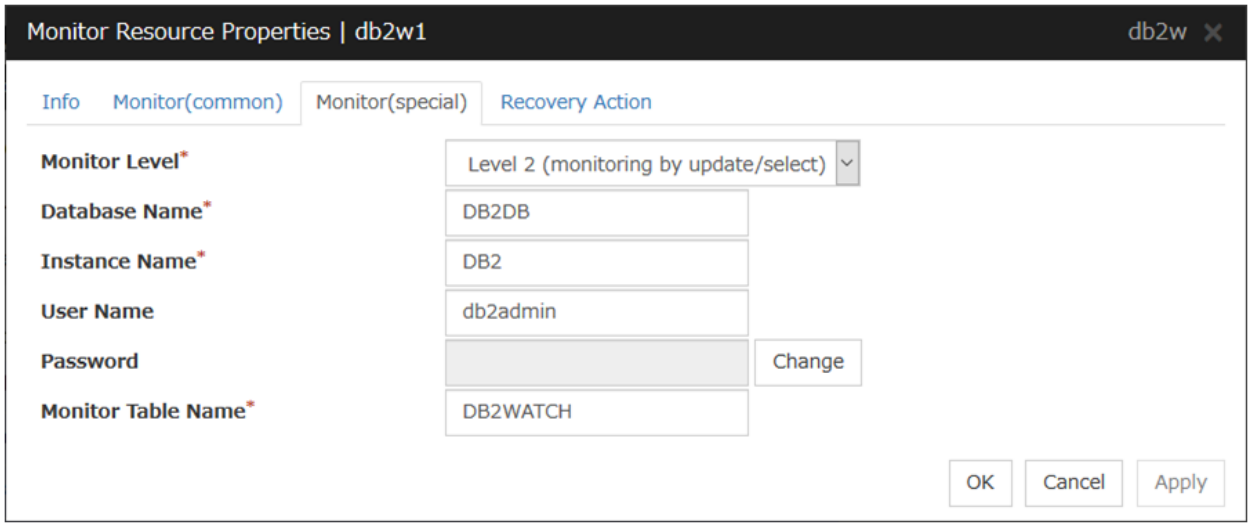
```
sql> create table DB2WATCH (num int not null primary key)
sql> insert into DB2WATCH values(0)
sql> commit
```

5.12.2 Monitoring by DB2 monitor resources

DB2 monitor resources perform monitoring according to the specified monitoring level.

- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.
  An error is recognized if:
  (1) A database connection could not be established
  (2) An error message is sent in response to an SQL statement
- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. One SQL statement can read/write numerical data of up to 10 digits. At monitoring start/end, the monitor table is created/deleted. SQL statements issued to the monitor table are of (create / update / select / drop) type.
  An error is recognized if:
  (1) A database connection could not be established
  (2) An error message is sent in response to an SQL statement
  (3) The written data is not the same as the read data

5.12.3 Monitor (special) tab



Monitor Level

Select one of the following levels. You cannot omit this level setting.

- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.
- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. SQL statements issued to the monitor table are of (create / update / select / drop) type.

Default value: Level 2 (monitoring by update/select)

Database Name (within 255 bytes)

Specify the database name to be monitored. Specifying this item cannot be omitted.

Default value: None

Instance Name (within 255bytes)

Specify the database instance name. Specifying this item cannot be omitted.

Default value: DB2

User Name (within 255 bytes)

Specify the user name to log on to the database.

Default value: db2admin

Password (within 255 bytes)

Specify the password to log on to the database. Click **Change** and enter the password in the dialog box.

Default value: None

Monitor Table Name (within 255 bytes)

Specify the name of a monitor table created on the database. Specifying this item cannot be omitted. Make sure not to specify the same name as the table used for operation because a monitor table will be created and deleted. Be sure to set the name different from the reserved word in SQL statements.

Some characters cannot be used to specify a monitor table name according to the database specifications. For details, refer to the database specifications.

Default value: DB2WATCH

5.13 Setting up FTP monitor resources

FTP monitor resources monitor FTP services that run on the server. FTP monitor resources monitor FTP protocol and they are not intended for monitoring specific applications. FTP monitor resources monitor various applications that use FTP protocol.

5.13.1 Notes on FTP monitor resources

For monitoring target resources, specify service resources or script resources that start FTP monitor resources. Monitoring starts after target resource is activated. However, if FTP monitor resources cannot be started immediately after target resource is activated, adjust the time using **Wait Time to Start Monitoring**.

FTP service may output operation logs for each monitoring. Configure FTP settings if this needs to be adjusted.

If a change is made to a default FTP message (such as a banner or welcome message) on the FTP server, it may be handled as an error.

With FTPS selected in **Protocol**, you need to specify the installation path of OpenSSL libraries in the **Encryption** tab of **Cluster Properties**. The following OpenSSL library versions support FTPS: OpenSSL 3.0 to 3.3 and OpenSSL 1.1.1.

5.13.2 Monitoring by FTP monitor resources

FTP monitor resources monitor the following:

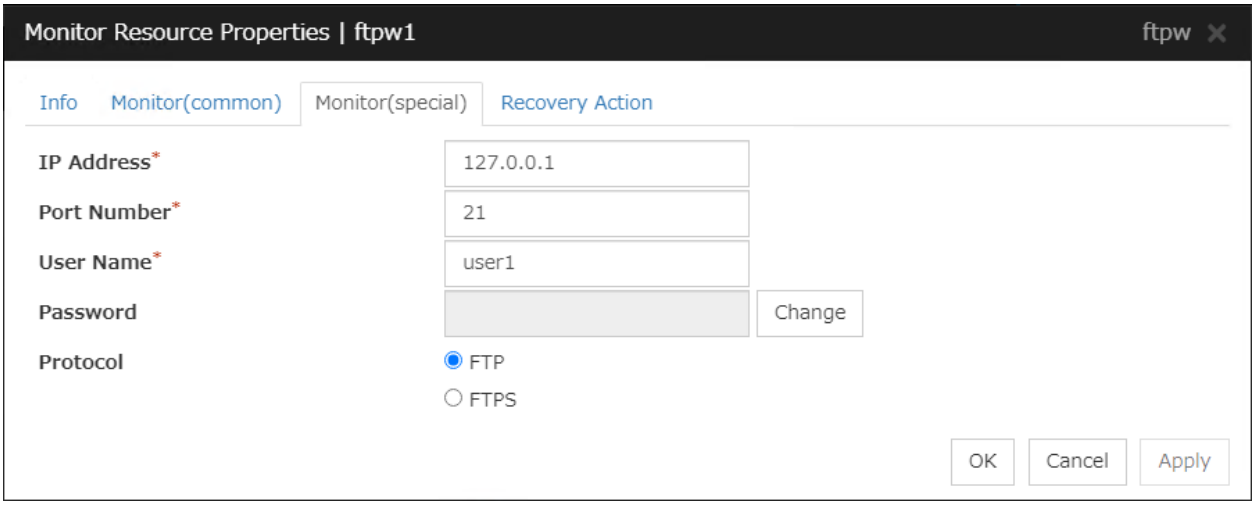
FTP monitor resources connect to the FTP server and execute the command for acquiring the file list.

As a result of monitoring, the following is considered as an error:

(1) When connection to the FTP service fails.

(2) When an error is notified as a response to the FTP command.

5.13.3 Monitor (special) tab



IP Address (within 255 bytes)

Specify the IP address of the FTP server to be monitored. Specifying this item cannot be omitted.

Usually, specify the loopback address (127.0.0.1) to connect to the FTP server that runs on the local server. If the addresses for which connection is possible are limited by FTP server settings, specify an address for which connection is possible.

Default value: 127.0.0.1

Port Number (1 to 65535)

Specify the FTP port number to be monitored. Specifying this item cannot be omitted.

Default value: 21

User Name (within 255 bytes)

Specify the user name to log on to FTP.

Default value: None

Password (within 255 bytes)

Specify the password to log on to FTP. Click **Change** and enter the password in the dialog box.

Default value: None

Protocol

Select a protocol for communication with the FTP server: **FTP** (in usual cases) or **FTPS** (with FTP over SSL/TLS connection required).

Default value: FTP

5.14 Setting up HTTP monitor resources

HTTP monitor resources monitor HTTP services that run on the server. HTTP monitor resources monitor HTTP protocol but they are not intended for monitoring specific applications. HTTP monitor resources monitor various applications that implement HTTP protocol.

5.14.1 Notes on HTTP monitor resources

For monitoring target resources, specify service resources or script resources that start HTTP services. Monitoring starts after a target resource is activated. However, if HTTP service cannot be started immediately after the target resource is activated, adjust the time using **Wait Time to Start Monitoring**.

HTTP service may output operation logs for each monitoring operation. Configure HTTP settings if this needs to be adjusted.

For the DIGEST authentication of HTTP monitor resources, the MD5 algorithm is used.

For the client certificate of HTTP monitor resources, IIS can be monitored.

If HTTP is specified in **Protocol**, HTTP requests of HTTP monitor resources are issued with the default port number (80).

5.14.2 Monitoring by HTTP monitor resources

HTTP monitor resources monitor the following:

Monitors the HTTP daemon by connecting to the HTTP daemon on the server and issuing a HTTP request.

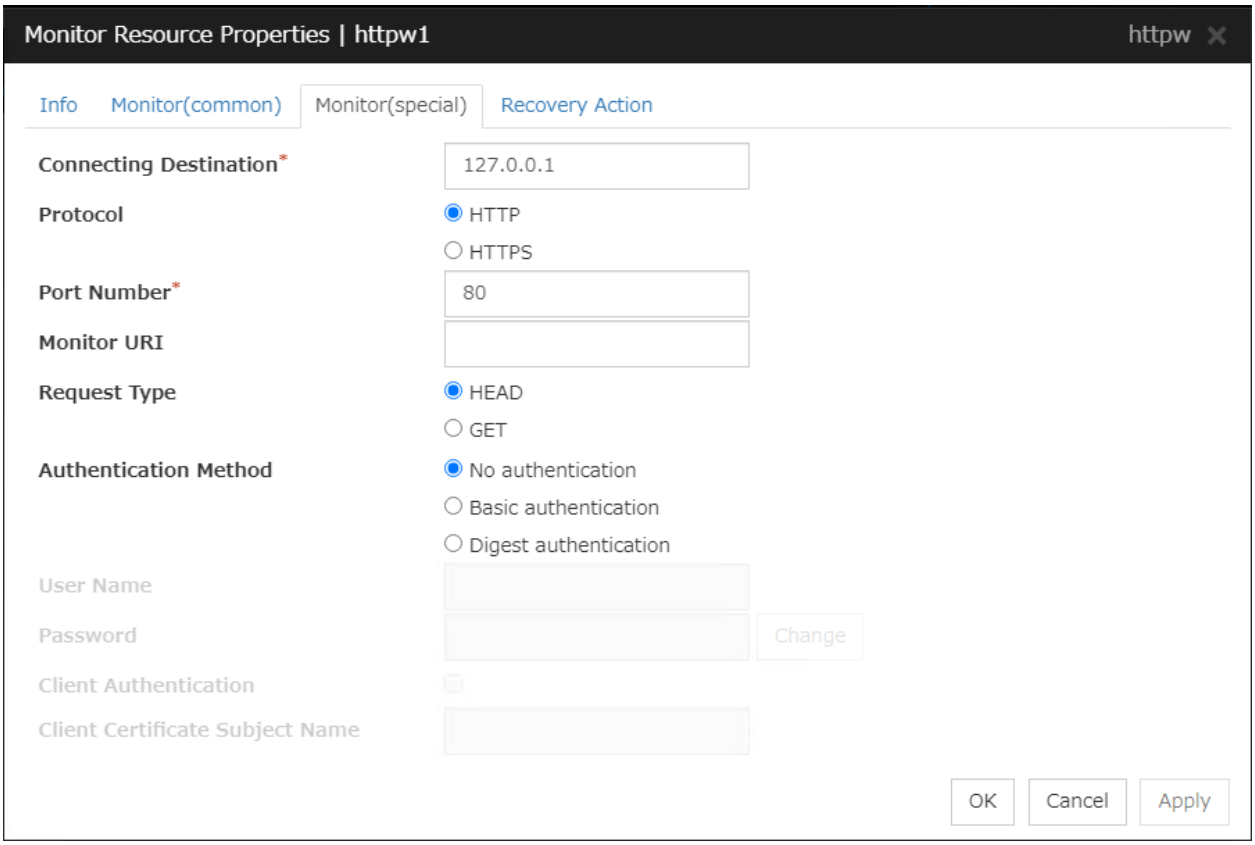
This monitor resource determines the following results as an error:

(1) an error is notified during the connection to the HTTP daemon.

(2) the response message to the HTTP request is not started with "/HTTP"

(3) the status code for the response to the HTTP request is in 400s and 500s (when URI other than the default is specified to the request URI)

5.14.3 Monitor (special) tab



Connecting Destination (within 255 bytes)

Specify the IP address of the HTTP server to be monitored. Be sure to specify the name.
Usually, specify the loopback address (127.0.0.1) to connect to the HTTP server that runs on the local server. If the addresses for which connection is possible are limited by HTTP server settings, specify an address for which connection is possible.

Default value: 127.0.0.1

Protocol

Configure protocol used for communication with HTTP server. In general, HTTP is selected. If you need to connect with HTTP over SSL, select HTTPS.

Note: If you select HTTPS, GET requests are issued regardless of which request type you choose.

Port Number (1 to 65535)

You must specify the port number of the HTTP to be monitored. Specifying this item cannot be omitted.

Default value: 80 (HTTP)
443 (HTTPS)

Monitor URI (within 255 bytes)

Specify the URI of the HTTP to be monitored.
If URI is not specified, the document root is monitored. It is not necessary to create a monitoring page.
If a URI is specified, that URI is monitored. The specified URI needs to allow anonymous access.

Write the following in URI form from the DocumentRoot.
(Example) When the URI of the web page to be monitored is as follows:
http://WebServer:80/watch/sample.htm

```
/watch/sample.htm
```

Default value: None

Request Type

Specify a type of HTTP request for accessing the HTTP server. Setting this parameter is mandatory.

Default value: HEAD

Authentication Method

Specify an authentication method for connecting to the HTTP server.

Default value: No authentication

User Name(within 255 bytes)

Specify a user name for logging in to the HTTP server.

Default value: None

Password(within 255 bytes)

Specify a password for logging in to the HTTP server.

Default value: None

Client Authentication

Enabling this function, which requires selecting **HTTPS** in **Protocol**, performs client authentication.

Default value: Disabled

Note: Even if you enable this function for an HTTP server which does not perform client authentication, the operation is not affected.

Client Certificate Subject Name (within 64 bytes)

Specify the subject name of a client certificate for client authentication. This is required when **Client Authentication** is enabled.

Note: Based on the subject name specified in **Client Certificate Subject Name**, the system retrieves the corresponding client certificate stored in **Personal** of the local computer's certificate store.

Default value: None

5.15 Setting up IMAP4 monitor resources

IMAP4 monitor resources monitor IMAP4 services that run on the server. IMAP4 monitor resources monitor IMAP4 protocol but they are not intended for monitoring specific applications. IMAP4 monitor resources monitor various applications that use IMAP4 protocol.

5.15.1 Notes on IMAP4 monitor resources

As the monitoring target resource, specify a service resource or script resource that starts the IMAP4 server. Monitoring starts after the target resource is activated. However, if the IMAP4 server cannot be started immediately after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring**.

The IMAP4 server might output an operation log or other data for each monitoring operation. If this needs to be adjusted, specify the IMAP4 server settings as appropriate.

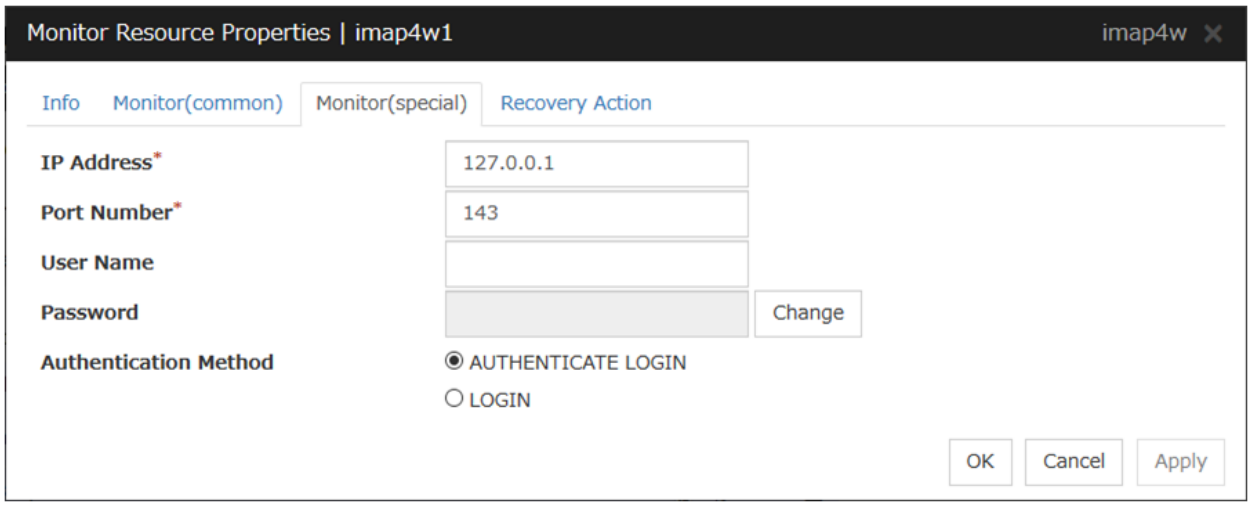
5.15.2 Monitoring by IMAP4 monitor resources

IMAP4 monitor resources monitor the following:
IMAP4 monitor resources connect to the IMAP4 server and execute the command to verify the operation.
As a result of monitoring, the following is considered as an error:

(1) When connection to the IMAP4 server fails.

(2) When an error is notified as a response to the command.

5.15.3 Monitor (special) tab



IP Address (within 255 bytes)

Specify the IP address of the IMAP4 server to be monitored. Specifying this item cannot be omitted.
Usually, specify the loopback address (127.0.0.1) to connect to the IMAP4 server that runs on the local server. If the addresses for which connection is possible are limited by IMAP4 server settings, specify an address for which connection is possible.

Default value: 127.0.0.1

Port Number (1 to 65,535)

Specify the port number of the IMAP4 to be monitored. Specifying this item cannot be omitted.

Default value: 143

User Name (within 255 bytes)

Specify the user name to log on to IMAP4.

Default value: None

Password (within 189 bytes)

Specify the password to log on to IMAP4. Click **Change** and enter the password in the dialog box.

Default value: None

Authentication Method

Select the authentication method to log on to IMAP4. It must follow the settings of IMAP4 being used:

- AUTHENTICATE LOGIN (default value)

  The encryption authentication method that uses the AUTHENTICATE LOGIN command.

- LOGIN

  The plaintext method that uses the LOGIN command.

5.16 Setting up ODBC monitor resources

ODBC monitor resources monitor ODBC database that runs on the server.

5.16.1 Notes on ODBC monitor resources

Because the ODBC driver is used for monitoring, set up the data source in advance by using the ODBC data source administrator of Windows. Add the data source to the system data source.

For monitoring target resources, specify service resources or script resources that start the database. Monitoring starts after the target resource is activated; however, if the database cannot be started right after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring**.

A monitor table is created when monitoring starts. When monitoring is stopped due to the group stopping, the monitor table is deleted. When monitoring is temporarily stopped or when server fails before the failover group stops due to system error, the monitor table will not be deleted. Note that, if the server is shut down due to a system failure or other cause before the group is stopped, the monitor table will not be deleted. In this case, an alert message saying that "a monitor table exists" might be displayed next time monitoring is started. This is not an error.

ODBC database may output operation logs for each monitoring. Configure the database settings if this needs to be adjusted.

Regarding the monitor levels described in the next section "5.16.2. *Monitoring by ODBC monitor resources*", note the following:

At "Level 1", a monitor error occurs if there is no monitor table at the start of monitoring. Create a monitor table as shown below.

At "Level 2", if there is no monitor table at the start of monitoring, EXPRESSCLUSTER automatically creates a monitor table. At the same time, a message notifying that there is no monitor table is displayed in the Cluster WebUI alert log.

Selectable monitor level	Prior creation of a monitor table
Level 1 (monitoring by select)	Required
Level 2 (monitoring by update/select)	Optional

Create a monitor table using either of the following methods:

(In the following example, the monitor table is named ODBCWATCH):

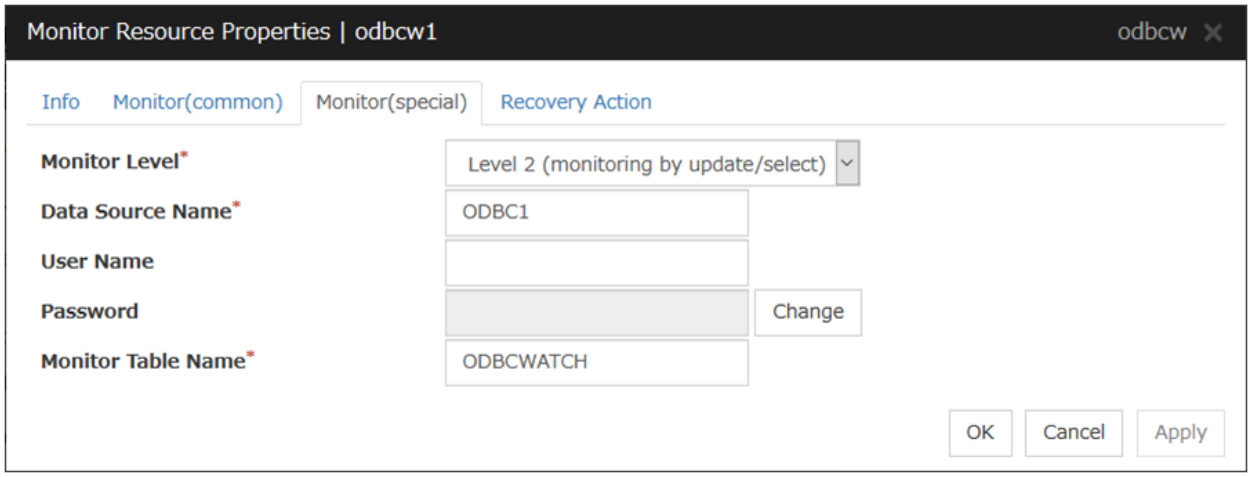
```
sql> create table ODBCWATCH (num int not null primary key);
sql> insert into ODBCWATCH values(0);
sql> commit;
```

5.16.2 Monitoring by ODBC monitor resources

ODBC monitor resources perform monitoring according to the specified monitoring level.

- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.
  An error is recognized if:
  (1) A database connection could not be established
  (2) An error message is sent in response to an SQL statement
- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. One SQL statement can read/write numerical data of up to 10 digits. At monitoring start/end, the monitor table is created/deleted. SQL statements issued to the monitor table are of (create / update / select / drop) type.
  An error is recognized if:
  (1) A database connection could not be established
  (2) An error message is sent in response to an SQL statement
  (3) The written data is not the same as the read data

5.16.3 Monitor (special) tab



Monitor Level

Select one of the following levels. You cannot omit this level setting.

- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.
- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. SQL statements issued to the monitor table are of (create / update / select / drop) type.

Default value: Level 2 (monitoring by update/select)

Data Source Name (within 255 bytes)

Specify the data source name to be monitored. Specifying this item cannot be omitted.

Default value: None

User Name (within 255 bytes)

Specify the user name to log on to the database. You do not have to specify if the user name is specified in the data source settings.

Default value: None

Password (within 255 bytes)

Specify the password to log on to the database. Click **Change** and enter the password in the dialog box.

Default value: None

Monitor Table Name (within 255 bytes)

Specify the name of a monitor table created on the database. Specifying this item cannot be omitted. Make sure not to specify the same name as the table used for operation because a monitor table will be created and deleted. Be sure to set the name different from the reserved word in SQL statements.

Some characters cannot be used to specify a monitor table name according to the database specifications. For details, refer to the database specifications.

Default value: ODBCWATCH

5.17 Setting up Oracle monitor resources

Oracle monitor resources monitor Oracle database that runs on the server.

5.17.1 Notes on Oracle monitor resources

For the supported Oracle version, see " 5.1.2. *Applications supported by monitoring options*" in "5. *Monitor resource details*".

Interface DLL (OCI.DLL) needs to be installed on the server where monitoring is performed because Oracle OCI is used for monitoring.

For a target monitoring resource, specify a service resource or a script resource that can start Oracle. Monitoring starts after the target resource is activated; however, if the database cannot be started right after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring.**

A monitor table is created when monitoring starts. When monitoring is stopped due to the group stopping, the monitor table is deleted. When monitoring is temporarily stopped or when server fails before the group stops due to system error, the monitor table will not be deleted. Note that, if the server is shut down due to a system failure or other cause before the group is stopped, the monitor table will not be deleted. In this case, an alert message saying that "a monitor table exists" might be displayed next time monitoring is started. This is not an error.

The user specified for the user name parameter is sys by default, but when a monitoring-dedicated user has been configured, for each monitor level the following access permissions must be provided for that user (if the sysdba permission is not provided):

Monitor level	Necessary permissions
Level 0 (database status)	SELECT permission for V$PROCESS / SELECT permission for V$INSTANCE
Level 1 (monitoring by select)	SELECT permission for V$PROCESS / SELECT permission for a monitor table
Level 2 (monitoring by update/select)	SELECT permission for V$PROCESS / CREATE TABLE / DROP ANY TABLE / INSERT permission for a monitor table / UPDATE permission for a monitor table /SELECT permission for a monitor table

Oracle database may output operation logs for each monitoring. Configure the Oracle settings if this needs to be adjusted.

Regarding the monitor levels described in the next section "5.17.2. *Monitoring by Oracle monitor resources*", note the following:

At "Level 1", a monitor error occurs if there is no monitor table at the start of monitoring. Create a monitor table as shown below.

At "Level 2", if there is no monitor table at the start of monitoring, EXPRESSCLUSTER automatically creates a monitor table. At the same time, a message notifying that there is no monitor table is displayed in the Cluster WebUI alert log.

Selectable monitor level	Prior creation of a monitor table
Level 0 (database status)	Optional
Level 1 (monitoring by select)	Required

Continued on next page

Table 5.8 – continued from previous page

Selectable monitor level	Prior creation of a monitor table
Level 2 (monitoring by update/select)	Optional

Create a monitor table using either of the following methods:

(In the following example, the monitor table is named ORAWATCH):

```
sql> create table ORAWATCH (num int primary key);
sql> insert into ORAWATCH values(0);
sql> commit;
```

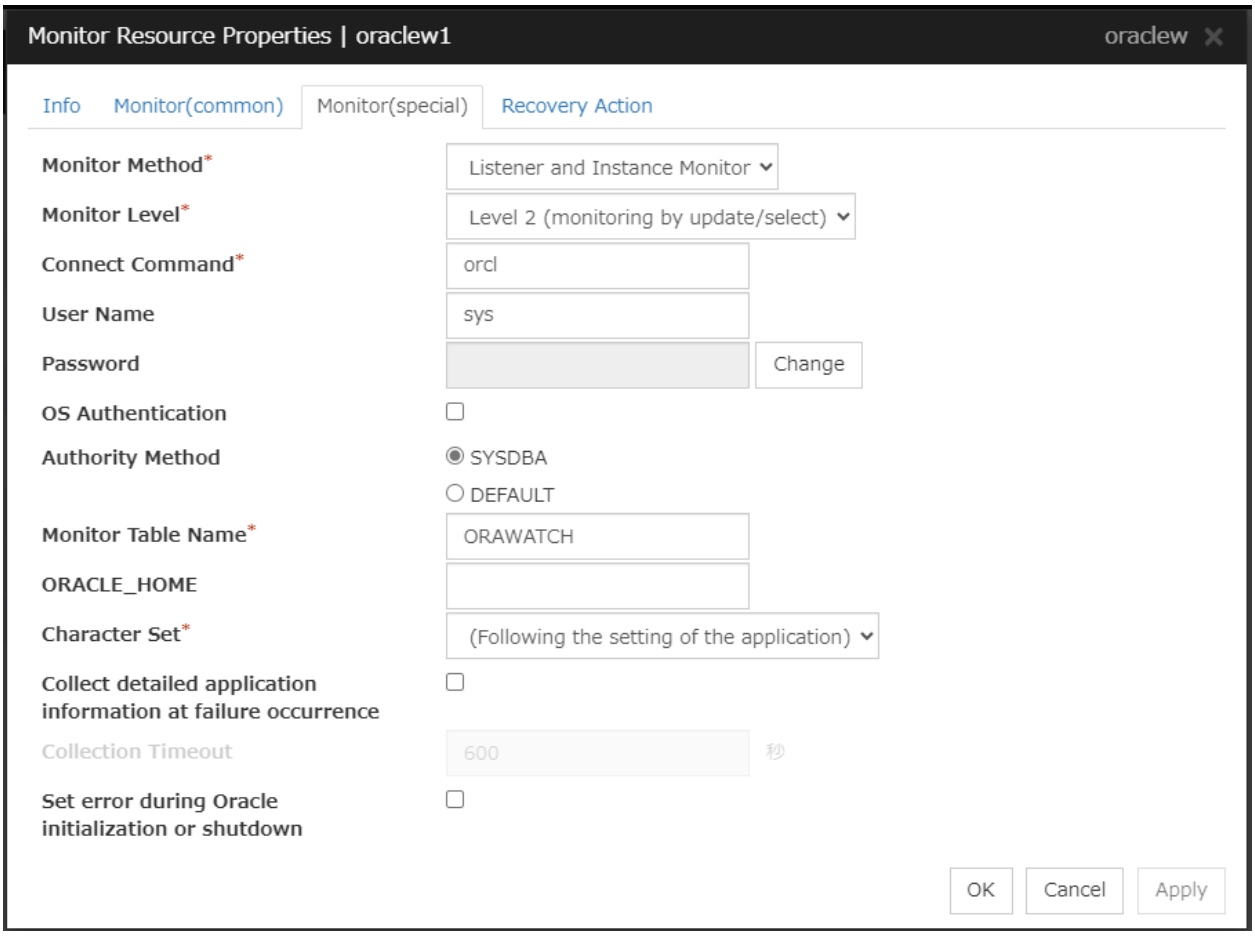
*Create this in a schema for the user specified for the user name parameter.

5.17.2 Monitoring by Oracle monitor resources

Oracle monitor resources perform monitoring according to the specified monitor level.

- Level 0 (database status)
  The Oracle management table (V$INSTANCE table) is referenced to check the DB status (instance status). This level corresponds to simplified monitoring without SQL statements being executed for the monitor table.
  An error is recognized if:
  (1) The DB (instance) status is in the inactive state (MOUNTED, STARTED)
- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.
  An error is recognized if:
  (1) A database connection could not be established
  (2) An error message is sent in response to an SQL statement
- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. One SQL statement can read/write numerical data of up to 10 digits. At monitoring start/end, the monitor table is created/deleted. SQL statements issued to the monitor table are of (create / update / select / drop) type.
  An error is recognized if:
  (1) A database connection could not be established
  (2) An error message is sent in response to an SQL statement
  (3) The written data is not the same as the read data

5.17.3 Monitor (special) tab



Monitor Method

Select the Oracle features to be monitored.

- **listener and instance monitor**
  According to the specified monitor level, database connection, reference, and update operations are monitored.
- **listener monitor**
  To check for the listener operation, use the tnsping Oracle command. For a monitor resource properties, ORACLE_HOME must be set.
  If ORACLE_HOME is not set, only connection operations for the items specified in the connect string are monitored. Use this to attempt recovery by restarting the Listener service upon a connection error.
  Selecting this setting causes the monitor level setting to be ignored.
- **instance monitor**
  A direction (BEQ) connection to the database is established, bypassing the listener and, according to the specified monitor level, database connection, reference, and update operations are monitored. For a monitor resource properties, ORACLE_HOME must be set. This is used for direct instance monitoring and recovery action setting without routing through the listener.
  A multi-tenant Oracle12c database cannot be monitored using a BEQ connection.
  If ORACLE_HOME is not set, only the connection specified by the connect string is established,

and any error in the connection operation is ignored. This is used to set the recovery action for a non-connection error together with an Oracle monitor resource for which **Monitor Listener only** is specified.

Default value: Monitor Listener and Instance

Monitor Level

Select one of the following levels. You cannot omit this level setting.

- Level 0 (database status)
  The Oracle management table (V$INSTANCE table) is referenced to check the DB status (instance status). This level corresponds to simplified monitoring without SQL statements being executed for the monitor table.
- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.
- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. SQL statements issued to the monitor table are of (create / update / select / drop) type.

Default value: Level 2 (monitoring by update/select)

Connect String (within 255 bytes)

Specify the connect string for the database to be monitored. You must specify the connect string.
When **Monitor Type** is set to **Monitor Instance only**, set ORACLE_SID.

Monitor Type	ORACLE_HOME	Connect Command	Monitor Level
Monitor Listener and Instance	Need not be specified	Specify the connect string	As specified
Monitor Listener only	Monitoring dependent on Oracle command if specified	Specify the connect string	Ignored
	Check for connection to the instance through the listener if not specified	Specify the connect string	Ignored
Monitor Instance only	Check for the instance by BEQ connection if specified	Specify ORACLE_SID	As specified
	Check for the instance through the listener if not specified	Specify the connect string	As specified

Default value: None for the connect string

User Name (within 255 bytes)

Specify the user name to log on to the database. Be sure to specify this when a method other than **Monitor Listener only** is selected for **Monitor Method** or when OS authentication is used.

Default value: sys

Password (within 255 bytes)

Specify the password to log on to the database. Click **Change** and enter the password in the dialog box.

Default value: None

OS Authentication

Specify the authentication method to log on to the Oracle monitor. It must follow the Oracle monitor settings.

- When selected:
  Use OS authentication.
- When cleared (default value):
  Use database authentication.

Authority Method

Select the user authority to log on to the Oracle monitor. This must be set according to the authority of the specified user name.

- SYSDBA (default value)
  Connect with SYSDBA authority.
- DEFAULT
  Connect with general user authority.

Monitor Table Name (within 255 bytes)

Specify the name of a monitor table created on the database. Specifying this item cannot be omitted. Make sure not to specify the same name as the table used for operation because a monitor table will be created and deleted. Be sure to set the name different from the reserved word in SQL statements.

Some characters cannot be used to specify a monitor table name according to the database specifications. For details, refer to the database specifications.

Default value: ORAWATCH

ORACLE_HOME (within 255 bytes)

Specify the path name configured in ORACLE_HOME. Begin with [/]. This is used when **Monitor Type** is set to **Monitor Listener only** or **Monitor Instance only**.

Default value: None

Character Set

Select the character set for Oracle. When the language for Oracle is not Japanese or English, select AMERICAN_AMERICA.US7ASCII.

- (Following the setting of the application) (default)
  The Oracle character set installed in the server is used.
- AMERICAN_AMERICA.US7ASCII
  Connect with general user authority.

Collect detailed application information at failure occurrence

Specify whether to collect detailed Oracle information if an Oracle database error is detected.

- When selected:
  Detailed Oracle information is collected.
- When cleared (default value):
  Detailed Oracle information is not collected.
  To use this function, because the database processing for collecting information is performed using a local system account, the local system account requires DBA privileges. When using this function, the local system account needs DBA authorization because the database processing for information collection is executed by the local system account. The collected information is saved in `work\rm\resource name\errinfo.cur` folder under EXPRESSCLUSTER install

folder. When collection is executed more than once, the folder names of the past collection information are renamed as errinfo.1, errinfo.2. And the folders are saved by 5 generations from the latest information.

Note:

When the oracle service is stopped due to cluster stop or other reasons while collecting, the correct information may not be collected.

Do not perform the manual operation such as Group stop or Group move while collecting information. Monitoring process may not work normally depending on the timing of the manual operation.

Collection Timeout (1 to 9,999)

Specify the timeout time for collecting detailed information in seconds.

Default value: 120

Set error during Oracle initialization or shutdown

When this function is enabled, a monitor error occurs immediately upon the detection of Oracle initialization or shutdown in progress.

Disable this function when Oracle automatically restarts in cooperation with Oracle Clusterware or the like during operation. Monitoring becomes normal even during Oracle initialization or shutdown.

However, a monitor error occurs if Oracle initialization or shutdown continues for one hour or more.

Default value: Disabled

5.18 Setting up POP3 monitor resources

POP3 monitor resources monitor POP3 services that run on the server. POP3 monitor resources monitor POP3 protocol but they are not intended for monitoring specific applications. POP3 monitor resources monitor various applications that use POP3 protocol.

5.18.1 Notes on POP3 monitor resources

For monitoring target resources, specify service resources or script resources that start POP3 services. Monitoring starts after target resource is activated. However, if POP3 services cannot be started immediately after target resource is activated, adjust the time using **Wait Time to Start Monitoring**.

POP3 services may output operation logs for each monitoring. Configure the POP3 settings if this needs to be adjusted.

With POP3S selected in **Authentication Method**, you need to specify the installation path of OpenSSL libraries in the **Encryption** tab of **Cluster Properties**. The following OpenSSL library versions support POP3S: OpenSSL 3.1 to 3.3.

5.18.2 Monitoring by POP3 monitor resources

POP3 monitor resources monitor the following:

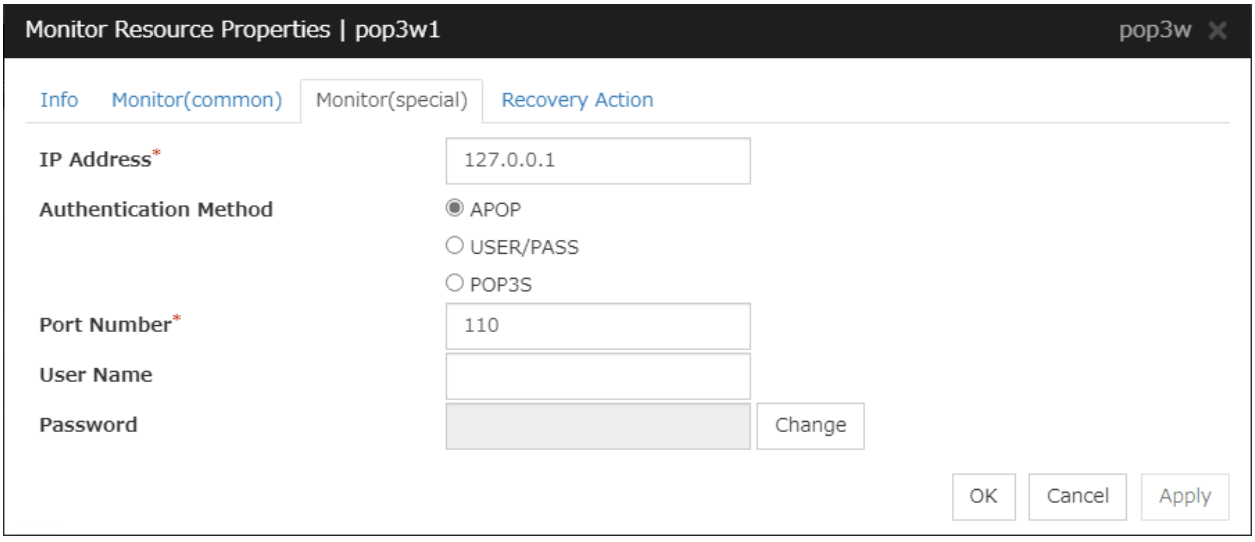
POP3 monitor resources connect to the POP3 server and execute the command to verify the operation.

As a result of monitoring, the following is considered as an error:

(1) When connection to the POP3 server fails.

(2) When an error is notified as a response to the command.

5.18.3 Monitor (special) tab



IP Address (within 255 bytes)

Specify the IP address of the POP3 server to be monitored. Specifying this item cannot be omitted.

Usually, specify the loopback address (127.0.0.1) to connect to the POP3 server that runs on the local server. If the addresses for which connection is possible are limited by POP3 server settings, specify an address for which connection is possible.

Default value: 127.0.0.1

Authentication Method

Select the authentication method to log on to POP3. It must follow the settings of POP3 being used:

- APOP (default value)
  The encryption authentication method that uses the APOP command.
- USER/PASS
  The plaintext method that uses the USER/PASS command.
- POP3S
  An encryption authentication method that uses SSL/TLS.

Port Number (1 to 65535)

Specify the POP3 port number to be monitored. Specifying this item cannot be omitted.

Default value :
110
995 (POP3S)

User Name (within 255 bytes)

Specify the user name to log on to POP3.

Default value: None

Password (within 255 bytes)

Specify the password to log on to POP3. Click **Change** and enter the password in the dialog box.

Default value: None

5.19 Setting up PostgreSQL monitor resources

PostgreSQL monitor resources monitor PostgreSQL database that runs on the server.

5.19.1 Notes on PostgreSQL monitor resources

For the supported PostgreSQL/PowerGres version, see " 5.1.2. *Applications supported by monitoring options* " in "*5. Monitor resource details*".

Interface DLL (LIBPQ.DLL) needs to be installed on the server where monitoring is performed because PostgreSQL/PowerGres library is used for monitoring. Specify the path of this DLL to the environmental variable when monitoring PostgreSQL.

For a target monitoring resource, specify a service resource or a script resource that can start PostgreSQL/PowerGres. Monitoring starts after the target resource is activated; however, if the database cannot be started right after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring.**

A monitor table is created when monitoring starts. When monitoring is stopped due to the group stopping, the monitor table is deleted. When monitoring is temporarily stopped or when the server fails before the failover group stops due to system error, the monitor table is not deleted. Note that, if the server is shut down due to a system failure or other cause before the group is stopped, the monitor table will not be deleted. In this case, an alert message saying that "a monitor table exists" might be displayed next time monitoring is started. This is not an error.

PostgreSQL/PowerGres may output operation logs for each monitoring. Configure the PostgreSQL/PowerGres settings if this needs to be adjusted.

Because PostgreSQL is open-source software (OSS), its operation is checked but not guaranteed. Make sure to use PostgreSQL after evaluating it by yourself.

If PostgreSQL monitoring is performed, an error indicating that no library can be found may be output depending on the OS and PostgreSQL versions. In this case, add PostgreSQL bin to the PATH of the system environment variable. After that, restart the cluster.

When adding PATH to the environment variable (The following is an example of PATH of PostgreSQL9.6 bin.)

```
C:\Program Files\PostgreSQL\9.6\bin
```

When this monitor resource is used, messages like those shown below are output to a log on the PostgreSQL side. These messages are output by the monitor processing and do not indicate any problems.

```
YYYY-MM-DD hh:mm:ss JST moodle moodle LOG: statement: DROP TABLE psqlwatch
YYYY-MM-DD hh:mm:ss JST moodle moodle ERROR: table "psqlwatch" does not exist
YYYY-MM-DD hh:mm:ss JST moodle moodle STATEMENT: DROP TABLE psqlwatch
YYYY-MM-DD hh:mm:ss JST moodle moodle LOG: statement: CREATE TABLE psqlwatch (num␣
↪INTEGER NOT NULL PRIMARY KEY)
YYYY-MM-DD hh:mm:ss JST moodle moodle NOTICE: CREATE TABLE / PRIMARY KEY will create␣
↪implicit index "psqlwatch_pkey" for table "psql watch"
YYYY-MM-DD hh:mm:ss JST moodle moodle LOG: statement: DROP TABLE psqlwatch
```

Regarding the monitor levels described in the next section "Monitoring by PostgreSQL monitor resources", note the following:

At "Level 1", a monitor error occurs if there is no monitor table at the start of monitoring. Create a monitor table as shown below.

At "Level 2", if there is no monitor table at the start of monitoring, EXPRESSCLUSTER automatically creates a monitor table. At the same time, a message notifying that there is no monitor table is displayed in the Cluster WebUI alert log.

Selectable monitor level	Prior creation of a monitor table
Level 1 (monitoring by select)	Required
Level 2 (monitoring by update/select)	Optional

Create a monitor table using either of the following methods:

(In the following example, the monitor table is named PSQLWATCH):

```
sql> create table PSQLWATCH (num int not null primary key);
sql> insert into PSQLWATCH values(0);
sql> commit;
```

5.19.2 Monitoring by PostgreSQL monitor resources

PostgreSQL monitor resources perform monitoring according to the specified monitor level.

- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.

  An error is recognized if:

  (1) A database connection could not be established

  (2) An error message is sent in response to an SQL statement

- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. One SQL statement can read/write numerical data of up to 10 digits. At monitoring start/end, the monitor table is created/deleted. SQL statements issued to the monitor table are of (create / update / select / reindex / drop / vacuum) type.

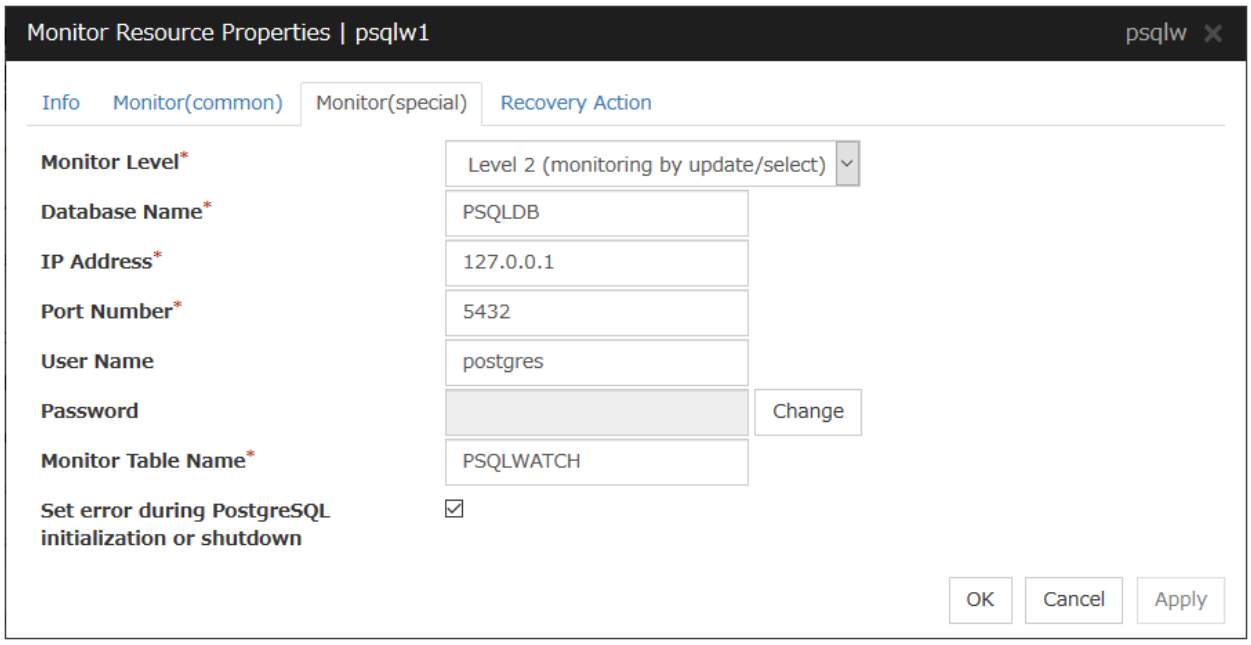
  An error is recognized if:

  (1) A database connection could not be established

  (2) An error message is sent in response to an SQL statement

  (3) The written data is not the same as the read data

5.19.3 Monitor (special) tab



Monitor Level

Select one of the following levels. You cannot omit this level setting.

- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.
- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. SQL statements issued to the monitor table are of (create / update / select / reindex / drop / vacuum) type.

Default value: Level 2 (monitoring by update/select)

Database Name (within 255 bytes)

Specify the database name to be monitored. Specifying this item cannot be omitted.

Default value: None

IP Address:

Specify the IP address of the database server to be monitored. Specifying this item cannot be omitted.

Default value: 127.0.0.1

Port Number

Specify the PostgreSQL port number to be monitored. Specifying this item cannot be omitted.

Default value: 5432

User Name (within 255 bytes)

Specify the user name to log on to the database.

Default value: postgres

Password (within 255 bytes)

Specify the password to log on to the database. Click **Change** and enter the password in the dialog box.

Default value: None

Monitor Table Name (within 255 bytes)

Specify the name of a monitor table created on the database. Specifying this item cannot be omitted. Make sure not to specify the same name as the table used for operation because a monitor table will be created and deleted. Be sure to set the name different from the reserved word in SQL statements.

Some characters cannot be used to specify a monitor table name according to the database specifications. For details, refer to the database specifications.

Default value: PSQLWATCH

Set error during PostgreSQL initialization or shutdown

When this function is enabled, a monitor error occurs immediately upon the detection of PostgreSQL initialization or shutdown in progress.

When this function is disabled, monitoring becomes normal even during PostgreSQL initialization or shutdown.

However, a monitor error occurs if PostgreSQL initialization or shutdown continues for one hour or more.

Default value: Enabled

5.20 Setting up SMTP monitor resources

SMTP monitor resources monitor SMTP services that run on the server. SMTP monitor resources monitor SMTP protocol but they are not intended for monitoring specific applications. SMTP monitor resources monitor various applications that use SMTP protocol.

5.20.1 Notes on SMTP monitor resources

For monitoring target resources, specify service resources or script resources that start SMTP. Monitoring starts after the target resource is activated; however, if the database cannot be started right after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring**.
SMTP services may output operation logs for each monitoring. Configure the SMTP settings if this needs to be adjusted.

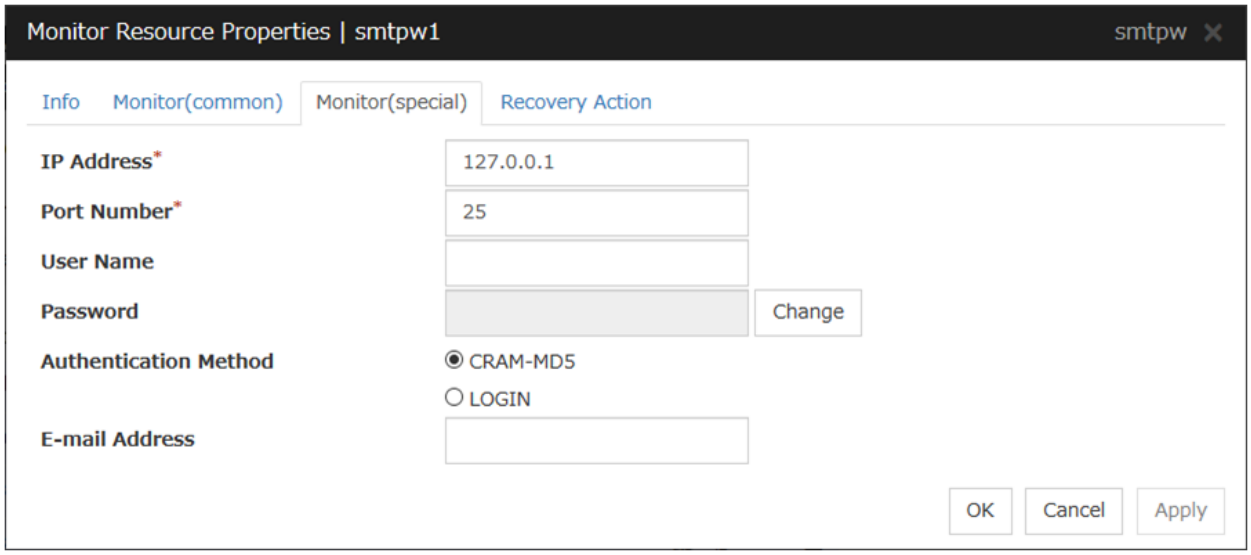
5.20.2 Monitoring by SMTP monitor resources

SMTP monitor resources monitor the following:
POP3 monitor resources connect to the POP3 server and execute the command to verify the operation.
As a result of monitoring, the following is considered as an error:

(1) When connection to the SMTP server fails.

(2) When an error is notified as a response to the command.

5.20.3 Monitor (special) tab



IP Address

Specify the IP address of the SMTP server to be monitored. Specifying this item cannot be omitted.

Default value: 127.0.0.1

Port Number

Specify the port number of the SMTP to be monitored. Specifying this item cannot be omitted.

Default value: 25

User Name (within 255 bytes)

Specify the user name to log on to SMTP. If no user name is specified, SMTP authentication is not performed.

Default value: None

Password (within 255 bytes)

Specify the password to log on to SMTP. Click **Change** and enter the password in the dialog box.

Default value: None

Authentication Method

Select the authentication method to log on to the SMTP. It must follow the settings of SMTP being used:

- CRAM-MD5 (default value)
  The encryption authentication method that uses the CRAM-MD5 command.
- LOGIN
  The plaintext method that uses the LOGIN command.

E-mail Address (within 255 bytes)

Specify the email address used for monitoring. If nothing is specified, monitoring is performed using the command to verify the operation. The command that uses a dummy e-mail address is executed internally. If an email address is specified, monitoring is performed by running SMTP command to the specified e-mail address and verifying the result of it. It is recommended to have an e-mail address dedicated to monitoring.

Default value: None

5.21 Setting up SQL Server monitor resources

SQL Server monitor resources monitor SQL Server database that runs on the server.

5.21.1 Notes on SQL Server monitor resources

For the supported SQL Server version, see " 5.1.2. *Applications supported by monitoring options* " in "5. *Monitor resource details*".

For target monitoring resource, specify a service resource that can start SQL Server. Monitoring starts after the target resource is activated; however, if the database cannot be started right after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring.**

A monitor table is created when monitoring starts. When monitoring is stopped due to the group stopping, the monitor table is deleted. When monitoring is temporarily stopped or when server fails before the failover group stops due to system error, the monitor table will not be deleted. Note that, if the server is shut down due to a system failure or other cause before the group is stopped, the monitor table will not be deleted. In this case, an alert message saying that "a monitor table exists" might be displayed next time monitoring is started. This is not an error.

SQL Server may output operation logs for each monitoring. Configure the SQL Server settings if this needs to be adjusted.

Regarding the monitor levels described in the next section "5.21.2. *Monitoring by SQL Server monitor resources*", note the following:
At "Level 1", a monitor error occurs if there is no monitor table at the start of monitoring. Create a monitor table as shown below.
At "Level 2", if there is no monitor table at the start of monitoring, EXPRESSCLUSTER automatically creates a monitor table. At the same time, a message notifying that there is no monitor table is displayed in the Cluster WebUI alert log.

Selectable monitor level	Prior creation of a monitor table
Level 0 (database status)	Optional
Level 1 (monitoring by select)	Required
Level 2 (monitoring by update/select)	Optional

Create a monitor table using either of the following methods:

(In the following example, the monitor table is named SQLWATCH)

- **When SET IMPLICIT_TRANSACTIONS is OFF**:

```
sql> create table SQLWATCH (num int not null primary key)
sql> go
sql> insert into SQLWATCH values(0)
sql> go
```

- **When SET IMPLICIT_TRANSACTIONS is ON**:

```
sql> create table SQLWATCH (num int not null primary key)
sql> go
sql> insert into SQLWATCH values(0)
sql> go
```

(continues on next page)

(continued from previous page)

```
sql> commit
sql> go
```

5.21.2 Monitoring by SQL Server monitor resources

SQL Server monitor resources perform monitoring according to the specified monitor level.

- Level 0 (database status)
  The SQL Server management table is referenced to check the DB status. This level corresponds to simplified monitoring without SQL statements being executed for the monitor table.

  An error is recognized if:

  (1) The database status is not online
- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.

  An error is recognized if:

  (1) A database connection could not be established

  (2) An error message is sent in response to an SQL statement
- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. One SQL statement can read/write numerical data of up to 10 digits. At monitoring start/end, the monitor table is created/deleted. SQL statements issued to the monitor table are of (create / update / select / drop) type.

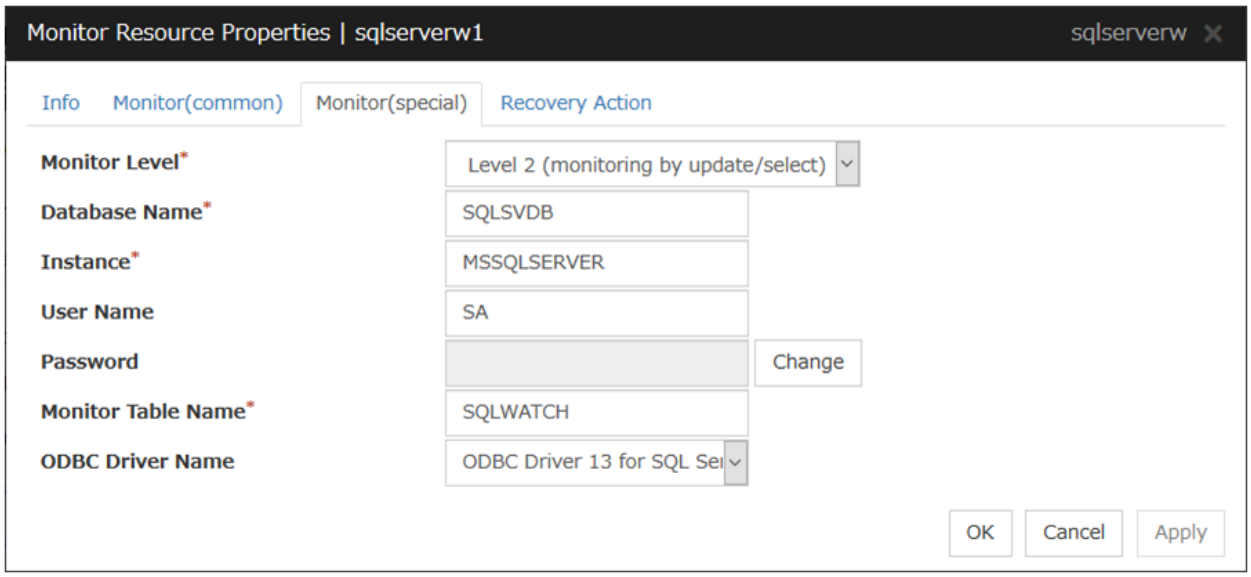
  An error is recognized if:

  (1) A database connection could not be established

  (2) An error message is sent in response to an SQL statement

  (3) The written data is not the same as the read data

5.21.3 Monitor (special) tab



Monitor Level

Select one of the following levels. You cannot omit this level setting.

- Level 0 (database status)
  The SQL Server management table is referenced to check the DB status.
- Level 1 (monitoring by select)
  Monitoring with only reference to the monitor table. SQL statements issued to the monitor table are of (select) type.
- Level 2 (monitoring by update/select)
  Monitoring with reference to and update of the monitoring table. SQL statements issued to the monitor table are of (create / update / select / drop) type.

Default value: Level 2 (monitoring by update/select)

Database Name (within 255 bytes)

Specify the database name to be monitored. Specifying this item cannot be omitted.

Default value: None

Instance Name (within 255bytes)

Specify the database instance name. Specifying this item cannot be omitted.

Default value: MSSQLSERVER

User Name (within 255 bytes)

Specify the user name to log on to the database. If the user name is not specified, Windows authentication is used.

Default value: SA

Password (within 255 bytes)

Specify the password to log on to the database. Click **Change** and enter the password in the dialog box.

Default value: None

Monitor Table Name (within 255 bytes)

Specify the name of a monitor table created on the database. Specifying this item cannot be omitted. Make sure not to specify the same name as the table used for operation because a monitor table will be created and deleted. Be sure to set the name different from the reserved word in SQL statements.

Some characters cannot be used to specify a monitor table name according to the database specifications. For details, refer to the database specifications.

Default value: SQLWATCH

ODBC Driver Name (within 255 bytes)

Select the driver name of the target database shown in the **ODBC** tab when you click **Start** -> **Administrative Tools** -> **Data Sources (ODBC)**.

Select **SQL Server Native Client 11.0** in SQL Server 2014.

Select ODBC Driver 13 for SQL Server in SQL Server 2016, SQL Server 2017.

Select ODBC Driver 17 for SQL Server in SQL Server 2019.

Default value: ODBC Driver 13 for SQL Server

5.22 Setting up Tuxedo monitor resources

Tuxedo monitor resources monitor Tuxedo that runs on the server.

5.22.1 Notes on Tuxedo monitor resources

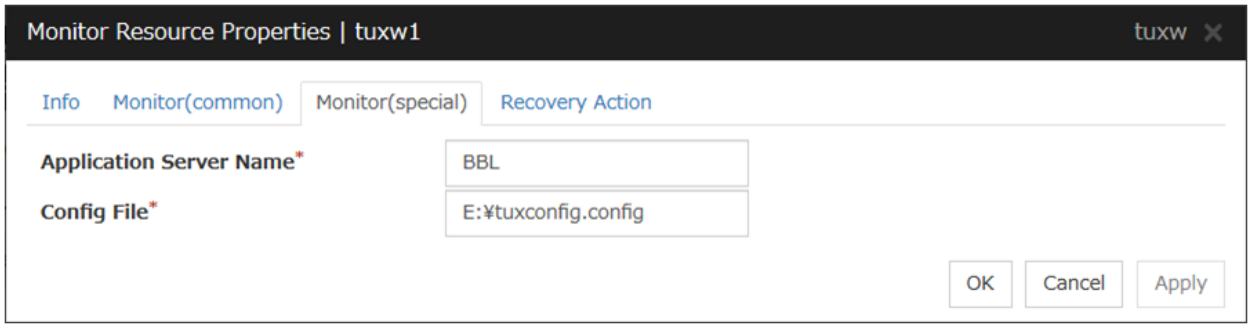
For the supported Tuxedo version, see " 5.1.2. *Applications supported by monitoring options*" in "5. *Monitor resource details*".
For target monitoring resource, specify a script resource and application resource that can start Tuxedo. Monitoring starts after the target resource is activated; however, if Tuxedo cannot be started right after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring**.
Tuxedo may output operation logs for each monitoring. Configure the Tuxedo settings if this needs to be adjusted.

5.22.2 Monitoring by Tuxedo monitor resources

Tuxedo monitor resources monitor the following:
Tuxedo monitor resources connect to the Tuxedo and execute API to verify the operation.
As a result of monitoring, the following is considered as an error:

(1) When an error is reported during the connection to the application server and/or the acquisition of the status.

5.22.3 Monitor (special) tab



Application Server Name (within 255 bytes)

Specify the application server name to be monitored. Specifying this item cannot be omitted.

Default value: BBL

Config File (within 1,023 bytes)

Specify the placement file name of Tuxedo. Specifying this item cannot be omitted.

Default value: None

5.23 Setting up WebLogic monitor resources

WebLogic monitor resources monitor WebLogic that runs on the server.

5.23.1 Notes on WebLogic monitor resources

For the supported WebLogic version, see " 5.1.2. *Applications supported by monitoring options*" in "5. *Monitor resource details*".
If WebLogic cannot run immediately after startup, it is recognized as an error. To prevent this, adjust **Wait Time to Start Monitoring**. Or, make sure that WebLogic starts first (for example, by specifying the script resource and application resource that starts WebLogic as the monitor target resource).
If the selected monitoring method is WLST for this monitor resource, the monitoring requires a JAVA environment. Since the JAVA functions are used by the application server system, a stall of JAVA (if any) may be recognized as an error.
WebLogic may output operation logs for each monitoring. Configure the WebLogic settings if this needs to be adjusted.

5.23.2 Monitoring by WebLogic monitor resources

WebLogic monitor resource monitors the following:

- Monitoring method: if RESTful API is selected

  WebLogic offers RESTful APIs called WebLogic RESTful management services.

  The RESTful APIs allow you to monitor the application server.

  As a result, an error is considered to be found if:

  1. There is an error message in response to the RESTful API.

  Note: Compared with the WLST monitoring method, RESTful API can reduce the CPU load of the application server under the monitoring.

- Monitoring method: if WLST is selected

  Monitors the application server by performing connect with the "weblogic.WLST" command.

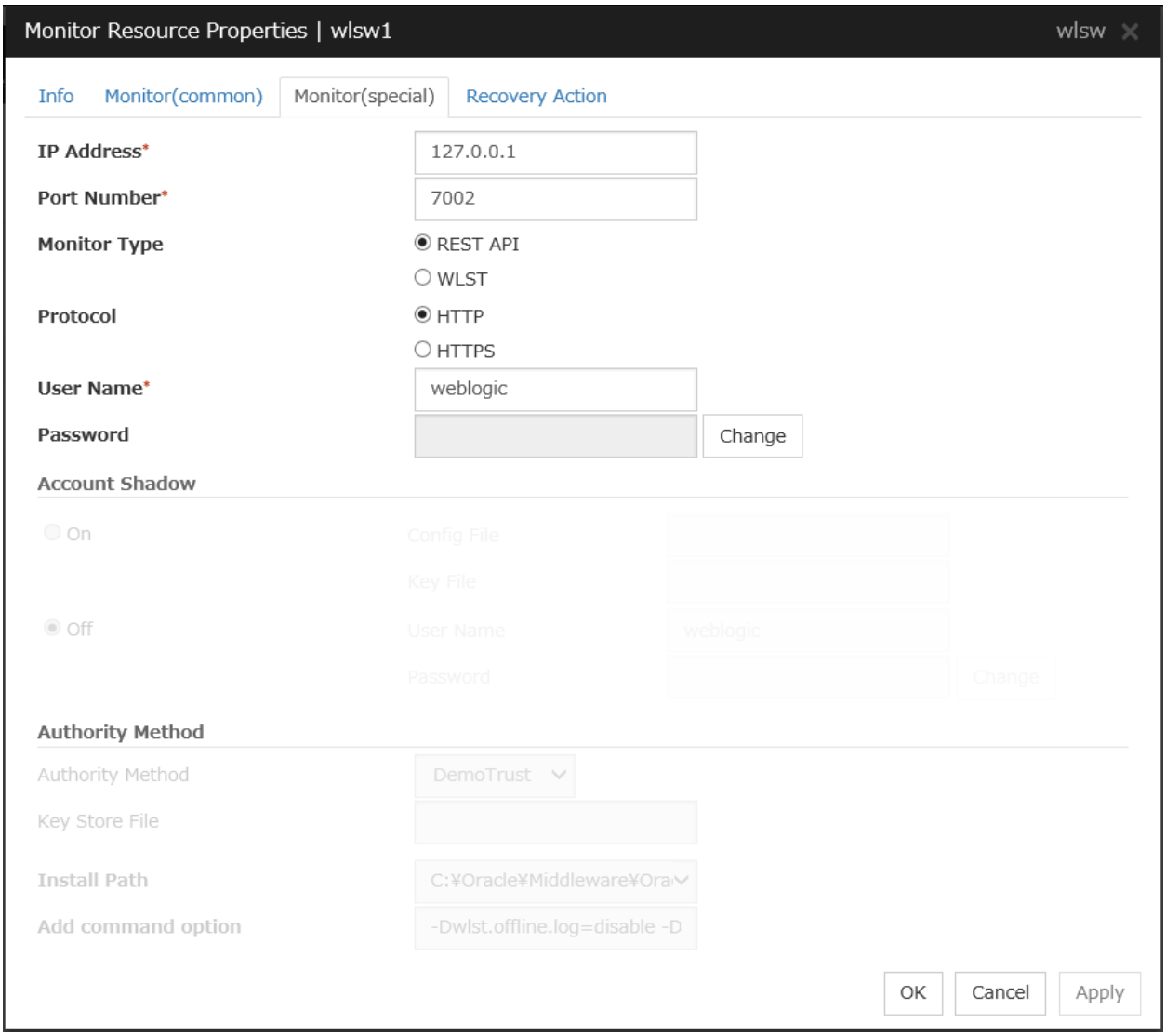
  This monitor resource determines the following results as an error:

  1. An error reporting as the response to the connect.

  The operations are as follows, based on **Authentication Method**.

  - DemoTrust: SSL authentication method using authentication files for demonstration of WebLogic
  - CustomTrust: SSL authentication method using user-created authentication files
  - Not Use SSL: SSL authentication method is not used.

5.23.3 Monitor (special) tab



IP Address (within 80 bytes)

Specify the IP address of the server to be monitored. Specifying this item cannot be omitted.

Default value: 127.0.0.1

Port (1 to 65535)

Specify the port number used to connect to the server. Specifying this item cannot be omitted.

Default value: 7002

Monitor Method

Specify the method of monitoring the server. Setting this parameter is mandatory.

Default value: RESTful API

Protocol

Specify the protocol of the server to be monitored. Setting this parameter is mandatory if RESTful API is selected in **Monitor Method**.

Default value: HTTP

User Name (Within 255 bytes)

Specify the name of the WebLogic user. Setting this parameter is mandatory if RESTful API is selected in **Monitor Method**.

Default value: weblogic

Password (Within 255 bytes)

Specify the password for WebLogic, if necessary, with RESTful API selected in **Monitor Method**.

Default value: None

Account Shadow

When you specify a user name and a password directly, select **Off**. If not, select **On**. Specifying this item cannot be omitted.

Default value: Off

Config File (within 1023 bytes)

Specify the file in which the user information is saved. Specifying this item cannot be omitted if **Account Shadow** is **On**.

Default value: None

Key File (within 1023 bytes)

Specify the file in which the password required to access to a config file path is saved. Specify the full path of the file. Specifying this item cannot be omitted if **Account Shadow** is **On**.

Default value: None

User Name (within 255 bytes)

Specify the user name of WebLogic. Specifying this item cannot be omitted if **Account Shadow** is **Off**.

Default value: weblogic

Password (within 255 bytes)

Specify the password of WebLogic.

Default value: None

Authority Method

Specify the authentication method when connecting to an application server. Specifying this item cannot be omitted.

Specify DemoTrust or Custom Trust for **Authority Method**, in order to execute monitoring by using the SSL communication.

It is determined whether to use DemoTrust or CustomTrust, according to the setting of WebLogic Administration Console.

When Keystores of WebLogic Administration Console is set to Demo Identity and Demo Trust, specify Demo Trust. In this case, you do not need to make settings for Key Store File.

When Keystores of WebLogic Administration Console is set to Custom Identity and Custom Trust, specify Custom Trust. In this case, you need to make settings for Key Store File.

Default value: DemoTrust

Key Store File (within 1023 bytes)

Specify the authentication file when authenticating SSL. You must specify this when the **Authority Method** is **CustomTrust**. Set the file specified in Custom Identity Key Store File on WebLogic Administration Console.

Default value: None

Installation Path (within 255 bytes)

Specify the installation path of WebLogic. Specifying this item cannot be omitted.

Default value: `C:\Oracle\Middleware\Oracle_Home\wlserver`

Additional command option (within 1023 bytes)

Set this value when changing the option to be passed to the webLogic.WLST command.

Default value: -Dwlst.offline.log=disable -Duser.language=en_US

5.24 Setting up WebOTX monitor resources

WebOTX monitor resources monitor WebOTX that runs on the server.

5.24.1 Notes on WebOTX monitor resources

For the supported WebOTX version, see " 5.1.2. *Applications supported by monitoring options*" in "5. *Monitor resource details*".
For target monitoring resource, specify a script resource that can start WebOTX. Monitoring starts after the target resource is activated; however, if WebOTX cannot be started right after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring.**
A Java environment is required to start monitoring with this command. The application server system uses Java functions. Therefore if Java stalls, it may be recognized as an error.
WebOTX may output operation logs for each monitoring. Configure the WebOTX settings if this needs to be adjusted.
WebOTX monitor resource monitors application servers by using the otxadmin.bat command which Web OTX offers. `${AS_INSTALL}\bin` where the otxadmin.bat command is arranged is not included in environment variable PATH any more in WebOTX V10.1 or later. When monitoring WebOTX V10.1 or later, configure either of the following settings.

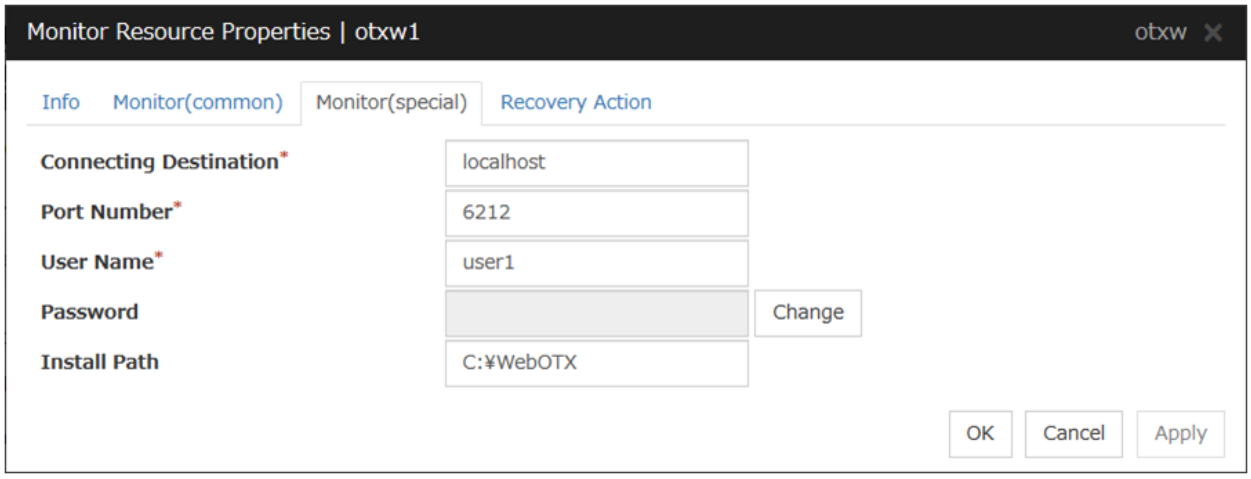
- Add the path where **otxadmin.bat** command is located to the system environment variable, PATH.
- Set the install path of WebOTX Application Server to **Install Path**. (e.g. `C:\WebOTX`)

5.24.2 Monitoring by WebOTX monitor resources

WebOTX monitor resources monitor the following.
WebOTX monitor resources use the serverStatus.bat command to verify the operation.
As a result of monitoring, the following is considered as an error:

(1) When an error is reported with the state of the acquired application server.

5.24.3 Monitor (special) tab



Connecting Destination (Within 255 bytes)

Specify the server name of the server to be monitored. Specifying this item cannot be omitted.

Default value: localhost

Port Number (1 to 65535)

Specify the port number used to connect to the server. Specifying this item cannot be omitted.
When monitoring a WebOTX user domain, specify the management port number for the WebOTX domain. The management port number is the number which was set for "domain.admin.port" of <domain_name>.properties when the domain was created. Refer to the WebOTX documents for details of <domain_name>.properties

Default value: 6212

User Name (Within 255 bytes)

Specify the user name of WebOTX. Specifying this item cannot be omitted.
When monitoring a WebOTX user domain, specify the login user name for the WebOTX domain.

Default value:None

Password (Within 255 bytes)

Specify the password of WebOTX.

Default value: None

Install Path (Within 255 bytes)

Specify the install path of WebOTX Application Server. You must configure this setting when monitoring WebOTX Application Server V10.1 or later.

Default value: None

5.25 Setting up WebSphere monitor resources

WebSphere monitor resources monitor WebSphere that runs on the server.

5.25.1 Notes on WebSphere monitor resources

For the supported WebSphere version, see " 5.1.2. *Applications supported by monitoring options*" in "*5. Monitor resource details*".
For target monitoring resource, specify a service resource that can start WebSphere. Monitoring starts after the target resource is activated; however, if the database cannot be started right after the target resource is activated, adjust the time by using **Wait Time to Start Monitoring**.
A Java environment is required to start monitoring with this command. The application server system uses Java functions. Therefore if Java stalls, it may be recognized as an error.
WebSphere may output operation logs for each monitoring. Configure the WebSphere settings if this needs to be adjusted.

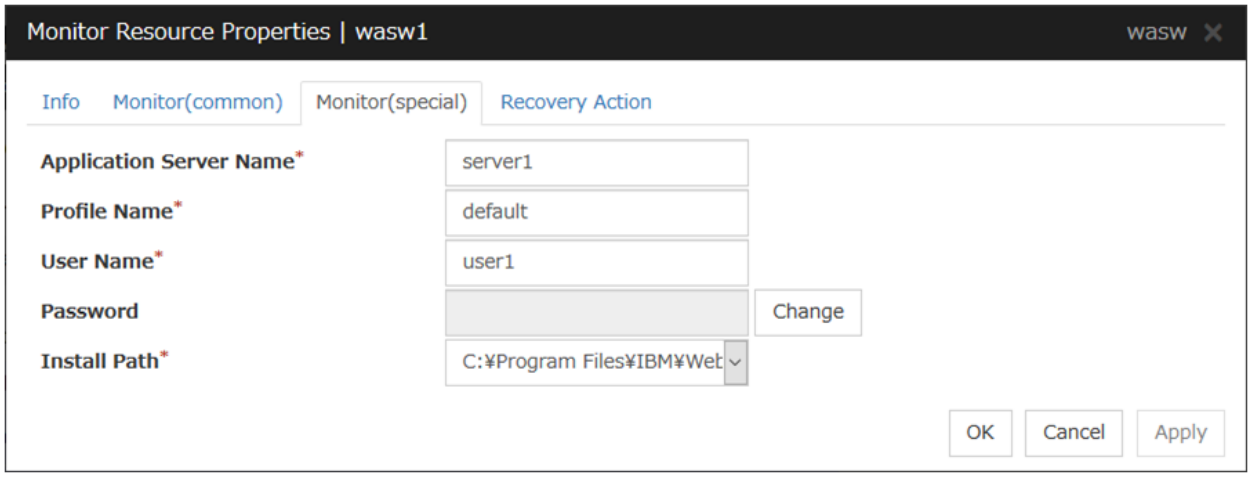
5.25.2 Monitoring by WebSphere monitor resources

WebSphere monitor resources monitor the following:WebSphere monitor resources use the serverStatus.bat command to verify the operation.

As a result of monitoring, the following is considered as an error:

(1) When an error is reported with the state of the acquired application server.

5.25.3 Monitor (special) tab



Application Server Name (within 255 bytes)

Specify the application server name to be monitored. Specifying this item cannot be omitted.

Default value: server1

Profile Name (within 1023 bytes)

Specify the profile name of WebSphere. Specifying this item cannot be omitted.

Default value: default

User Name (within 255 bytes)

Specify the user name of WebSphere. Specifying this item cannot be omitted.

Default value:None

Password (within 255 bytes)

Specify the password of WebSphere.

Default value: None

Installation Path (within 1023 bytes)

Specify the installation path of WebSphere. Specifying this item cannot be omitted.

Default value: `C:\Program Files\IBM\WebSphere\AppServer`

5.26 Setting up JVM monitor resources

JVM monitor resources monitor information about the utilization of resources that are used by Java VM or an application server running on a server.

5.26.1 Note on JVM monitor resources

The **Java installation path** on the **JVM monitor** tab of **Cluster Properties** must be set before adding JVM monitor resource.

For a target resource, specify an application server running on Java VM such as WebLogic Server or WebOTX. As soon as the JVM monitor resource has been activated, the Java Resource Agent starts monitoring, but if the target (WebLogic Server or WebOTX) cannot start running immediately after the activation of the JVM monitor resource, use **Wait Time to Start Monitoring** to compensate.

The setting of **Monitor(common)** tab-**Retry Count** is invalid. When you'd like to delay error detection, please change the setting of **Cluster Properties-JVM monitor** tab-**Resource Measurement Settings** [**Common**]-**Retry Count**.

The status of the JVM monitor resource is "Warning" from when monitoring is started to when the monitoring processing is actually performed.

5.26.2 Monitoring by JVM monitor resources

JVM monitor resource monitors the following:

Monitors application server by using JMX (Java Management Extensions).

The monitor resource determines the following results as errors:

- Target Java VM or application server cannot be connected.
- The value of the used amount of resources obtained for the Java VM or application server exceeds the user-specified threshold a specified number of times (error decision threshold) consecutively.

As a result of monitoring, an error is regarded as having been solved if:

- The value falls below the threshold when restarting the monitoring after the recovery action.

Note: Collect Cluster Logs in the Cluster WebUI does not handle the configuration file and log files of the target (WebLogic or WebOTX).

The following figure shows the monitoring operation by the JVM monitor resource.

Monitoring of the target Java VM is started. ... a)

JMX (Java Management Extensions) is used for monitoring Java VM.

Java Resource Agent periodically obtains the amount of used resources through JMX to check the status of Java VM.

When the status changes from Normal to Error , an error in Java VM is indicated in Cluster WebUI, where its status and alert can be checked. ... b)

An error is notified to the event log and JVM operation log. ... c)

If an alert service is used, a notification via an e-mail is available.

After a), if the status is changed from Error to Normal, Cluster WebUI indicates Java VM has been restored. ... d)

The restoration of Java VM is notified to the event log and JVM operation log. ... e)

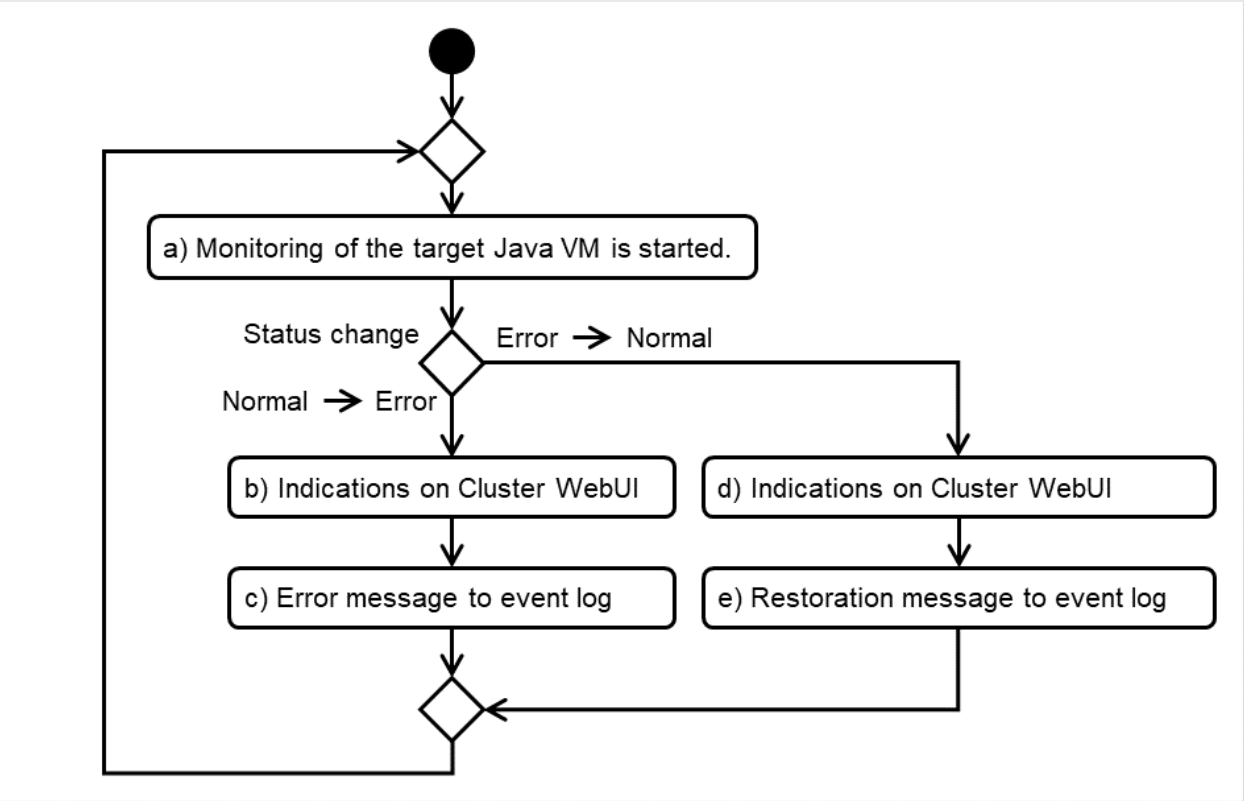


Fig. 5.5: Monitoring flow by the JVM monitor resource

The standard operations when the threshold is exceeded are as described below.

In the figure below, the horizontal axis shows the lapse of time, while the vertical axis shows whether the value exceeded the threshold or not.
If the value consecutively exceeds the threshold the number of times of the error decision threshold (five times in this figure), it is determined as an error.

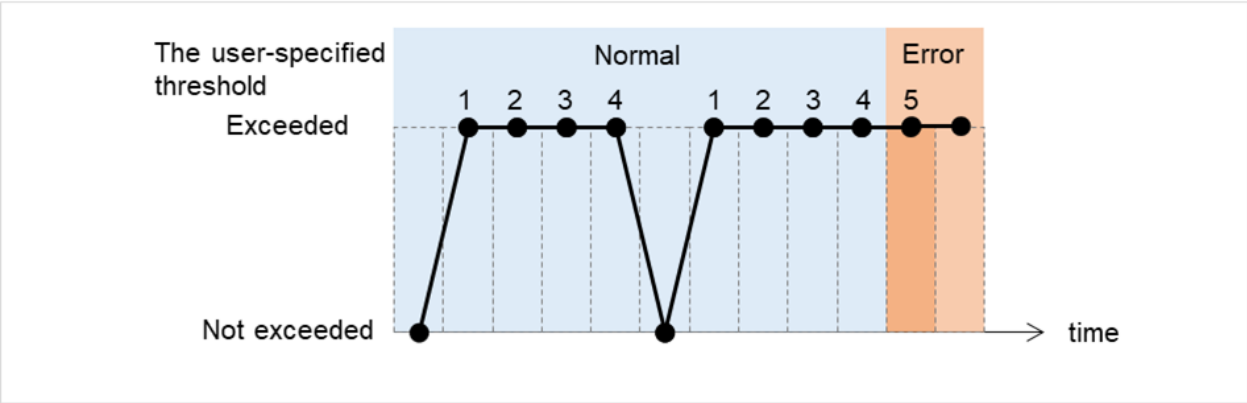


Fig. 5.6: Behavior with threshold exceeded

The operations performed if an error persists are as described below.

If the value consecutively exceeds the threshold the number of the error decision threshold, it is determined as an error.
After determining as an error, even if the value consecutively exceeds the number of times of the error decision threshold again, Cluster WebUI does not display an alert again.

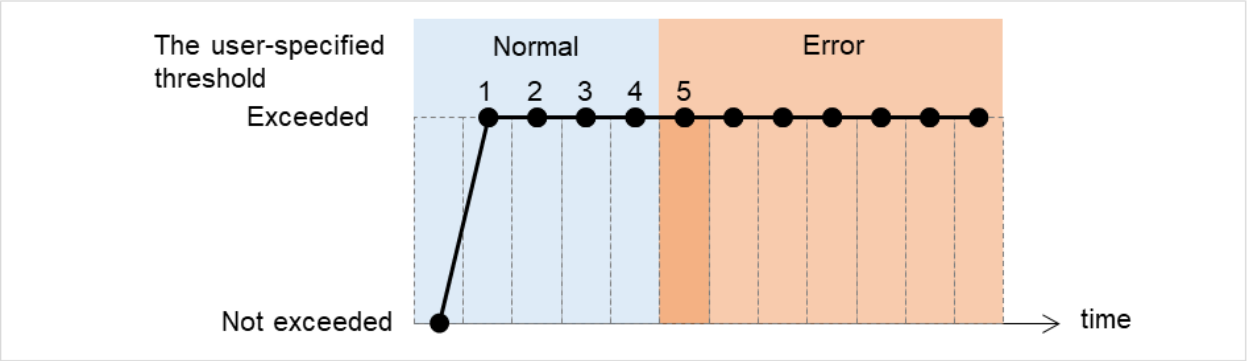


Fig. 5.7: Behavior with an error persistent

The following example describes the case of monitoring Full GC (Garbage Collection).

In this example, the horizontal axis shows the lapse of time.
The upper part of the figure shows whether Full GC occurred or not, while the lower part shows how many times Full GC occurred consecutively.
The JVM resource detects an error when Full GC consecutively occurs the number of times of the error judgment threshold.
With the error decision threshold set at five times, the JVM resource detects an error when the Full GC has been detected five times.

Full GC has a significant influence on the system, thus the recommended error threshold is 1 time.

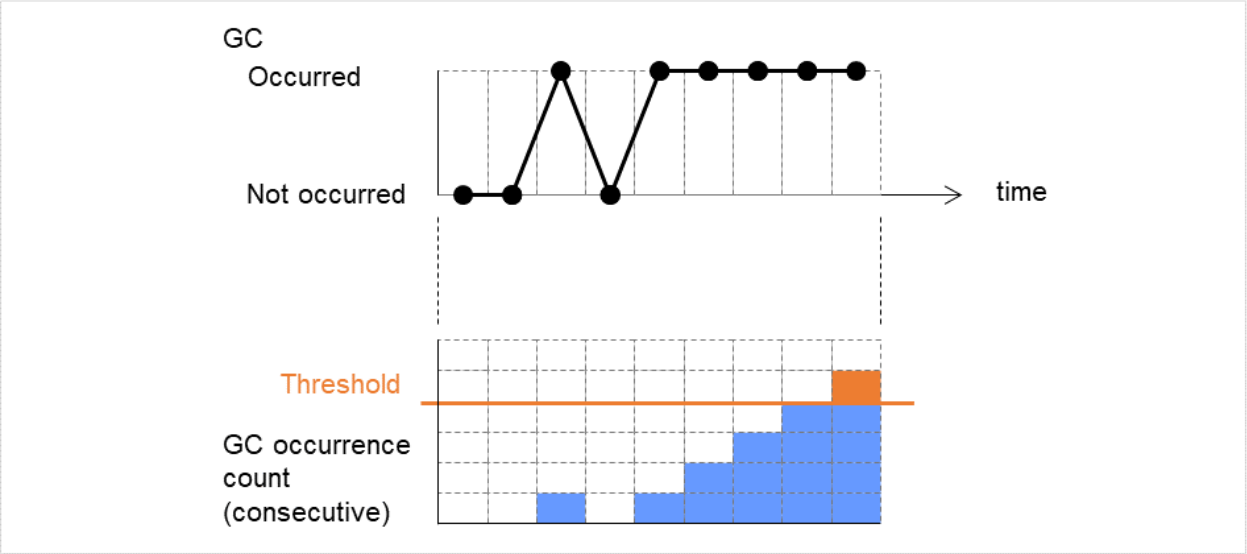


Fig. 5.8: Monitoring image (with the error decision threshold set at five times)

5.26.3 JVM statistical log

JVM monitor resources collect statistical information on the monitor target Java VM. The information is stored on CSV-format files, JVM statistical logs. The file is created in the following location:

<EXPRESSCLUSTER install path>\log\ha\jra*.stat

The following "monitor items" refer to parameters in the [Monitor(special)] tab in the [Properties] of the JVM monitor resources.
Statistical information is collected and output to its corresponding JVM statistical log when an item is selected and the threshold value is set for the item. If a monitor item is not selected, statistical information on the item will be neither collected nor output to its corresponding JVM statistical log.

The following table lists monitor items and their corresponding JVM statistical logs.

Monitor items	Corresponding JVM statistical log
[Memory] tab - [Monitor Heap Memory Rate] [Memory] tab - [Monitor Non-Heap Memory Rate] [Memory] tab-[Monitor Heap Memory Usage] [Memory] tab -[Monitor Non-Heap Memory Usage]	jramemory.stat
[Thread] tab - [Monitor the number of Active Threads]	jrathread.stat
[GC] tab - [Monitor the time in Full GC] [GC] tab - [Monitor the count of Full GC execution]	jragc.stat

Continued on next page

Table 5.12 – continued from previous page

Monitor items	Corresponding JVM statistical log
[WebLogic] tab - [Monitor the requests in Work Manager] [WebLogic] tab - [Monitor the requests in Thread Pool] When either of the above monitor items is checked, both of the logs, such as wlworkmanager.stat and wlthreadpool.stat, are output. No functions to output only one of the two logs are provided.	wlworkmanager.stat wlthreadpool.stat

5.26.4 Java memory area usage check on monitor target Java VM (jramemory.stat)

The jramemory.stat log file records the size of the Java memory area used by the monitor target Java VM. Its file name becomes either of the following two depending on the Rotation Type selected on the Log Output Setting dialog box.

- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type] - [File Capacity] is checked: `jramemory<integer starting with 0>.stat`
- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type] - [Period] is checked: `jramemory<YYYYMMDDhhmm>.stat`

Its data formats are as follows.

No	Format	Description
1	yyyy/mm/dd hh:mm:ss.SSS	Date and time of log recording
2	Half-size alphanumeric characters and symbols	Name of the monitor target Java VM; it has been specified in [Properties] - [Monitor(special)] tab - [Identification name] in JVM monitor resources.
3	Half-size alphanumeric characters and symbols	Name of the Java memory pool; for details, refer to "5.26.9. *Java memory pool name*".
4	Half-size alphanumeric characters and symbols	Type of the Java memory pool Heap, Non-Heap
5	Half-size numeric characters	Memory size that the Java VM requests from the OS at startup; it is expressed in bytes. (init) At the startup of the monitor target Java VM, the size can be specified by the following Java VM startup options. - HEAP:-Xms - NON_HEAP permanent area (Perm Gen): -XX:PermSize - NON_HEAP code cache area (Code Cache): -XX:InitialCodeCacheSize
6	Half-size numeric characters	Memory size currently used by the Java VM; it is expressed in bytes. (used)

Continued on next page

Table 5.13 – continued from previous page

No	Format	Description
7	Half-size numeric characters	Memory size guaranteed for current use in operation of the Java VM; it is expressed in bytes. (committed) This size varies depending on memory use; it is always equal to the value of "used" or larger but equal to the value of "max" or smaller.
8	Half-size numeric characters	Maximum memory size that the Java VM can use; it is expressed in bytes. (max) The size can be specified by the following Java VM startup options. - HEAP:-Xmx - NON_HEAP permanent area (Perm Gen): -XX:MaxPermSize - NON_HEAP code cache area (Code Cache): -XX:ReservedCodeCacheSize Example) java -XX:MaxPermSize=128m -XX:ReservedCodeCacheSize=128m javaAP In this example, max of NON_HEAP becomes 128 m + 128 m = 256 m. (Note) When the same value is specified for -Xms and -Xmx, "ini" may become larger than "max". This is because "max" of HEAP is determined by subtracting half the size of Survivor Space from the area size ensured by specification of -Xmx.
9	Half-size numeric characters	Peak size of the memory used after startup of the measurement target Java VM; when the name of the Java memory pool is HEAP or NON_HEAP, this size becomes equal to that of the memory currently used by the Java VM (used). It is expressed in bytes.
10	Half-size numeric characters	Ignore this value when Oracle Java(usage monitoring) is selected for JVM Type. When the item other than Oracle Java(usage monitoring) for JVM Type, memory size equal to "max" (No. 8 field) * the threshold (%) when the Java memory pool type (No. 4 field) is HEAP; it is expressed in bytes. When the Java memory pool type is not HEAP, it is 0.

5.26.5 Thread operation status check on monitor target Java VM (jrathread.stat)

The jrathread.stat log file records the thread operation status of the monitor target Java VM. Its file name becomes either of the following two depending on the Rotation Type selected on the Log Output Setting dialog box.

- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type] - [File Capacity] is checked: `jrathread<integer starting with 0>.stat`
- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type] - [Period] is checked: `jrathread<YYYYMMDDhhmm>.stat`

Its data formats are as follows.

No	Format	Description
1	yyyy/mm/dd hh:mm:ss.SSS	Date and time of log recording
2	Half-size alphanumeric characters and symbols	Name of the monitor target Java VM; it has been specified in [Properties] - [Monitor(special)] tab - [Identification name] in JVM monitor resources.
3	Half-size alphanumeric characters and symbols	The number of active threads in the monitor target Java VM
4	[Half-size numeric characters: half-size numeric characters:...]	Deadlocked thread ID in the monitor target Java VM; it contains the IDs of all deadlocked threads successively.
5	Half-size alphanumeric characters and symbols	Detailed information on deadlocked threads in the monitor target Java VM; it contains information on all deadlocked threads successively in the following format. ThreadName, ThreadID, ThreadStatus, UserTime, CpuTime, WaitedCount, WaitedTime, isInNative, isSuspended <line feed> stacktrace<line feed> : stacktrace<line feed> stacktrace=ClassName, FileName, LineNumber, MethodName, isNativeMethod

5.26.6 GC operation status check on monitor target Java VM (jragc.stat)

The jragc.stat log file records the GC operation status of the monitor target Java VM. Its file name becomes either of the following two depending on the Rotation Type selected on the Log Output Setting dialog box.

- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type]-[File Capacity] is checked: `jragc<integer starting with 0>.stat`
- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type] - [Period] is checked: `jragc<YYYYMMDDhhmm>.stat`

JVM monitor resources output two types of GC information: Copy GC and Full GC.

On Oracle Java, JVM monitor resources count the increment in the count of execution of the following GC as Full GC.

- MarkSweepCompact
- PS MarkSweep
- ConcurrentMarkSweep
- G1 Old Generation

Its data formats are as follows.

No	Format	Description
1	yyyy/mm/dd hh:mm:ss.SSS	Date and time of log recording
2	Half-size alphanumeric characters and symbols	Name of the monitor target Java VM; it has been specified in [Properties] - [Monitor(special)] tab - [Identification name] in JVM monitor resources.
3	Half-size alphanumeric characters and symbols	GC name of the monitor target Java VM When the monitor target Java VM is Oracle Java The GC name to be indicated is one of the following. Copy MarkSweepCompact PS Scavenge PS MarkSweep ParNew ConcurrentMarkSweep G1 Young Generation G1 Old Generation
4	Half-size numeric characters	Count of GC execution during the period from startup of the monitor target Java VM to measurement; the count includes GC executed before the JVM monitor resources starts monitoring.
5	Half-size numeric characters	Total time in GC during the period from startup of the monitor target Java VM to measurement; it is expressed in milliseconds. It includes time taken for GC executed before the JVM monitor resources starts monitoring.

5.26.7 Operation status check on Work Manager of WebLogic Server (wlworkmanager.stat)

The wlworkmanager.stat log file records the operation status of the Work Manager of the WebLogic Server. Its file name becomes either of the following two depending on the Rotation Type selected on the Log Output Setting dialog box.

- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type] - [File Capacity] is checked: `wlworkmanager<integer starting with 0>.stat`
- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type] - [Period] is checked: `wlworkmanager<YYYYMMDDhhmm>.stat`

Its data formats are as follows.

No	Format	Description
1	yyyy/mm/dd hh:mm:ss.SSS	Date and time of log recording
2	Half-size alphanumeric characters and symbols	Name of the monitor target Java VM; it has been specified in [Properties] - [Monitor(special)] tab - [Identification name] in JVM monitor resources.
3	Half-size alphanumeric characters and symbols	Application name
4	Half-size alphanumeric characters and symbols	Work Manager name
5	Half-size numeric characters	Count of request execution
6	Half-size numeric characters	The number of wait requests

5.26.8 Operation status check on Thread Pool of WebLogic Server (wlthreadpool.stat)

The wlthreadpool.stat log file records the operation status of the thread pool of the WebLogic Server. Its file name becomes either of the following two depending on the Rotation Type selected on the Log Output Setting dialog box.

- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type] - [File Capacity] is checked: `wlthreadpool<integer starting with 0>.stat`
- When [Cluster Properties] - [JVM monitor] tab - [Log Output Setting] - [Rotation Type] - [Period] is checked: `wlthreadpool<YYYYMMDDhhmm>.stat`

Its data formats are as follows.

No	Format	Description
1	yyyy/mm/dd hh:mm:ss.SSS	Date and time of log recording
2	Half-size alphanumeric characters and symbols	Name of the monitor target Java VM; it has been specified in [Properties] - [Monitor(special)] tab - [Identification name] in JVM monitor resources.
3	Half-size numeric characters	Total count of request execution
4	Half-size numeric characters	The number of requests queued in the WebLogic Server
5	Half-size numeric characters	Count of request execution per unit time (second)
6	Half-size numeric characters	The total number of threads for executing the application
7	Half-size numeric characters	The number of threads in an idle state
8	Half-size numeric characters	The number of executing threads
9	Half-size numeric characters	The number of threads in a stand-by state

5.26.9 Java memory pool name

This section describes the Java memory pool name outputted as memory_name in messages to the JVM operation log file. It also describes the Java memory pool name outputted to a JVM statistical log file, jrammemory.stat log file.

The character strings of Java memory pool names are not determined by JVM monitor resources. Character strings received from the monitor target Java VM are output as Java memory pool names.

Their specifications are not open for Java VM, and accordingly, are subject to change without notice in a version upgrade of Java VM.

Therefore, we do not recommend monitoring Java memory pool names contained in messages.

The following monitor items refer to parameters in the [Memory] tab of the [Monitor(special)] tab in the [Properties]

of the JVM monitor resources.

The following memory pool names have been confirmed on actual machines operating on Oracle Java.

When **Oracle Java** is selected for **JVM Type** and "-XX:+UseSerialGC" is specified as a startup option of the monitor target Java VM, the No. 3 Java memory pool name in the jrammemory.stat log file appears as follows.

Monitor item	Character string outputted as memory_name
[Monitor Heap Memory Rate] - [Total Usage]	HEAP
[Monitor Heap Memory Rate] - [Eden Space]	Eden Space
[Monitor Heap Memory Rate] - [Survivor Space]	Survivor Space
[Monitor Heap Memory Rate] - [Tenured Gen]	Tenured Gen
[Monitor Non-Heap Memory Rate] - [Total Usage]	NON_HEAP
[Monitor Non-Heap Memory Rate] - [Code Cache]	Code Cache
[Monitor Non-Heap Memory Rate] - [Perm Gen]	Perm Gen
[Monitor Non-Heap Memory Rate] - [Perm Gen[shared-ro]]	Perm Gen [shared-ro]
[Monitor Non-Heap Memory Rate] - [Perm Gen[shared-rw]]	Perm Gen [shared-rw]

When **Oracle Java** is selected for **JVM Type** and "-XX:+UseParallelGC" and "-XX:+UseParallelOldGC" are specified as startup options of the monitor target Java VM, the No. 3 Java memory pool name in the jrammemory.stat log file appears as follows.

Monitor item	Character string outputted as memory_name
[Monitor Heap Memory Rate] - [Total Usage]	HEAP
[Monitor Heap Memory Rate] - [Eden Space]	PS Eden Space
[Monitor Heap Memory Rate] - [Survivor Space]	PS Survivor Space
[Monitor Heap Memory Rate] - [Tenured Gen]	PS Old Gen
[Monitor Non-Heap Memory Rate] - [Total Usage]	NON_HEAP
[Monitor Non-Heap Memory Rate] - [Code Cache]	Code Cache
[Monitor Non-Heap Memory Rate] - [Perm Gen]	PS Perm Gen
[Monitor Non-Heap Memory Rate] - [Perm Gen[shared-ro]]	Perm Gen [shared-ro]
[Monitor Non-Heap Memory Rate] - [Perm Gen[shared-rw]]	Perm Gen [shared-rw]

When **Oracle Java** is selected for **JVM Type** and "-XX:+UseConcMarkSweepGC" is specified as a startup option of the monitor target Java VM, the No. 3 Java memory pool name in the jrammemory.stat log file appears as follows.

Monitor item	Character string outputted as memory_name
[Monitor Heap Memory Rate] - [Total Usage]	HEAP
[Monitor Heap Memory Rate] - [Eden Space]	Par Eden Space
[Monitor Heap Memory Rate] - [Survivor Space]	Par Survivor Space
[Monitor Heap Memory Rate] - [Tenured Gen]	CMS Old Gen
[Monitor Non-Heap Memory Rate] - [Total Usage]	NON_HEAP
[Monitor Non-Heap Memory Rate] - [Code Cache]	Code Cache
[Monitor Non-Heap Memory Rate] - [Perm Gen]	CMS Perm Gen
[Monitor Non-Heap Memory Rate] - [Perm Gen[shared-ro]]	Perm Gen [shared-ro]
[Monitor Non-Heap Memory Rate] - [Perm Gen[shared-rw]]	Perm Gen [shared-rw]

When [Oracle Java(usage monitoring)] is selected for [JVM Type] and "-XX:+UseSerialGC" is specified as a startup option for the monitor target Java VM, the No. 3 Java memory pool name in the jramemory.stat file will be as follows.

Monitor item	Character string output as memory_name
[Monitor Heap Memory Usage]-[Total Usage]	HEAP
[Monitor Heap Memory Usage]-[Eden Space]	Eden Space
[Monitor Heap Memory Usage]-[Survivor Space]	Survivor Space
[Monitor Heap Memory Usage]-[Tenured Gen]	Tenured Gen
[Monitor Non-Heap Memory Usage]-[Total Usage]	NON_HEAP
[Monitor Non-Heap Memory Usage]-[Code Cache]	Code Cache (For Java 9 or later, no output)
[Monitor Non-Heap Memory Usage]-[Metaspace]	Metaspace
[Monitor Non-Heap Memory Usage]-[CodeHeap non-nmethods]	CodeHeap non-nmethods
[Monitor Non-Heap Memory Usage]-[CodeHeap profiled]	CodeHeap profiled nmethods
[Monitor Non-Heap Memory Usage]-[CodeHeap non-profiled]	CodeHeap non-profiled nmethods
[Monitor Non-Heap Memory Usage]-[Compressed Class Space]	Compressed Class Space

When [Oracle Java(usage monitoring)] is selected for [JVM Type] and "-XX:+UseParallelGC" is specified as a startup option for the monitor target Java VM, the No. 3 Java memory pool name in the jramemory.stat file will be as follows.

Monitor item	Character string output as memory_name
[Monitor Heap Memory Usage]-[Total Usage]	HEAP
[Monitor Heap Memory Usage]-[Eden Space]	PS Eden Space
[Monitor Heap Memory Usage]-[Survivor Space]	PS Survivor Space
[Monitor Heap Memory Usage]- [Tenured Gen]	PS Old Gen
[Monitor Non-Heap Memory Usage]-[Total Usage]	NON_HEAP
[Monitor Non-Heap Memory Usage]-[Code Cache]	Code Cache (For Java 9 or later, no output)
[Monitor Non-Heap Memory Usage]- [Metaspace]	Metaspace
[Monitor Non-Heap Memory Usage]-[CodeHeap non-nmethods]	CodeHeap non-nmethods
[Monitor Non-Heap Memory Usage]-[CodeHeap profiled]	CodeHeap profiled nmethods
[Monitor Non-Heap Memory Usage]-[CodeHeap non-profiled]	CodeHeap non-profiled nmethods
[Monitor Non-Heap Memory Usage]-[Compressed Class Space]	Compressed Class Space

When [Oracle Java(usage monitoring)] is selected for [JVM Type] and "-XX:+UseParNewGC" is added as a startup option of the target Java VM, the No. 3 Java memory pool name in the jramemory.stat file will be as follows. For Java 9 or later, if -XX:+UseParNewGC is specified, the monitor target Java VM does not start.

Monitor item	Character string output as memory_name
[Monitor Heap Memory Usage]-[Total Usage]	HEAP
[Monitor Heap Memory Usage]-[Eden Space]	Par Eden Space
[Monitor Heap Memory Usage]-[Survivor Space]	Par Survivor Space
[Monitor Heap Memory Usage]-[Tenured Gen]	Tenured Gen
[Monitor Non-Heap Memory Usage]-[Total Usage]	NON_HEAP
[Monitor Non-Heap Memory Usage]-[Code Cache]	Code Cache

Continued on next page

Table 5.23 – continued from previous page

Monitor item	Character string output as memory_name
[Monitor Non-Heap Memory Usage]-[Metaspace]	Metaspace
[Monitor Non-Heap Memory Usage]-[CodeHeap non-nmethods]	CodeHeap non-nmethods
[Monitor Non-Heap Memory Usage]-[CodeHeap profiled]	CodeHeap profiled nmethods
[Monitor Non-Heap Memory Usage]-[CodeHeap non-profiled]	CodeHeap non-profiled nmethods
[Monitor Non-Heap Memory Usage]-[Compressed Class Space]	Compressed Class Space

When [Oracle Java(usage monitoring)] is selected for [JVM Type] and "-XX:+UseG1GC" is specified as a startup option for the monitor target Java VM the No. 3 Java memory pool name in the jramemory.stat file will be as follows.

Monitor item	Character string output as memory_name
[Monitor Heap Memory Usage]-[Total Usage]	HEAP
[Monitor Heap Memory Usage]-[Eden Space]	G1 Eden Space
[Monitor Heap Memory Usage]-[Survivor Space]	G1 Survivor Space
[Monitor Heap Memory Usage]-[Tenured Gen(Old Gen)]	G1 Old Gen
[Monitor Non-Heap Memory Usage]-[Total Usage]	NON_HEAP
[Monitor Non-Heap Memory Usage]-[Code Cache]	Code Cache (For Java 9 or later, no output)
[Monitor Non-Heap Memory Usage]-[Metaspace]	Metaspace
[Monitor Non-Heap Memory Usage]-[CodeHeap non-nmethods]	CodeHeap non-nmethods
[Monitor Non-Heap Memory Usage]-[CodeHeap profiled]	CodeHeap profiled nmethods
[Monitor Non-Heap Memory Usage]-[CodeHeap non-profiled]	CodeHeap non-profiled nmethods
[Monitor Non-Heap Memory Usage]-[Compressed Class Space]	Compressed Class Space

Java memory pool names appearing in the jramemory.stat log file, a JVM statistical log file, correspond to the Java VM memory space as follows.

- For Oracle Java 8/Oracle Java 9/Oracle Java 11/Oracle Java 17

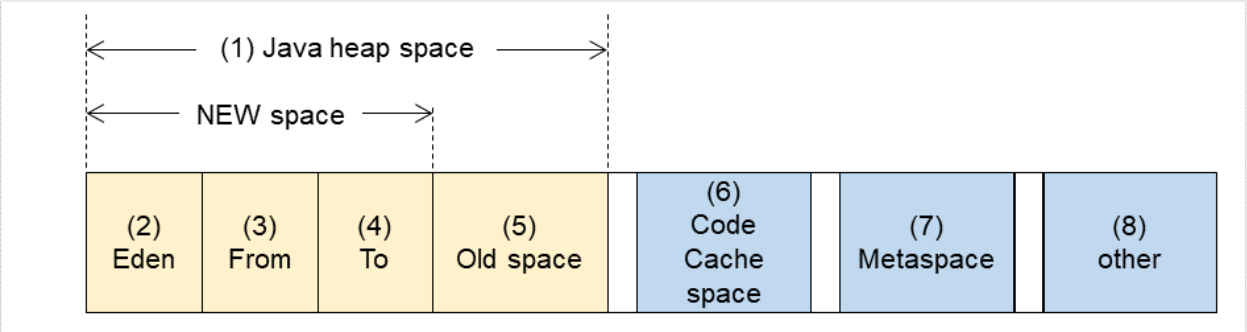


Fig. 5.9: Java VM memory space (Oracle Java 8/Oracle Java 9/Oracle Java 11/Oracle Java 17)

Number in diagram	Monitor item	Java memory pool name in jramemory.stat log file
(1)	[Monitor Heap Memory Usage] - [Total Usage]	HEAP
(2)	[Monitor Heap Memory Usage] - [Eden Space]	EdenSpace PS Eden Space Par Eden Space G1 Eden Space
(3)+(4)	[Monitor Heap Memory Usage] - [Survivor Space]	Survivor Space PS Survivor Space Par Survivor Space G1 Survivor Space
(5)	[Monitor Heap Memory Usage] - [Tenured Gen]	Tenured Gen PS Old Gen G1 Old Gen
(6)	[Monitor Non-Heap Memory Usage] - [Code Cache]	Code Cache (For Java 9 or later, no output)
(6)	[Monitor Non-Heap Memory Usage]- [CodeHeap non-nmethods]	CodeHeap non-nmethods (Only for Java 9 or later, it is output.)
(6)	[Monitor Non-Heap Memory Usage]- [CodeHeap profiled]	CodeHeap profiled nmethods (Only for Java 9 or later, it is output.)
(6)	[Monitor Non-Heap Memory Usage]- [CodeHeap non-profiled]	CodeHeap non-profiled nmethods (Only for Java 9 or later, it is output.)
(7)	[Monitor Non-Heap Memory Usage] - [Metaspace]	Metaspace
(8)	[Monitor Non-Heap Memory Usage]- [Compressed Class Space]	Compressed Class Space.
(6)+(7)+(8)	[Monitor Non-Heap Memory Usage] - [Total Usage]	NON_HEAP

5.26.10 Executing command corresponding to cause of each detected error

EXPRESSCLUSTER does not provide means for executing specific commands according to the causes of detected monitor resource errors.

JVM monitor resources can execute specific commands according to error causes. If an error is detected, JVM monitor resources will execute an appropriate command.

The following setting items specify commands that will be executed according to error causes.

Error cause	Setting item
- Failure in connection to the monitor target Java VM - Failure in resource measurement	[Monitor(special)] tab - [Command]
- Heap memory rate - Non-heap memory rate - Heap memory usage - Non-heap memory usage	[Monitor(special)] tab - [Tuning] properties - [Memory] tab - [Command]
• The number of active threads	[Monitor(special)] tab - [Tuning] properties - [Thread] tab - [Command]
- Time in Full GC - Count of Full GC execution	[Monitor(special)] tab - [Tuning] properties - [GC] tab - [Command]
- Requests in Work Manager of WebLogic - Requests in Thread Pool of WebLogic	[Monitor(special)] tab - [Tuning] properties - [WebLogic] tab - [Command]

A [Command] passes the detail of an error cause as the arguments of a command with the arguments attached to the end of the [Command]. A Command further specialized for dealing with specific error causes can be defined by designing and specifying a script etc. for a [Command]. The following character strings are passed as the arguments. When multiple character strings are stated as possible arguments, one of them will be passed according to the CG type of the monitor target Java VM. For the details of their differences, refer to " 5.26.9. *Java memory pool name*". Statements "(For Oracle Java)","(For Oracle Java(usage monitoring))" suggest that different character strings are used according to the JVM type. When no such statement is contained, the same character strings will be equally used for all JVM types.

Details of error causes	Character string for argument
- Failure in connection to the monitor target Java VM - Failure in resource measurement	No character string defined
[Monitor(special)] tab - [Tuning] properties - [Memory] tab - [Monitor Memory Heap Rate] - [Total Usage] (For Oracle Java)	HEAP
[Memory] tab - [Monitor Memory Heap Rate] - [Eden Space] (For Oracle Java)	EdenSpace PSEdenSpace ParEdenSpace

Continued on next page

Table 5.27 – continued from previous page

Details of error causes	Character string for argument
[Memory] tab - [Monitor Memory Heap Rate] - [Survivor Space] (For Oracle Java)	SurvivorSpace PSSurvivorSpace ParSurvivorSpace
[Memory] tab - [Monitor Memory Heap Rate] - [Tenured Gen] (For Oracle Java)	TenuredGen PSOldGen CMSOldGen
[Memory] tab - [Monitor Non-Heap Memory Rate] - [Total Usage] (For Oracle Java)	NON_HEAP
[Memory] tab - [Monitor Memory Non-Heap Rate] - [Code Cache] (For Oracle Java)	CodeCache
[Memory] tab - [Monitor Memory Non-Heap Rate] - [Perm Gen] (For Oracle Java)	PermGen PSPermGen CMSPermGen
[Memory] tab - [Monitor Memory Non-Heap Rate] - [Perm Gen[shared-ro]] (For Oracle Java)	PermGen[shared-ro]
[Memory] tab - [Monitor Memory Non-Heap Rate] - [Perm Gen[shared-rw]] (For Oracle Java)	PermGen[shared-rw]
[Memory] tab - [Monitor Heap Memory Usage]-[Total Usage] (Oracle Java(usage monitoring))	HEAP
[Memory] tab - [Monitor Heap Memory Usage]-[Eden Space] (Oracle Java(usage monitoring))	EdenSpace PSEdenSpace ParEdenSpace G1EdenSpace

Continued on next page

Table 5.27 – continued from previous page

Details of error causes	Character string for argument
[Memory] tab - [Monitor Heap Memory Usage]-[Survivor Space] (Oracle Java(usage monitoring))	SurvivorSpace PSSurvivorSpace ParSurvivorSpace G1SurvivorSpace
[Memory] tab - [Monitor Heap Memory Usage]-[Tenured Gen] (Oracle Java(usage monitoring))	TenuredGen PSOldGen CMSOldGen G1OldGen
[Memory] tab - [Monitor Non-Heap Memory Usage]-[Total Usage] (Oracle Java(usage monitoring))	NON_HEAP
[Memory] tab - [Monitor Non-Heap Memory Usage]-[Code Cache] (Oracle Java(usage monitoring))	CodeCache
[Memory] tab - [Monitor Non-Heap Memory Usage]-[Metaspace] (Oracle Java(usage monitoring))	Metaspace
[Thread] tab - [Monitor the number of Active Threads]	Count
[GC] tab - [Monitor the time in Full GC]	Time
[GC] tab - [Monitor the count of Full GC execution]	Count
[WebLogic] tab - [Monitor the requests in Work Manager] - [Waiting Requests, The number]	WorkManager_PendingRequests
[WebLogic] tab - [Monitor the requests in Thread Pool] - [Waiting Requests, The number]	ThreadPool_PendingUserRequestCount
[WebLogic] tab - [Monitor the requests in Thread Pool] - [Executing Requests, The number]	ThreadPool_Throughput

The following are examples of execution.

Example 1)

Setting item	Setting information
[Monitor(special)] tab - [Tuning] properties - [GC] tab - [Command]	\Program Files\bin\command.bat
[Monitor(special)] tab - [Tuning] properties - [GC] tab - [Monitor the count of Full GC execution]	1
[Cluster] properties - [JVM monitor] tab - [Resource Measurement Setting] - [Common] tab - [Error Threshold]	3

If Full GC is executed successively as many times as specified by the Error Threshold (three times), JVM monitor re-

sources will detect a monitor error and execute a command corresponding to `\Program Files\bin\command.bat Count`.

Example 2)

Setting item	Setting information
[Monitor(special)] tab - [Tuning] properties - [GC] tab - [Command]	\Program Files\bin\command.bat GC
[Monitor(special)] tab - [Tuning] properties - [GC] tab - [Monitor the time in Full GC]	65536
[Cluster] properties - [JVM monitor] tab - [Resource Measurement Setting] - [Common] tab - [Error Threshold]	3

If the time in Full GC exceeds 65535 milliseconds successively as many times as specified by the Error Threshold (three times), JVM monitor resources will detect a monitor error and execute a command corresponding to "`\Program Files\bin\command.bat GC Time`".

Example 3)

Setting item	Setting information
[Monitor(special)] tab - [Tuning] properties - [Memory] tab - [Command]	\Program Files\bin\command.bat memory
[Monitor(special)] tab - [Tuning] properties - [Memory] tab - [Monitor Heap Memory Rate]	On
[Monitor(special)] tab - [Tuning] properties - [Memory] tab - [Eden Space]	80
[Monitor(special)] tab - [Tuning] properties - [Memory] tab - [Survivor Space]	80
[Cluster] properties - [JVM monitor] tab - [Resource Measurement Setting] - [Common] tab - [Error Threshold]	3

If the usage rate of the Java Eden Space and that of the Java Survivor Space exceed 80% successively as many times as specified by the Error Threshold (three times), JVM monitor resources will detect a monitor error and execute a command corresponding to "`\Program Files\bin\command.bat memory EdenSpace SurvivorSpace`".

Timeout (second) for waiting for the completion of execution of the command specified by the [Command] is set by specifying the [Command Timeout] in the [JVM monitor] of the Cluster Properties window. The same value is applied to the timeout of the [Command] of each of the above-mentioned tabs; the timeout cannot be specified for each [Command] separately.

If a timeout occurs, the system will not perform processing for forced termination of the [Command] process; the operator needs to perform post-processing (e.g. forced termination) of the [Command] process. When a timeout occurs, the following message is output to the JVM operation log:

`action thread execution did not finish. action is alive = <command>`

Note the following cautions.

- No [Command] is executed when restoration of the Java VM to normal operation (error -> normal operation) is detected.
- A [Command] is executed upon detection of an error of the Java VM (when threshold crossing occurs successively as many times as specified by the error threshold). It is not executed at each threshold crossing.

- Note that specifying a [Command] on multiple tabs allows multiple commands to be executed if multiple errors occur simultaneously, causing a large system load.
- A [Command] may be executed twice simultaneously when the following two items are monitored: [Monitor(special)] tab - [Tuning] properties - [WebLogic] tab - [Monitor the requests in Work Manager] - [Waiting Requests, The Number]; [Monitor(special)] tab - [Tuning] properties - [WebLogic] tab - [Monitor the requests in Work Manager] - [Waiting Requests, Average].

This is because errors may be detected simultaneously on the following two items: [Cluster] properties - [JVM monitor] tab - [Resource Measurement Setting] - [WebLogic] tab - [Interval, The number of request]; [Cluster] properties - [JVM monitor] tab - [Resource Measurement Setting] - [WebLogic] tab - [Interval, The average number of the request]. To avoid this phenomenon, specify only one of the two items as a monitor target. This applies to the following combinations of monitor items.

- [Monitor(special)] tab - [Tuning] properties - [WebLogic] tab - [Monitor the requests in Thread Pool] - [Waiting Requests, The Number] and [Monitor(special)] tab - [Tuning] properties - [WebLogic] tab - [Monitor the requests in Thread Pool] - [Waiting Requests, Average]
- [Monitor(special)] tab - [Tuning] properties - [WebLogic] tab - [Monitor the requests in Thread Pool] - [Executing Requests, The Number] and [Monitor(special)] tab - [Tuning] properties - [WebLogic] tab - [Monitor the requests in Thread Pool] - [Executing Requests, Average]

5.26.11 Monitoring WebLogic Server

For how to start the operation of the configured target WebLogic Server as an application server, see the manual for WebLogic Server.

This section describes only the settings required for monitoring by the JVM monitor resource.

1. Start WebLogic Server Administration Console.
   For how to start WebLogic Server Administration Console, refer to "Overview of Administration Console" in the WebLogic Server manual.
   Select **Domain Configuration-Domain-Configuration-General**. Make sure that **Enable Management Port is unchecked.**
2. Select **Domain Configuration-Server**, and then select the name of the server to be monitored. Set the selected server name as the identifier on the **Monitor(Special)** tab from **Properties** that can be selected in the config mode of Cluster WebUI.
3. Regarding the target server, select **Configuration-General**, and then check the port number though which a management connection is established with **Listen Port**.
4. Stop WebLogic Server. For how to stop WebLogic Server, refer to "Starting and stopping WebLogic Server" in the WebLogic Server manual.
5. Open the WebLogic Server startup script.
6. Write the following instructions in the script.
   - When the target is the WebLogic Server managing server:

```
set JAVA_OPTIONS=%JAVA_OPTIONS%
-Dcom.sun.management.jmxremote.port=n
-Dcom.sun.management.jmxremote.ssl=false
-Dcom.sun.management.jmxremote.authenticate=false
-Djavax.management.builder.initial=weblogic.management.jmx.mbeanserver.
↪WLSMBeanServerBuilder
```

   *Write each line of coding on one line.

Note: For **n**, specify the number of the port used for monitoring. The specified port number **must be different from that of the listen port for the target Java VM.** If there are other target WebLogic Server entities on the same machine, specify a port number different from those for the listening port and application ports of the other entities.

- When the target is a WebLogic Server managed server:

```
if "%SERVER_NAME%" == "SERVER_NAME"(
    set JAVA_OPTIONS=%JAVA_OPTIONS%
-Dcom.sun.management.jmxremote.port=n
-Dcom.sun.management.jmxremote.ssl=false
-Dcom.sun.management.jmxremote.authenticate=false
-Djavax.management.builder.initial=weblogic.management.jmx.mbeanserver.
↪WLSMBeanServerBuilder
)
```

*Write all the if statement lines on one line.

Note: For *SERVER_NAME*, specify the name of the target server confirmed by **Select Target Server**. If more than one server is targeted, change the server name on the settings (line 1 to 6) for each server.

Note: Place the above addition prior to the following coding:

```
%JAVA_HOME%\bin\java %JAVA_VM% %MEM_ARGS%
-Dweblogic.Name=%SERVER_NAME%
-Djava.security.policy=%WL_HOME%\server\lib\weblogic.policy %JAVA_OPTIONS
% %PROXY_SETTINGS% %SERVER_CLASS%
```

*Write the above coding on one line.

7. If monitoring a request of work manager and thread pool, configure the following settings:
   Start WLST (wlst.cmd) of the target WebLogic Server.
   To do this, select Start menu-Oracle WebLogic-WebLogic Server <*version number*>-Tools-WebLogic Scripting Tool.
   On the prompt window displayed, execute the following commands.

```
> connect('USERNAME','PASSWORD','t3://SERVER_ADDRESS:SERVER_PORT')
> edit()
> startEdit()
> cd('JMX/DOMAIN_NAME')
> set('PlatformMBeanServerUsed','true')
> activate()
> exit()
```

   Replace the **USERNAME**, **PASSWORD**, **SERVER_ADDRESS**, **SERVER_PORT**, and **DOMAIN_NAME** with those for the domain environment.

8. Restart the target WebLogic Server.

5.26.12 Monitoring WebOTX

This section describes how to configure a target WebOTX to enable monitoring by the JVM monitor resource.

Start the WebOTX Administration Console. For how to start the WebOTX Administration Console, refer to "Starting the console" in the "WebOTX Operation (Web Administration Console)".

The settings differ depending on whether a Java process of the JMX agent running on WebOTX or the Java process of a process group is to be monitored. Configure the settings according to the target of monitoring.

5.26.13 Monitoring a Java process of the WebOTX domain agent

There is no need to specify any settings.

5.26.14 Monitoring a Java process of a WebOTX process group

1. Connect to the domain by using the administration console.
2. In the tree view, select **<domain_name>-TP System-Application Group-<application_group_name>-Process Group-<process_group_name>**.
3. For the **Other Arguments** attributes on the **JVM Options** tab on the right, specify the following Java options on one line. For **n**, specify the port number. If there is more than one Java VM to be monitored on the same machine, specify a unique port number. The port number specified for the settings is specified with Cluster WebUI (Monitor Resource Properties - Monitor(special) tab - Connection Port).

```
-Dcom.sun.management.jmxremote.port=n
-Dcom.sun.management.jmxremote.ssl=false
-Dcom.sun.management.jmxremote.authenticate=false
-Djavax.management.builder.initial=com.nec.webotx.jmx.mbeanserver.
↪JmxMBeanServerBuilder
```

   * In the case of WebOTX V9.2 or later, it is unnecessary to specify -Djavax.management.builder.initial.

4. Then, click **Update**. After the configuration is completed, restart the process group.
   These settings can be made by using **Java System Properties,** accessible from the **Java System Properties** tab of the WebOTX administration console. When making these settings by using the console, do not designate "-D" and set the strings prior to "=" in "name" and set the strings subsequent to "=" in "value".

Note: If restart upon a process failure is configured as a function of the WebOTX process group, and when the process group is restarted as the recovery processing by EXPRESSCLUSTER, the WebOTX process group may fail to function correctly. For this reason, when monitoring the WebOTX process group, make the following settings for the JVM monitor resource by using the Cluster WebUI.

Tab name for setting	Item name	Setting value
Monitor(common)	Monitor Timing	Always
Recovery Action	Recovery Action	Execute only the final action
Recovery Action	Final Action	No operation

5.26.15 Receiving WebOTX notifications

By registering a specific listener class, notification is issued when WebOTX detects a failure. The JVM monitor resource receives the notification and outputs the following message to the JVM operation log.

```
%1$s:Notification received. %2$s.
```

%1$s and %2$s each indicates the following:

```
%1$s: Monitored Java VM
%2$s: Message in the notification (ObjectName=,type=,message=)
```

At present, the following is the detailed information on MBean on the monitorable resource.

ObjectName	[domainname]:j2eeType=J2EEDomain,name=[domainname],category=runtime
notification type	nec.webotx.monitor.alivecheck.not-alive
Message	failed

5.26.16 Monitoring Tomcat

This section describes how to configure a target Tomcat to be monitored by the JVM monitor resource.

1. Stop Tomcat, and then open **Start ->** (*Tomcat_Program_folder*) **-> Configure Tomcat.**
2. In the Java Options of Java of the open window, specify the following settings on one line. For **n**, specify the port number. If there is more than one Java VM to be monitored on the same machine, specify a unique port number. The port number specified for the settings is specified with Cluster WebUI (**Monitor Resource Properties -> Monitor(special)** tab **-> Connection Port**).

   ```
   -Dcom.sun.management.jmxremote.port=n
   -Dcom.sun.management.jmxremote.ssl=false
   -Dcom.sun.management.jmxremote.authenticate=false
   ```

3. Save the settings, and then start Tomcat.
4. With Cluster WebUI (**JVM Monitor Resource Name -> Properties -> Monitor(special)** tab **-> Identifier**), specify a unique string that is different from those for the other monitor targets (e.g., tomcat).

5.26.17 Monitoring SVF

This section describes how to configure a target SVF to be monitored by the JVM monitor resource.

1. Select a monitor target from the following, and then use an editor to open the file.

Monitor target	File to be edited
UCX Server Service (for 9.x or later)	<SVF installation path> \launcher\UCXServer.run

Continued on next page

Table 5.33 – continued from previous page

Monitor target	File to be edited
Report Director EnterpriseServer	<SVF installation path> \launcher\ReportDirectorEnterpriseServer.run
Report Director Svf Server	<SVF installation path> \launcher\ReportDirectorSvfServer.run
Report Director Spool Balancer	<SVF installation path> \launcher\ReportDirectorSpoolBalancer.run
Tomcat	%FIT_PRODUCTS_BASE%\SetupUtils\setup_tomcat.bat

2. (When the monitor target is Tomcat:)
   Insert the additional description to --JvmOption of :install within setup_tomcat.bat in the following way. For **n**, specify the port number. If there is more than one Java VM to be monitored on the same machine, specify a unique port number. The port number specified here is also specified with the Cluster WebUI **(Monitor Resource Properties - Monitor(special)** tab **- Connection Port**).

   Before the change:

```
--JvmOptions=...
```

   After the change:

```
--JvmOptions=...;-Dcom.sun.management.jmxremote.port=n;-Dcom.sun.management.
↪jmxremote.ssl=false;-Dcom.sun.management.jmxremote.authenticate=false
```

3. (When the monitor target is other than Tomcat:)
   The following contents are inserted in the part where Arguments is designated just after the setting point of "-Xms". For **n**, specify the port number. If there is more than one Java VM to be monitored on the same machine, specify a unique port number. The port number specified here is also specified with the Cluster WebUI **(Monitor Resource Properties -> Monitor (special)** tab **-> Connection Port**).

```
-Dcom.sun.management.jmxremote.port=n -Dcom.sun.management.jmxremote.ssl=false -
↪Dcom.sun.management.jmxremote.authenticate=false
```

5.26.18 Monitoring a Java application that you created

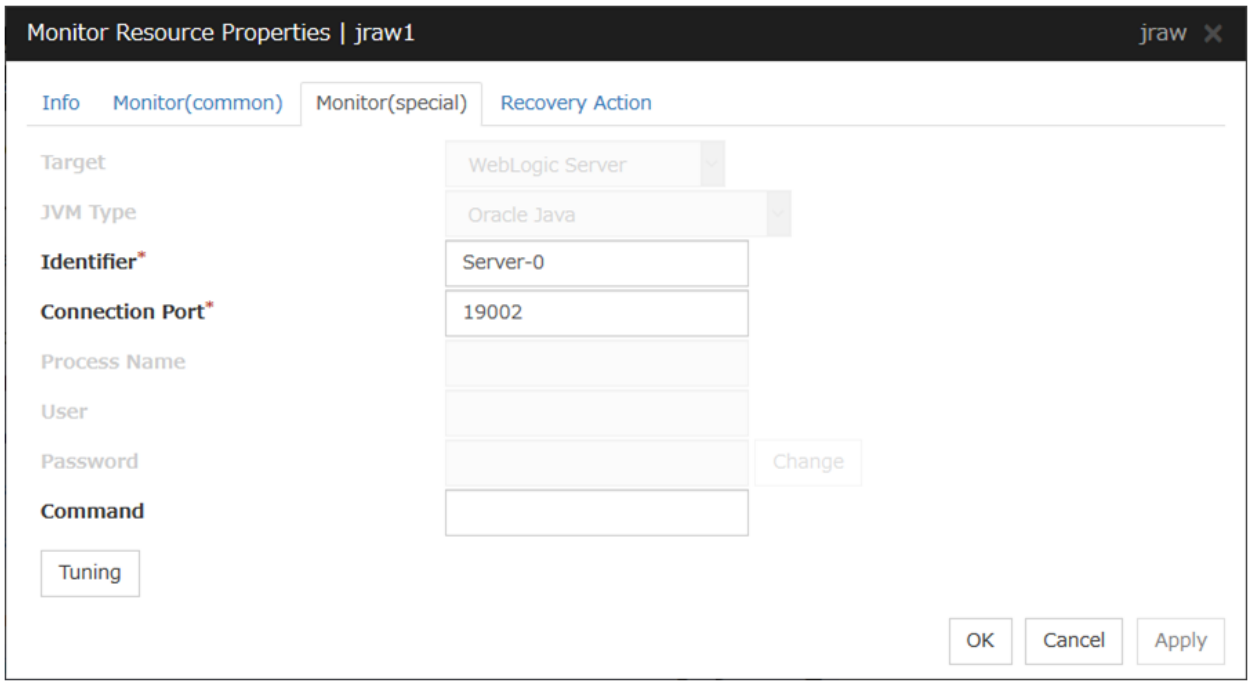
This section describes the procedure to configure Java application which is monitored by JVM monitor resource. Specify the following Java option in one row to the option for Java application startup while Java application (the monitor target) is stopped. For **n**, specify the port number. If there is more than one Java VM to be monitored on the same machine, specify a unique port number. The port number specified here is also specified with the Cluster WebUI **(Monitor Resource Properties - Monitor(special)** tab **- Connection Port**).

```
-Dcom.sun.management.jmxremote.port=n -Dcom.sun.management.jmxremote.ssl=false -Dcom.
↪sun.management.jmxremote.authenticate=false
```

Some Java applications require the following to be additionally specified.

```
-Djavax.management.builder.initial=<Class name of MBeanServerBuilder>
```

5.26.19 Monitor (special) tab



Target

Select the target to be monitored from the list.When monitoring WebSAM SVF for PDF, WebSAM Report Director Enterprise, or WebSAM Universal Connect/X, select **WebSAM SVF**. When monitoring a Java application that you created, select **Java Application**.

Default: None

JVM Type

Select the Java VM on which the target application to be monitored is running.
For Java 8 or later, select **Oracle Java(usage monitoring)**. For Java 8, the following specification changes have been made.

- It has become impossible to acquire the maximum value of each memory in a non-heap area.
- Perm Gen has been changed to Metaspace.
- Compressed Class Space was added.

For Java 8, therefore, the monitor items on the **Memory** tab have been changed as below.

- Monitoring for the use rate has been changed to monitoring for the amount used.
- **Perm Gen**, **Perm Gen[shared-ro]**, and **Perm Gen[shared-rw]** cannot be monitored. Clear the check box.
- **Metaspace** and **Compressed Class Space** can be monitored.

For Java 9, the following specification changes have been made.

- **Code Cache** has been divided.

For Java9, therefore, the monitor items on the **Memory** tab have been changed as below.

- **Code Cache** cannot be monitored. Clear the check box.
- **CodeHeap non-nmethods**, **CodeHeap profiled** and **CodeHeap non-profiled** can be monitored.

Default: None

Identifier (within 255 bytes)

Specify a name to uniquely identify the target Java VM. You must specify the identifier.

- When the target is **WebLogic Server**
  Set this according to " 5.26.11. *Monitoring WebLogic Server* ", item 2.
- When the target is **WebOTX Process Group**
  Specify the name of the process group.
- When the target is **WebOTX Domain Agent**
  Specify the name of the domain.
- When the target is **WebOTX ESB**
  Same as for **WebOTX Process Group**.
- When the target is **Tomcat**
  Specify this according to " 5.26.16. *Monitoring Tomcat* ".
- When the target is **WebSAM SVF**
  Specify this according to " 5.26.17. *Monitoring SVF* ".
- When the target is **Java applications**
  Specify a uniquely identifiable string for the monitored Java VM process.

Default: None

Connection Port (1024 to 65535)

Specify the number of the port to be used for connection with the target Java VM. You must specify the connection port. A value between 42424 and 61000 is not recommended.

- When the target is **WebLogic Server**
  Specify the connection port number according to " 5.26.11. *Monitoring WebLogic Server*", item 6.
- When the target is **WebOTX Process Group**
  Specify this according to " 5.26.14. *Monitoring a Java process of a WebOTX process group* ".
- When the target is **WebOTX Domain Agent**
  Specify "domain.admin.port" of "(WebOTX_installation_path)\<*domain_name*>.properties".
- When the target is **WebOTX ESB**
  Same as for **WebOTX Process Group**.
- When the target is **Tomcat**
  Specify as described in " 5.26.16. *Monitoring Tomcat* ".
- When the target is **WebSAM SVF**
  Specify this according to " 5.26.17. *Monitoring SVF* ".
- When the target is **Java applications**
  Specify a uniquely identifiable string for the monitored Java VM process.

Default: None

Process Name (within 255 bytes)

This does not need to be configured because the monitor target Java VM can be identified by **Connection Port**. The internal version 11.35 or earlier required the process name to be specified since this parameter was used for the identification when the data of virtual memory usage amount was obtained or when the data of the monitor target was output to the JVM operation log. However, in and after the internal version 12.00, **Monitor Virtual Memory Usage** was deleted. Therefore, it cannot be specified.

Default: None

User (within 255 bytes)

Specify the name of the administrator who will be making a connection with the target Java VM. When **WebOTX Domain Agent** is selected as the target, specify the "domain.admin.user" value of "(WebOTX_installation_path)\<*domain_name*>.properties".

Default: None

Password (within 255 bytes)

Specify the password for the administrator who will be making a connection with the target Java VM. When **WebOTX Domain Agent** is selected as the target, specify the "domain.admin.passwd" value of "(WebOTX_installation_path)\<*domain_name*>.properties". Click **Change** and enter the password in the dialog box. The letters of the password are not displayed.

Default: None

Command (within 255 bytes)

Specify the command to execute if an error is detected in the target Java VM. It is possible to specify the command to execute for each error cause, as well as arguments. Specify a full path. Enclose an executable file name with double quotes ("").

Example) `"\Program Files\bin\command.bat" arg1 arg2`

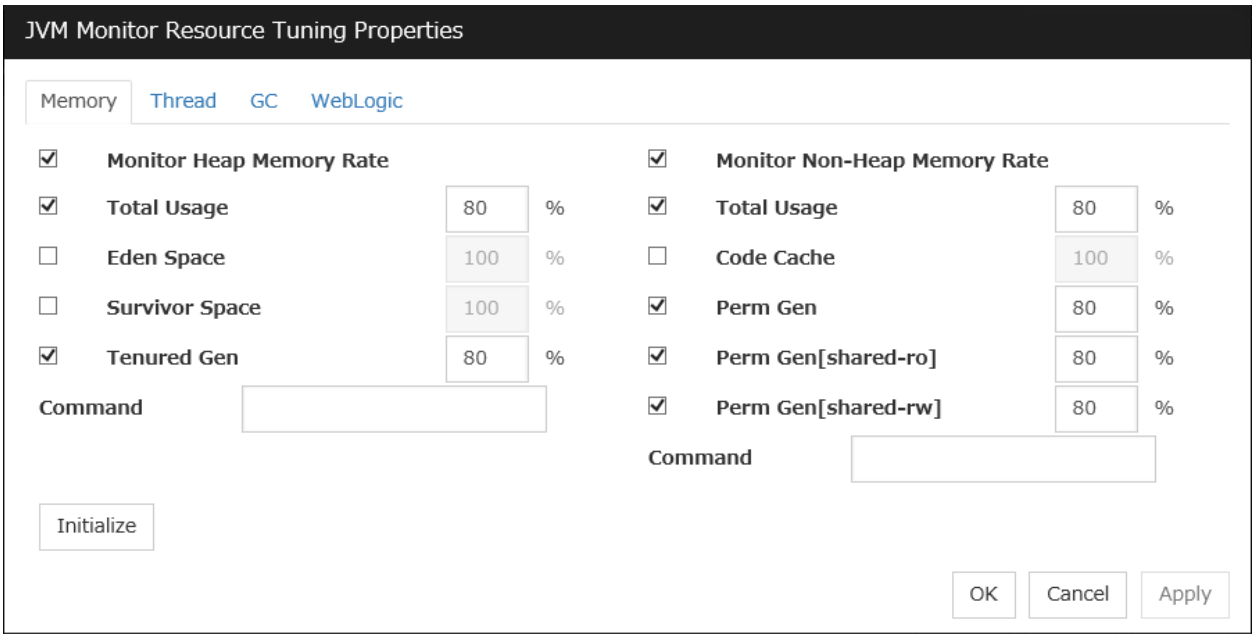
Here, specify the commands to execute if it is impossible to connect to the target Java VM and if an error is detected in acquiring the resource amount used.

See also " 5.26.10. *Executing command corresponding to cause of each detected error* ".

Default: None

When you click **Tuning**, the following information is displayed in the pop-up dialog box. Make detailed settings according to the descriptions below.

5.26.20 Memory tab (when Oracle Java is selected for JVM Type)



Monitor Heap Memory Rate

Enables the monitoring of the usage rates of the Java heap areas used by the target Java VM.

- When selected(default):
  Monitoring enabled
- When cleared:
  Monitoring disabled

Total Usage (1 to 100)

Specify the threshold for the usage rate of the Java heap areas used by the target Java VM.

Default: 80[%]

Eden Space (1 to 100)

Specify the threshold for the usage rate of the Java Eden Space used by the target Java VM.If G1 GC is specified as the GC method of the target Java VM, read it as G1 Eden Space.

Default: 100[%]

Survivor Space (1 to 100)

Specify the threshold for the usage rate of the Java Survivor Space used by the target Java VM.If G1 GC is specified as the GC method of the target Java VM, read it as G1 Survivor

Default: 100[%]

Tenured Gen (1 to 100)

Specify the threshold for the usage rate of the Java Tenured(Old) Gen area used by the target Java VM. If G1 GC is specified as the GC method of the target Java VM, read it as G1 Old Gen.

Default: 80[%]

Monitor Non-Heap Memory Rate

Enables the monitoring of the usage rates of the Java non-heap areas used by the target Java VM.

- When selected(default):
  Monitoring enabled
- When cleared:
  Monitoring disabled

Total Usage (1 to 100)

Specify the threshold for the usage rate of the Java non-heap areas used by the target Java VM.

Default: 80[%]

Code Cache (1 to 100)

Specify the threshold for the usage rate of the Java Code Cache area used by the target Java VM.

Default: 100[%]

Perm Gen (1 to 100)

Specify the threshold for the usage rate of the Java Perm Gen area used by the target Java VM.

Default: 80[%]

Perm Gen[shared-ro] (1 to 100)

Specify the threshold for the usage rate of the Java Perm Gen [shared-ro] area used by the target Java VM.

Default: 80[%]

Perm Gen[shared-rw] (1 to 100)

Specify the threshold for the usage rate of the Java Perm Gen [shared-rw] area used by the target Java VM.

Default: 80[%]

Command (within 255 bytes)

Specify the command to execute if an error is detected in the target Java VM. It is possible to specify the command to execute for each error cause, as well as arguments. Specify a full path. Enclose an executable file name with double quotes ("").

Example) `"\Program Files\bin\command.bat" arg1 arg2`

Here, specify the commands to execute if an error is detected in the Java heap area and Java non-heap area of the target Java VM.

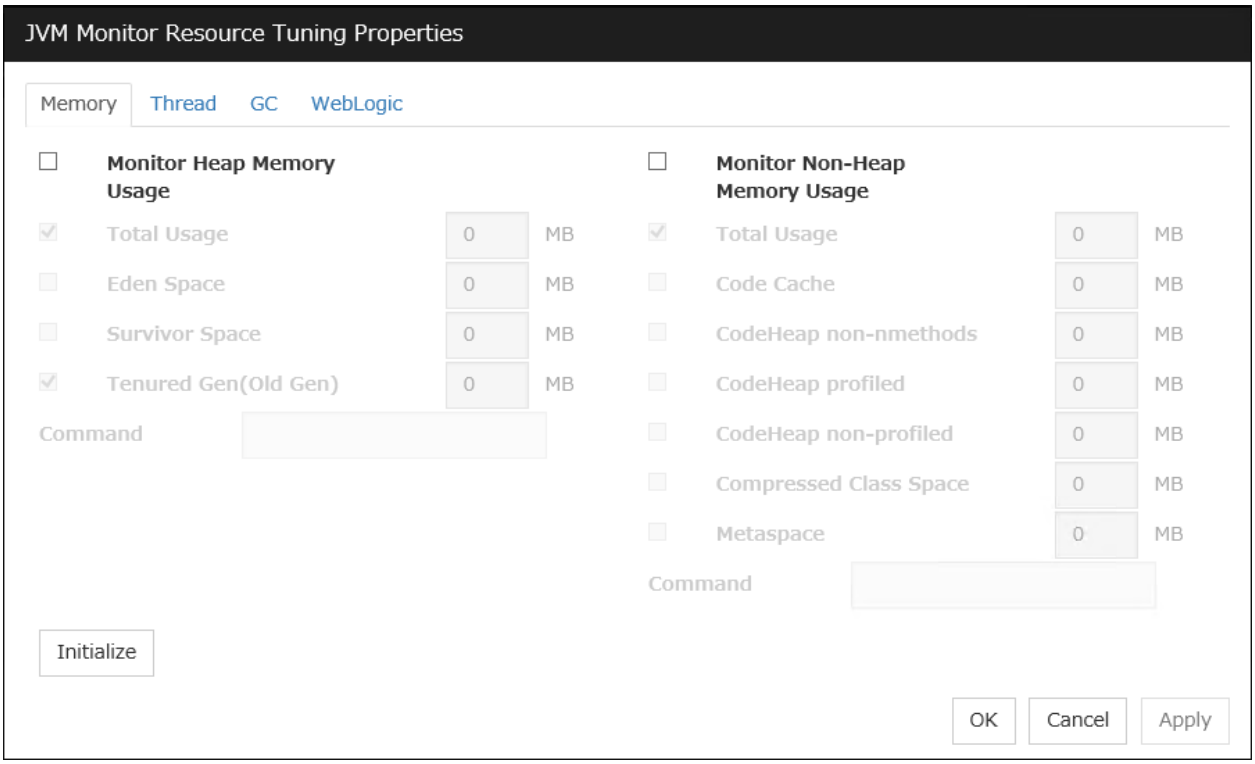
See also " 5.26.10. *Executing command corresponding to cause of each detected error* ".

Default: None

Initialize

Click **Initialize** to initialize all the items to their default values.

5.26.21 Memory tab (when Oracle Java(usage monitoring) is selected for JVM Type)



Monitor Heap Memory Usage

Enables the monitoring of the amount of the Java heap areas used by the target Java VM.

- When the check box is selected:
  Monitoring is enabled.
- When the check box is not selected (default):
  Monitoring is disabled.

Total Usage (0 to 102400)

Specify the threshold for the amount of the Java heap areas used by the target Java VM. If zero is specified, this item is not monitored.

Default: 0[MB]

Eden Space (0 to 102400)

Specify the threshold for the amount of the Java Eden Space used by the target Java VM. If zero is specified, this item is not monitored. If G1 GC is specified as the GC method of the target Java VM, read it as G1 Eden Space.

Default: 0[MB]

Survivor Space (0 to 102400)

Specify the threshold for the amount of the Java Survivor Space used by the target Java VM. If zero is specified, this item is not monitored. If G1 GC is specified as the GC method of the target Java VM, read it as G1 Survivor Space.

Default: 0[MB]

Tenured Gen (0 to 102400)

Specify the threshold for the amount of the Java Tenured(Old) Gen area used by the target Java VM. If zero is specified, this item is not monitored. If G1 GC is specified as the GC method of the target Java VM, read it as G1 Old Gen.

Default: 0[MB]

Monitor Non-Heap Memory Usage

Enables the monitoring of the amounts of the Java non-heap areas used by the target Java VM.

- When the check box is selected:
  Monitoring is enabled.
- When the check box is not selected (default):
  Monitoring is disabled.

Total Usage (0 to 102400)

Specify the threshold for the usage amount of the Java non-heap areas used by the target Java VM. If zero is specified, this item is not monitored.

Default: 0[MB]

Code Cache (0 to 102400)

Specify the threshold for the usage amount of the Java Code Cache area used by the target Java VM. If zero is specified, this item is not monitored.

Default: 0[MB]

CodeHeap non-nmethods (0 to 102400)

Specify the threshold for the usage rate of the Java CodeHeap non-nmethods areas used by the target Java VM. If zero is specified, this item is not monitored.

Default: 0[MB]

CodeHeap profiled (0 to 102400)

Specify the threshold for the usage rate of the Java CodeHeap profiled nmethods areas used by the target Java VM. If zero is specified, this item is not monitored.

Default: 0[MB]

CodeHeap non-profiled (0 to 102400)

Specify the threshold for the usage rate of the Java CodeHeap non-profiled nmethods areas used by the target Java VM. If zero is specified, this item is not monitored.

Default: 0[MB]

Compressed Class Space (0 to 102400)

Specify the threshold for the usage rate of the Compressed Class Space areas used by the target Java VM. If zero is specified, this item is not monitored.

Default: 0[MB]

Metaspace (0 to 102400)

Specify the threshold for the usage rate of the Metaspace area used by the target Java VM

Default: 0[MB]

Command (within 255 bytes)

Specify the command to execute if an error is detected in the target Java VM. It is possible to specify the command to execute for each error cause, as well as arguments. Specify a full path. Enclose an executable file name with double quotes ("").

Example) `"\Program Files\bin\command.bat" arg1 arg2`

Here, specify the commands to execute if an error is detected in the Java heap area and Java non-heap area of the target Java VM.

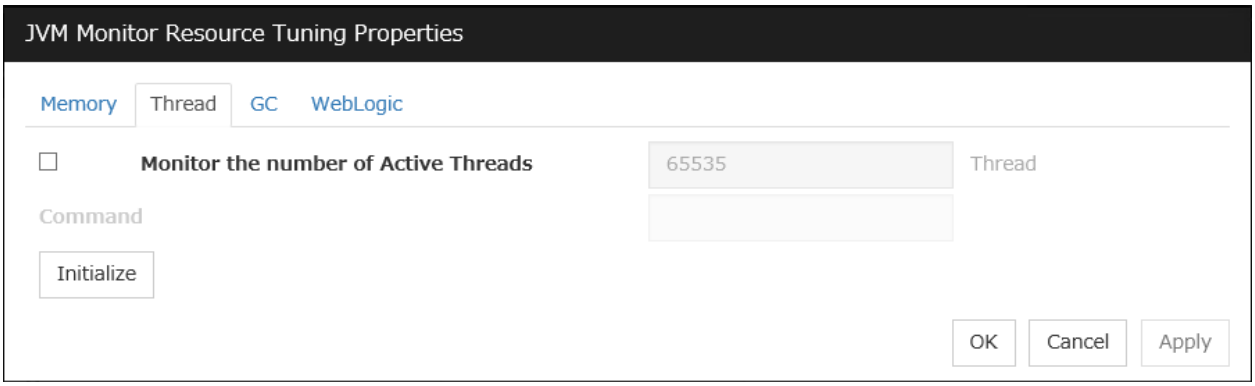
See also " 5.26.10. *Executing command corresponding to cause of each detected error* ".

Default: None

Initialize

Click **Initialize** to initialize all the items to their default values.

5.26.22 Thread tab



Monitor the number of Active Threads (1 to 65535)

Specify the upper limit threshold for the number of threads running on the monitor target Java VM.

Default: 65535 [threads]

Command (within 255 bytes)

Specify the command to execute if an error is detected in the target Java VM. It is possible to specify the command to execute for each error cause, as well as arguments. Specify a full path. Enclose an executable file name with double quotes ("").

Example) `"\Program Files\bin\command.bat" arg1 arg2`

Here, specify the command to execute if an error is detected in the number of threads currently running in the target Java VM.

See also " 5.26.10. *Executing command corresponding to cause of each detected error* ".

Default: None

Initialize

Click **Initialize** to initialize all the items to their default values.

5.26.23 GC tab

Monitor the time in Full GC (1 to 65535)

Specify the threshold for the Full GC execution time since previous measurement on the target Java VM. The threshold for the Full GC execution time is the average obtained by dividing the Full GC execution time by the number of times Full GC occurs since the previous measurement.

To determine the case in which the Full GC execution time since the previous measurement is 3000 milliseconds and Full GC occurs three times as an error, specify 1000 milliseconds or less.

Default: 65535 [milliseconds]

Monitor the count of Full GC execution (1 to 65535)

Specify the threshold for the number of times Full GC occurs since previous measurement on the target Java VM.

Default: 1 (time)

Command (within 255 bytes)

Specify the command to execute if an error is detected in the target Java VM. It is possible to specify the command to execute for each error cause, as well as arguments. Specify a full path. Enclose an executable file name with double quotes ("").

Example) `"\Program Files\bin\command.bat" arg1 arg2`

Here, specify the commands to execute if an error is detected in the Full GC execution time and Full GC execution count of the target Java VM.

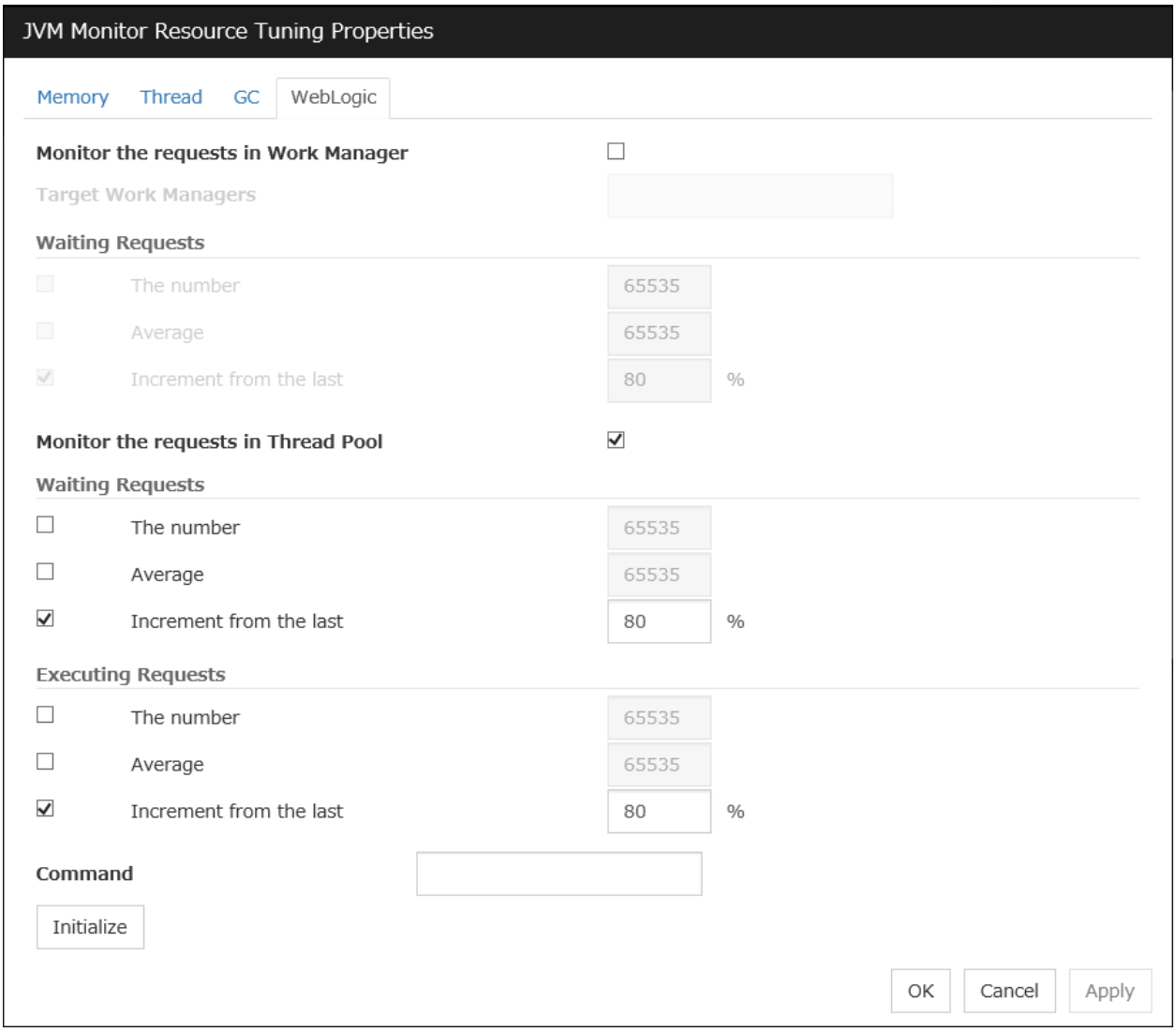
See also " 5.26.10. *Executing command corresponding to cause of each detected error* ".

Default: None

Initialize

Click **Initialize** to initialize all the items to their default values.

5.26.24 WebLogic tab



Monitor the requests in Work Manager

Enables the monitoring of the wait requests by Work Managers on the WebLogic Server.

- When selected(default):
  Monitoring enabled
- When cleared:
  Monitoring disabled

Target Work Managers

Specify the names of the Work Managers for the applications to be monitored on the target WebLogic Server. To monitor Work Managers, you must specify this setting.

*App*1[*WM*1,*WM*2, ...];*App*2[*WM*1,*WM*2, ...]; ...
For App and *WM,* only ASCII characters are valid (except Shift_JIS codes 0x005C and 0x00A1 to 0x00DF).

To specify an application that has an application archive version, specify "application_name#version" in *App*.
When the name of the application contains "[" and/or "]", prefix it with \.

(Ex.) When the application name is app[2], enter app\[2\].

Default: None

The number (1 to 65535)

Specify the threshold for the wait request count for the target WebLogic Server Work Manager(s).

Default: 65535

Average (1 to 65535)

Specify the threshold for the wait request count average for the target WebLogic Server Work Manager(s).

Default: 65535

Increment from the last (1 to 1024)

Specify the threshold for the wait request count increment since the previous measurement for the target WebLogic Server Work Manager(s).

Default: 80[%]

Monitor the requests in Thread Pool

Enables the monitoring of the number of wait requests (number of HTTP requests queued in the WebLogic Server) and the number of executing requests (number of HTTP requests queued in the WebLogic Server) in the target WebLogic Server thread pool.

- When selected:
  Monitoring enabled
- When cleared (default):
  Monitoring disabled

Wait Requests The number (1 to 65535)

Specify the threshold for the wait request count.

Default: 65535

Wait Request Average (1 to 65535)

Specify the threshold for the wait request count average.

Default: 65535

Wait Request Increment from the last (1 to 1024)

Specify the threshold for the wait request count increment since the previous measurement.

Default: 80[%]

Executing Requests The number (1 to 65535)

Specify the threshold for the number of requests executed per unit of time.

Default: 65535

Executing Requests Average (1 to 65535)

Specify the threshold for the average count of requests executed per unit of time.

Default: 65535

Executing Requests Increment from the last (1 to 1024)

Specify the threshold for the increment of the number of requests executed per unit of time since the previous measurement.

Default: 80[%]

Command (within 255 bytes)

Specify the command to execute if an error is detected in the target Java VM. It is possible to specify the command to execute for each error cause, as well as arguments. Specify a full path. Enclose an executable file name with double quotes ("").

Example) `"\Program Files\bin\command.bat" arg1 arg2`

Here, specify the commands to execute if an error is detected in the requests in the thread pool or in the work manager of the WebLogic Server.

See also " 5.26.10. *Executing command corresponding to cause of each detected error* ".

Default: None

Initialize

Click **Initialize** to initialize all the items to their default values.

5.27 Setting up System monitor resources

System monitor resources monitor the system resources. The resources periodically collect statistical information about system resources and analyze the information according to given knowledge data. System monitor resources serve to detect the exhaustion of resources early according to the results of analysis.

5.27.1 Notes on system monitor resource

For the recovery target, specify the resource to which fail-over is performed upon the detection of an error in resource monitoring by System Resource Agent.
The use of the default System Resource Agent settings is recommended.
Errors in resource monitoring may be undetectable when:

- A system resource value repeatedly exceeds and then falls below a threshold.

In a case like where the system is high loaded, it may take a long time to collect statistical information and the interval of statistical information collection may be unapplied.

If date or time of OS has been changed during System Resource Agent's operation, resource monitoring may operate wrongly as follows since the timing of analyze which is normally done at 10 minute intervals may be changed at first time after changing date or time. In such case, suspend and resume cluster.

- Error is not detected after passing specified duration to detect error.
- Error is detected before passing specified duration to detect error.

Once the cluster has been suspended and resumed, the collection of information is started from that point of time.

The amount of system resources used is analyzed at 10-minute intervals. Thus, an error may be detected up to 10 minutes after the monitoring session.

The amount of disk resources used is analyzed at 60-minute intervals. Thus, an error may be detected up to 60 minutes after the monitoring session.

Specify a smaller value than the actual disk size when specifying the disk size for free space monitoring of disk resources. If a larger value specified, a lack-of-free-space error will be detected.

If the monitored disk is exchanged, the following information analyzed up to then will be cleared if it differs from the information in the previous disk:

- Total disk capacity
- File system

When monitoring disk resources, only hard disks can be monitored.

Up to 26 disk units can be simultaneously monitored by the disk resource monitoring function.

If **system monitor** is not displayed in the **Type** column on the monitor resource definition screen, select **Get License Info** and then acquire the license information.

The status of the system monitor resource is Warning from when start of monitoring is enabled to when the monitoring processing is actually performed.

Too many number of registered system monitor resources and process resource monitor resources may be detected as an error and lead to outputting the following message to the alert log.
If this message is output, review the timeout setting in the **Monitor (common)** tab.

```
Monitor sraw has detected an error. (99 : monitor was timeout)
```

5.27.2 Monitoring by System monitor resources

System monitor resources monitor the following:

Periodically collect the amounts of system resources and disk resources used and then analyze the amounts.

An error is recognized if the amount of a resource used exceeds a pre-set threshold.When an error detected state persists for the monitoring duration, it is posted as an error detected during resource monitoring.

System resource monitoring with the default values reports an error found in resource monitoring 60 minutes later if the resource usage does not fall below 90%.

The following shows an example of error detection for the total memory usage in system resource monitoring with the default values.

- The total memory usage remains at the total memory usage threshold or higher as time passes, for at least a certain duration of time.

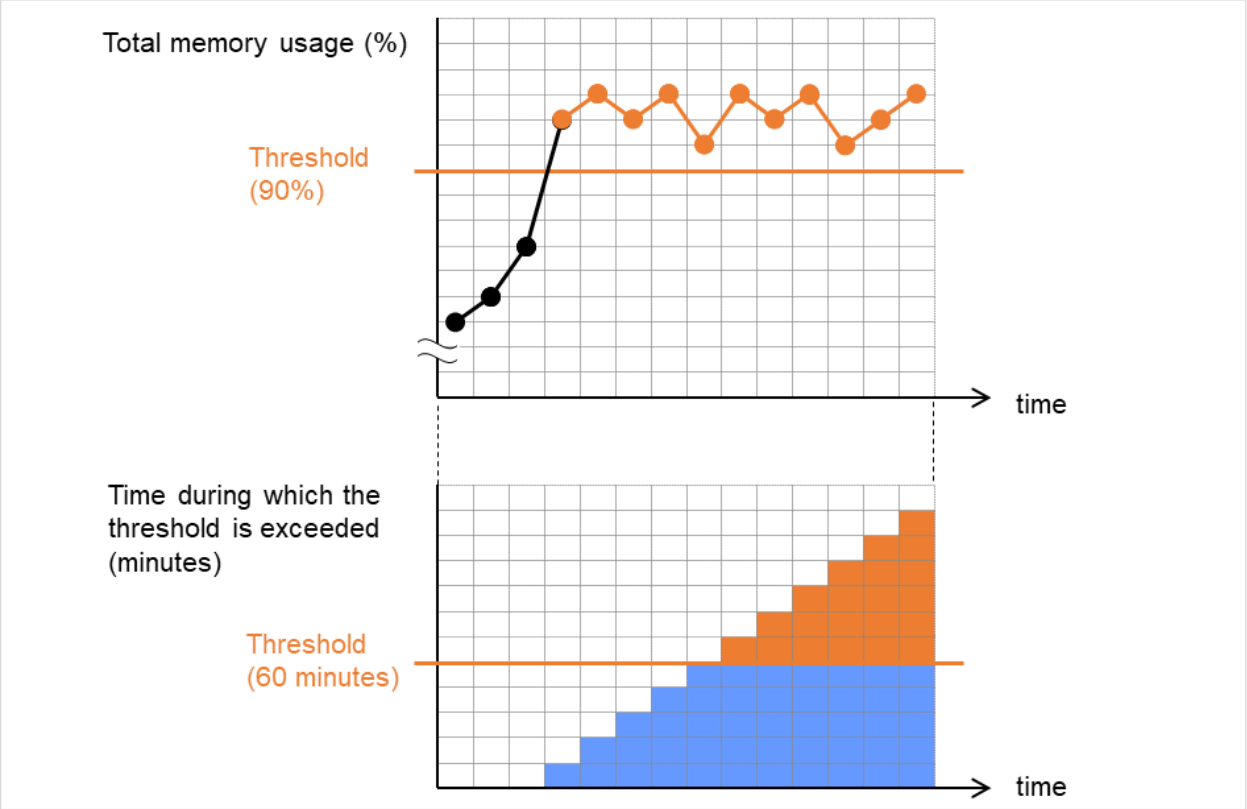


Fig. 5.10: The total memory usage remains at the total memory usage threshold or higher for a certain duration of time (an error detected)

- The total memory usage rises and falls in the vicinity of the total memory usage threshold as time passes, but always remains under that threshold.

  The following figure shows the total memory usage temporarily exceeding the total memory usage threshold (90%). This state of exceeding the threshold, however, does not persist for the monitoring duration (60 minutes) and thus an error in the total memory usage is not detected.

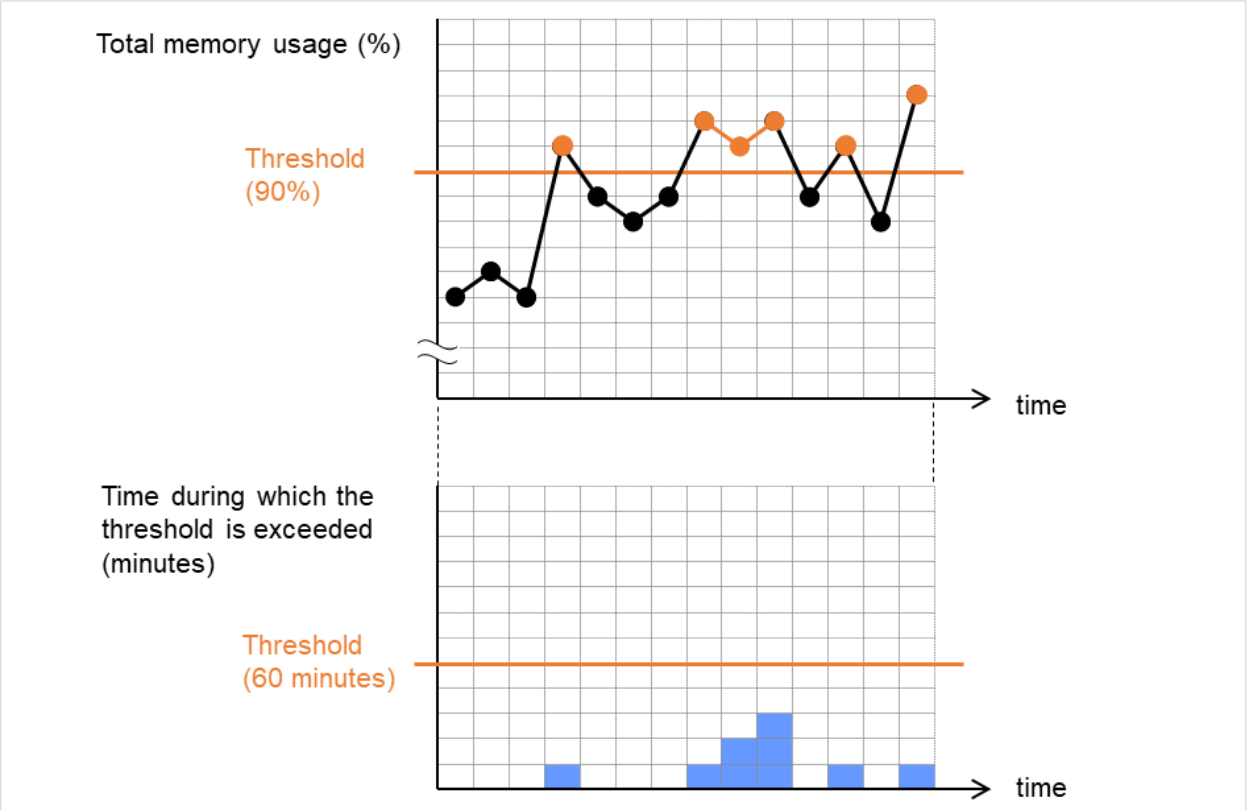


Fig. 5.11: The state of exceeding the total memory usage threshold does not persist for a certain duration of time (no error detected)

If disk resource monitoring operated under the default settings, it will report a notice level error after 24 hours. The following chart describes how disk resource monitoring detects disk usage errors when operating under the default settings.

Monitoring disk usage by warning level

- In the following example, disk usage exceeds the threshold which is specified as the warning level upper limit.

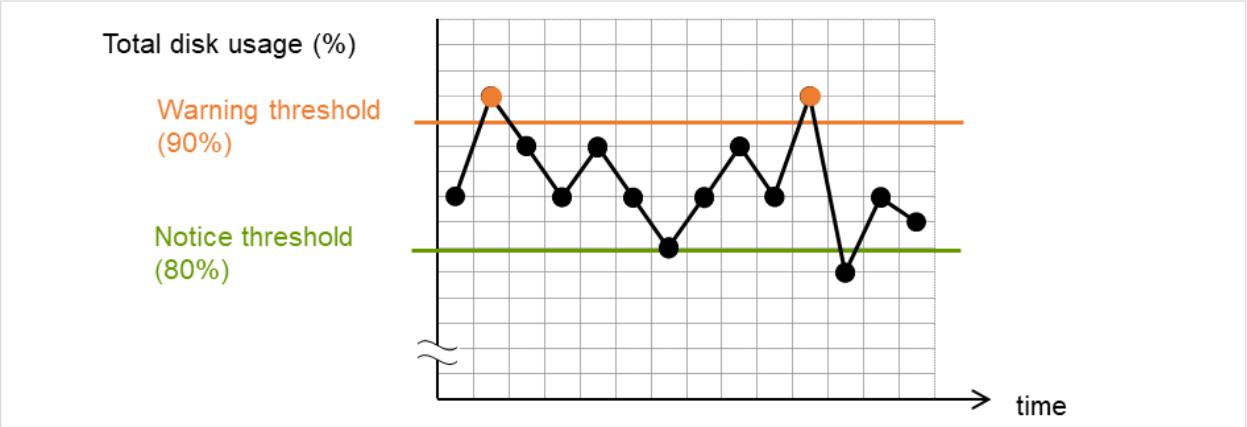


Fig. 5.12: Disk usage exceeds the warning level upper limit (an error detected)

- In the following example, disk usage increases and decreases within certain range, and does not exceed the threshold which is specified as the warning level upper limit.

  Disk usage increases and decreases in a range where it does not exceed the warning level upper limit, which is not determined as an error in monitoring the usage.

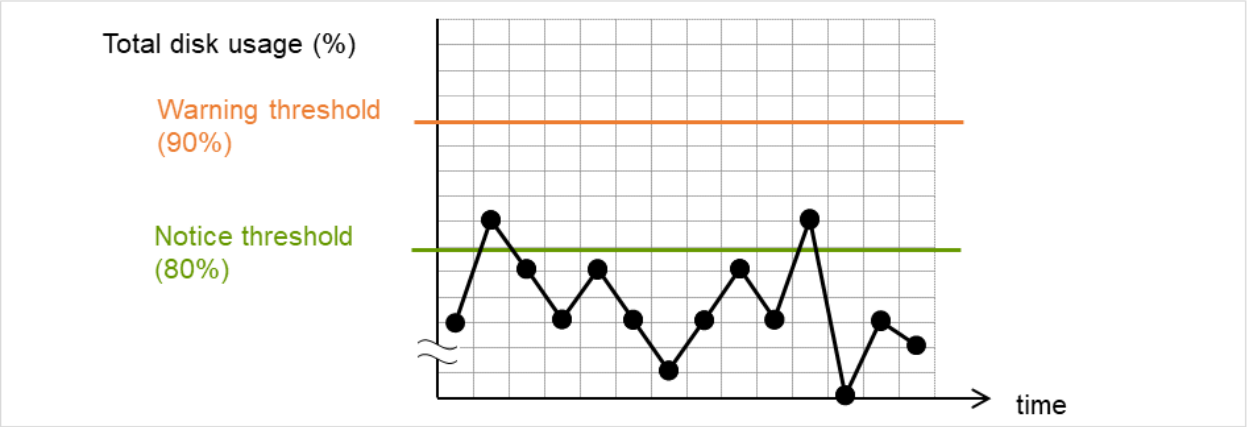


Fig. 5.13: Disk usage does not exceed the warning level upper limit (no error detected)

Monitoring disk usage by notice level

- In the following example, disk usage continuously exceeds the threshold specified as the notification level upper limit, and the duration exceeds the set length.

  Disk usage continuously exceeds the notification level upper limit, which is determined as an error in monitoring the disk usage.

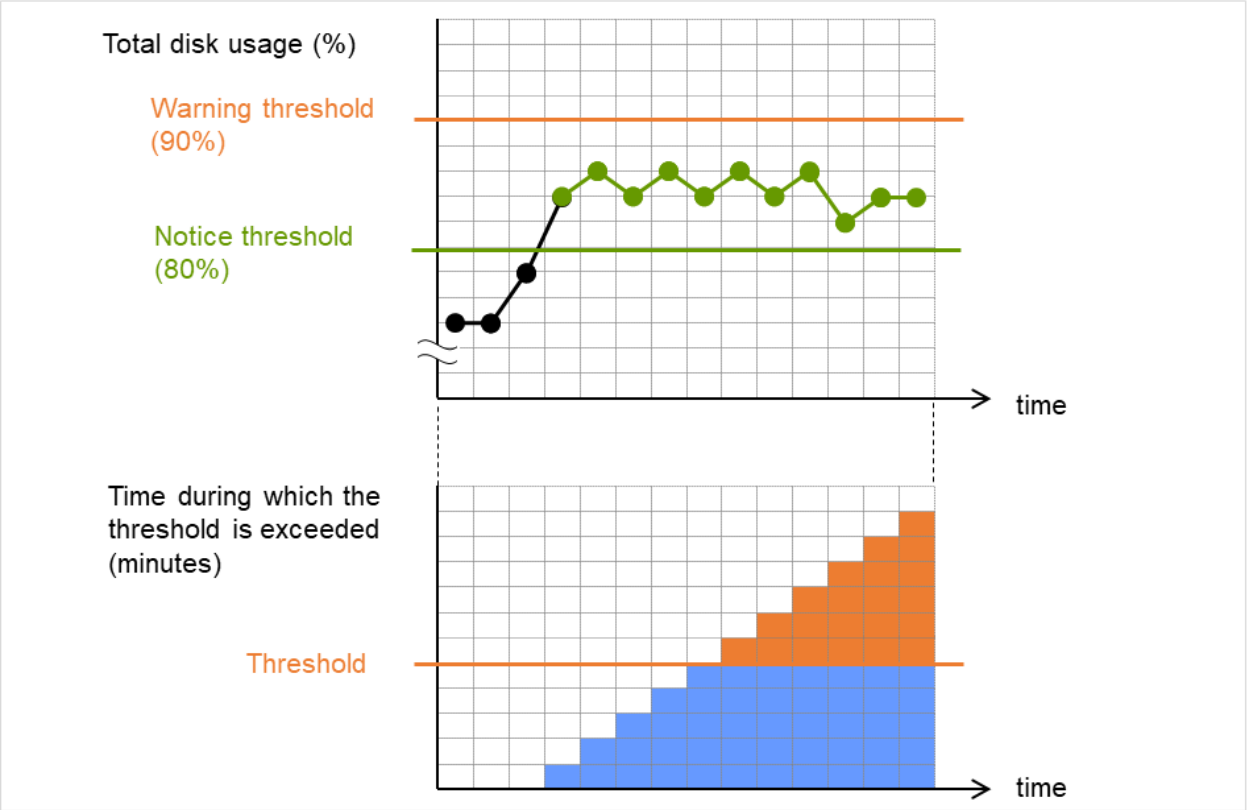


Fig. 5.14: Disk usage exceeds the notification level upper limit for a certain duration of time (an error detected)

- In the following example, disk usage increases and decreases within a certain range, and does not exceed the threshold specified as the notification level upper limit.

  Disk usage rises and falls in the vicinity of the notification level upper limit, which is not determined as an error in monitoring the disk usage.

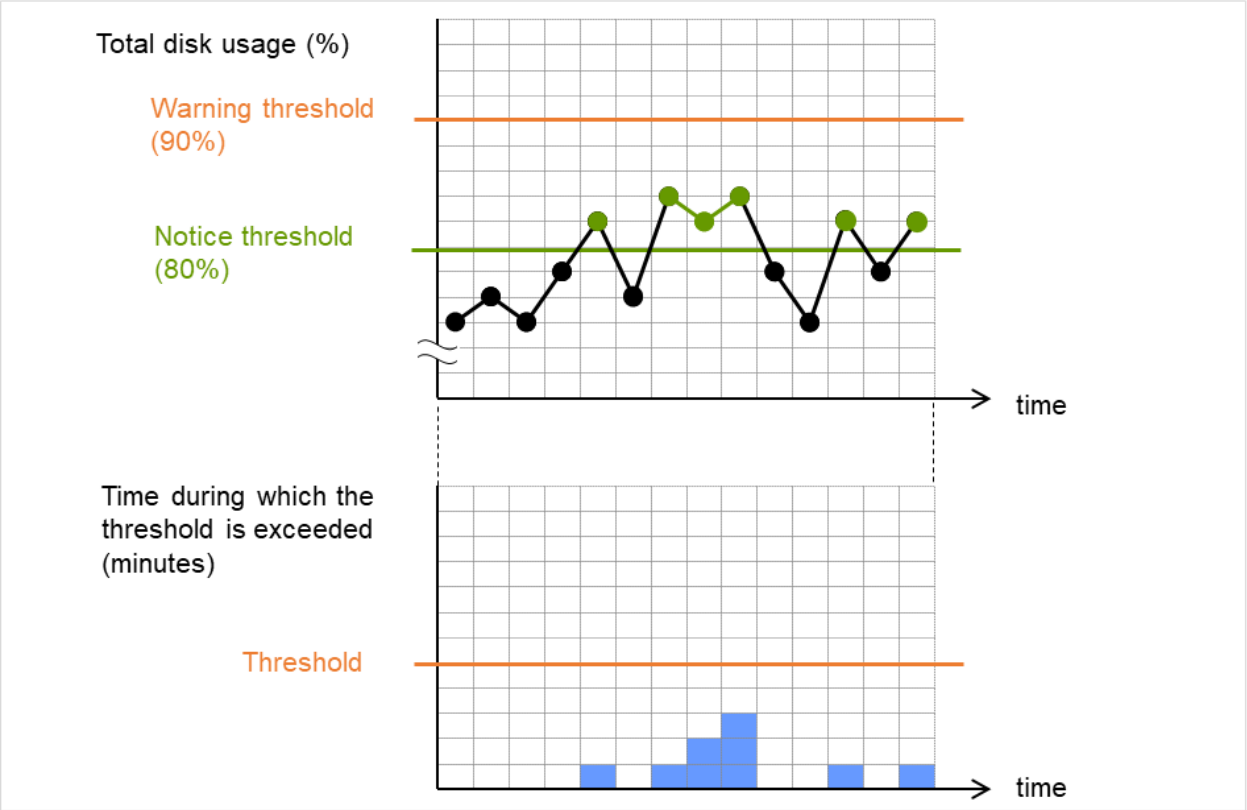
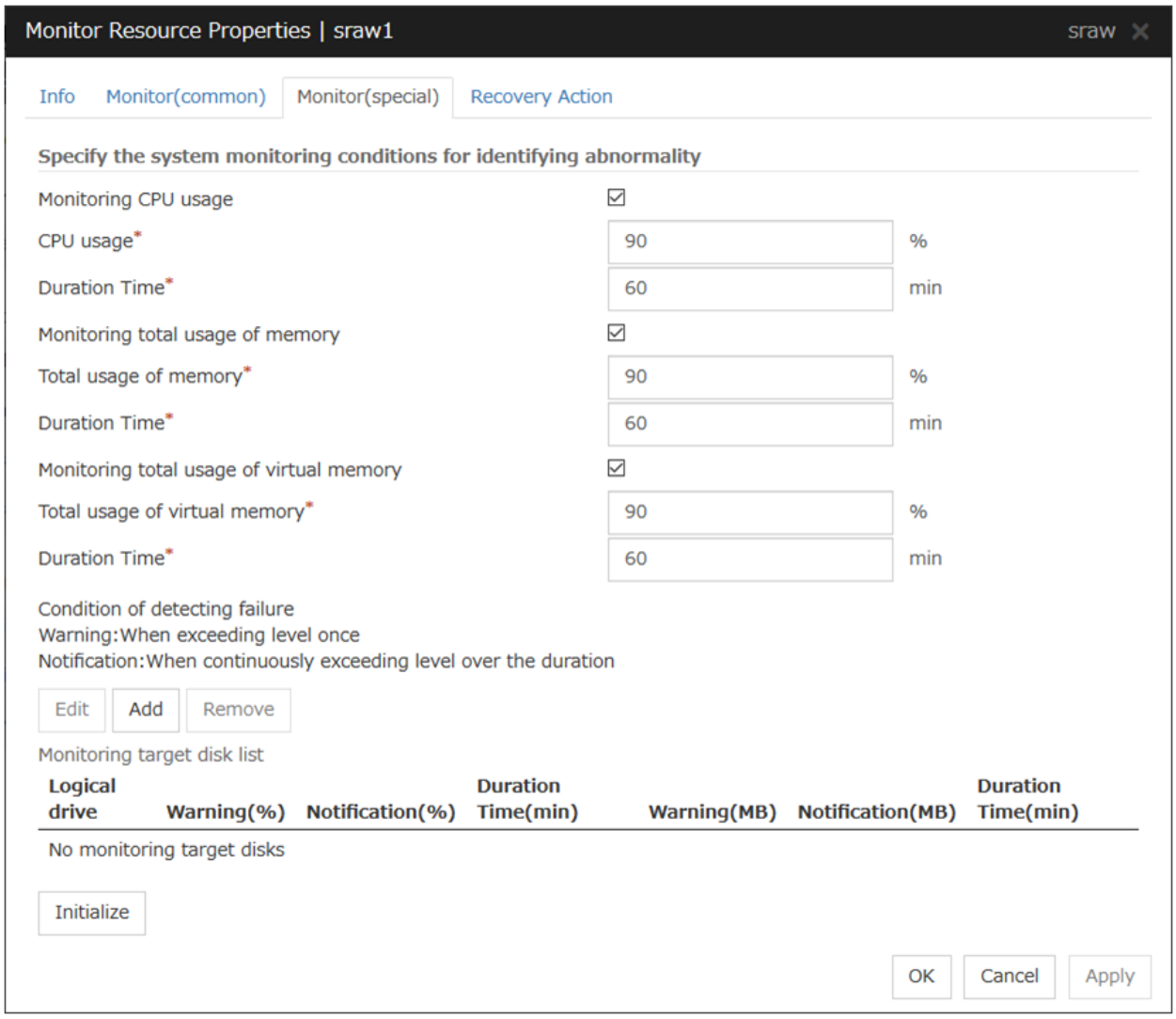


Fig. 5.15: The state of exceeding the notification level threshold in disk usage does not persist for a certain duration of time (no error detected)

5.27.3 Monitor (special) tab



Monitoring CPU usage

Enables CPU usage monitoring.

- When selected:
  Monitoring is enabled for the CPU usage.
- When cleared:
  Monitoring is disabled for the CPU usage.

CPU usage (1 to 100)

Specify the threshold for the detection of the CPU usage.

Duration Time (1 to 1440)

Specify the duration for detecting the CPU usage.
If the threshold is continuously exceeded over the specified duration, the detection of an error is recognized.

Monitoring total usage of memory

Enables the monitoring of the total usage of memory.

- When selected:
  Monitoring is enabled for the total usage of memory.
- When cleared:
  Monitoring is disabled for the total usage of memory.

Total usage of memory (1 to 100)

Specify the threshold for the detection of a memory use amount error (percentage of the memory size implemented on the system).

Duration Time (1 to 1440)

Specify the duration for detecting a total memory usage error.
If the threshold is continuously exceeded over the specified duration, the detection of an error is recognized.

Monitoring total usage of virtual memory

Enables the monitoring of the total usage of virtual memory.

- When selected:
  Monitoring is enabled for the total usage of virtual memory.
- When cleared:
  Monitoring is disabled for the total usage of virtual memory.

Total usage of virtual memory (1 to 100)

Specify the threshold for the detection of a virtual memory usage error.

Duration Time (1 to 1440)

Specify the duration for detecting a total virtual memory usage error.
If the threshold is continuously exceeded over the specified duration, the detection of an error is recognized.

Add

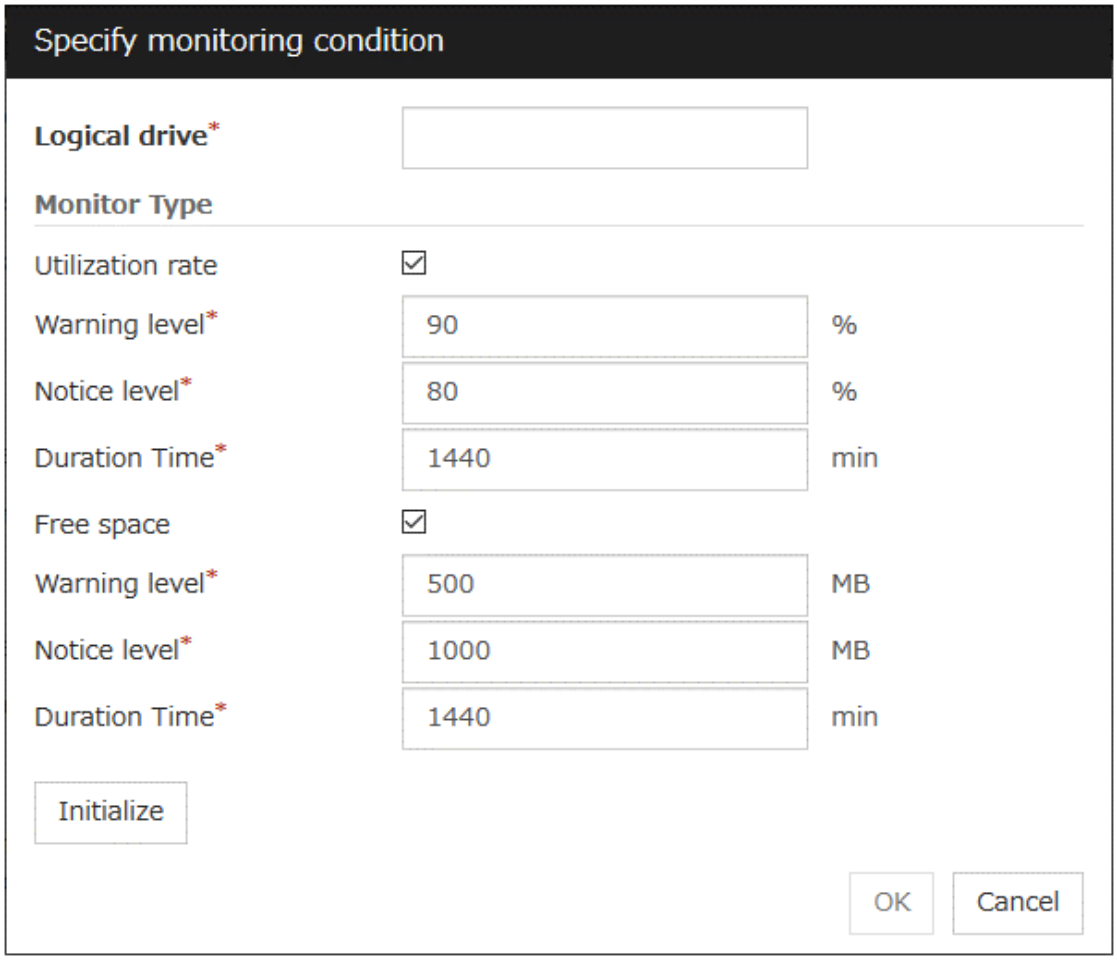
Click this to add disks to be monitored. The **Input of watch condition** dialog box appears.
Configure the detailed monitoring conditions for error determination, according to the descriptions given in the **Input of watch condition** dialog box.

Remove

Click this to remove a disk selected in **Disk List so** that it will no longer be monitored.

Edit

Click this to display the **Input of watch condition** dialog box. The dialog box shows the monitoring conditions for the disk selected in **Disk List**. Edit the conditions and click **OK**.



Logical drive

Set the logical drive to be monitored.

Utilization rate

Enables the monitoring of the disk usage.

- When selected:
  Monitoring is enabled for the disk usage.
- When cleared:
  Monitoring is disabled for the disk usage.

Warning level (1 to 100)

Specify the threshold for warning level error detection for disk usage.

Notice level (1 to 100)

Specify the threshold for notice level error detection for disk usage.

Duration Time (1 to 43200)

Specify the duration for detecting a notice level error of the disk usage rate.
If the threshold is continuously exceeded over the specified duration, the detection of an error is recognized.

Free space

Enables the monitoring of the free disk space.

- When selected:
  Monitoring is enabled for the free disk space.
- When cleared:
  Monitoring is disabled for the free disk space.

Warning level (1 to 4294967295)

Specify the amount of disk space (in megabytes) for which the detection of an free disk space error at the warning level is recognized.

Notice level (1 to 4294967295)

Specify the amount of disk space (in megabytes) for which the detection of an free disk space error at the notice level is recognized.

Duration Time (1 to 43200)

Specify the duration for detecting a notice level error related to the free disk space.
If the threshold is continuously exceeded over the specified duration, the detection of an error is recognized.

5.28 Setting up Process resource monitor resources

Process resource monitor resources monitor the resources used by processes. The resources periodically collect statistical information about resources used by processes and analyze the information according to given knowledge data. Process resource monitor resources serve to detect the exhaustion of resources early according to the results of analysis.

5.28.1 Notes on Process resource monitor resource

The use of the default process resource monitor resources settings is recommended.

In a case like where the system is high loaded, it may take a long time to collect statistical information and the interval of statistical information collection may be unapplied.

If date or time of OS has been changed during System Resource Agent's operation, resource monitoring may operate wrongly as follows since the timing of analyze which is normally done at 10 minute intervals may be changed at first time after changing date or time. In such case, suspend and resume cluster.

- Error is not detected after passing specified duration to detect error.
- Error is detected before passing specified duration to detect error.

Once the cluster has been suspended and resumed, the collection of information is started from that point of time.
The amount of process resources used is analyzed at 10-minute intervals. Thus, an error may be detected up to 10 minutes after the monitoring session.
If **Process resource monitor** is not displayed in the **Type** column on the monitor resource definition screen, select **Get License Info** and then acquire the license information.
The status of the process resource monitor resource is Warning from when start of monitoring is enabled to when the monitoring processing is actually performed.

To return the status of the process resource monitor resource from error to normal, perform either of the following:

- Suspending and resuming the cluster
- Stopping and starting the cluster

Use the following command to check the name of a process that is actually running and specify the name for the monitor target process name.

EXPRESSCLUSTER installation path\bin\GetProcess.vbs

When the above command is executed, GetProcess_Result.txt is output to the folder in which the command is executed. Open GetProcess_Result.txt and specify the CommandLine section of the process being displayed. If the output information includes double quotations (""), specify the section including the double quotations.

Example of output file

```
20XX/07/26 12:03:13
Caption     CommandLine
services.exe    C:\WINDOWS\system32\services.exe
svchost.exe     C:\WINDOWS\system32\svchost -k rpcss
explorer.exe    C:\WINDOWS\Explorer.EXE
```

To monitor svchost.exe shown in the above command output information, specify `C:\WINDOWS\system32\svchost -k rpcss` as the monitor target process name.

The process name specified for the name of the target process specifies the target process, using the process arguments as part of the process name. To specify the name of the target process, specify the process name containing the arguments. To monitor only the process name with the arguments excluded, specify it with the wildcard (*) using right truncation or partial match excluding the arguments.

Too many number of registered system monitor resources and process resource monitor resources may be detected as an error and lead to outputting the following message to the alert log.
If this message is output, review the timeout setting in the **Monitor (common)** tab.

```
Monitor psrw has detected an error. (99 : monitor was timeout)
```

5.28.2 Monitoring by Process resource monitor resources

Process resource monitor resources monitor the following:
Periodically collect the amounts of process resources used and then analyze the amounts.
An error is recognized if the amount of a resource used exceeds a pre-set threshold.
When an error detected state persists for the monitoring duration, it is posted as an error detected during resource monitoring.
If process resource monitoring (of the CPU, memory, or number of threads) operated by using the default values, a resource error is reported after 24 hours.
The following chart describes how process resource monitoring detects memory usage errors.

- In the following example, as time progresses, memory usage increases and decreases, the maximum value is updated more times than specified, and increases by more than 10% from its initial value.

  The maximum value is kept updated for more than 24 hours (default) and the memory usage increases by more than 10% from its initial value, which is determined as a memory leak.

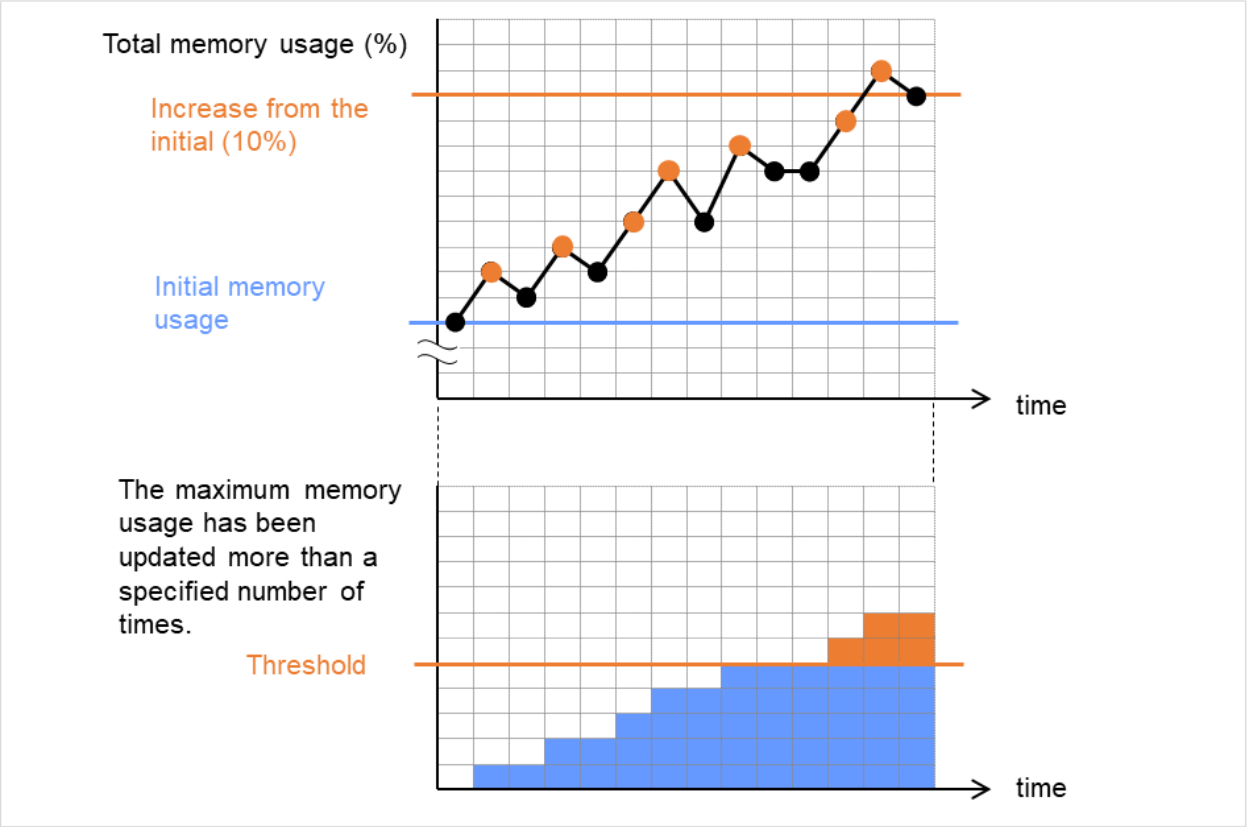


Fig. 5.16: The maximum value of the memory usage is updated more than the specified number of times, and the memory usage increases by more than 10% from its initial value (an error detected)

- In the following example, memory usage increases and decreases, but remains within a set range.

  The memory usage increases and decreases within a set range, which is not determined as a memory leak.

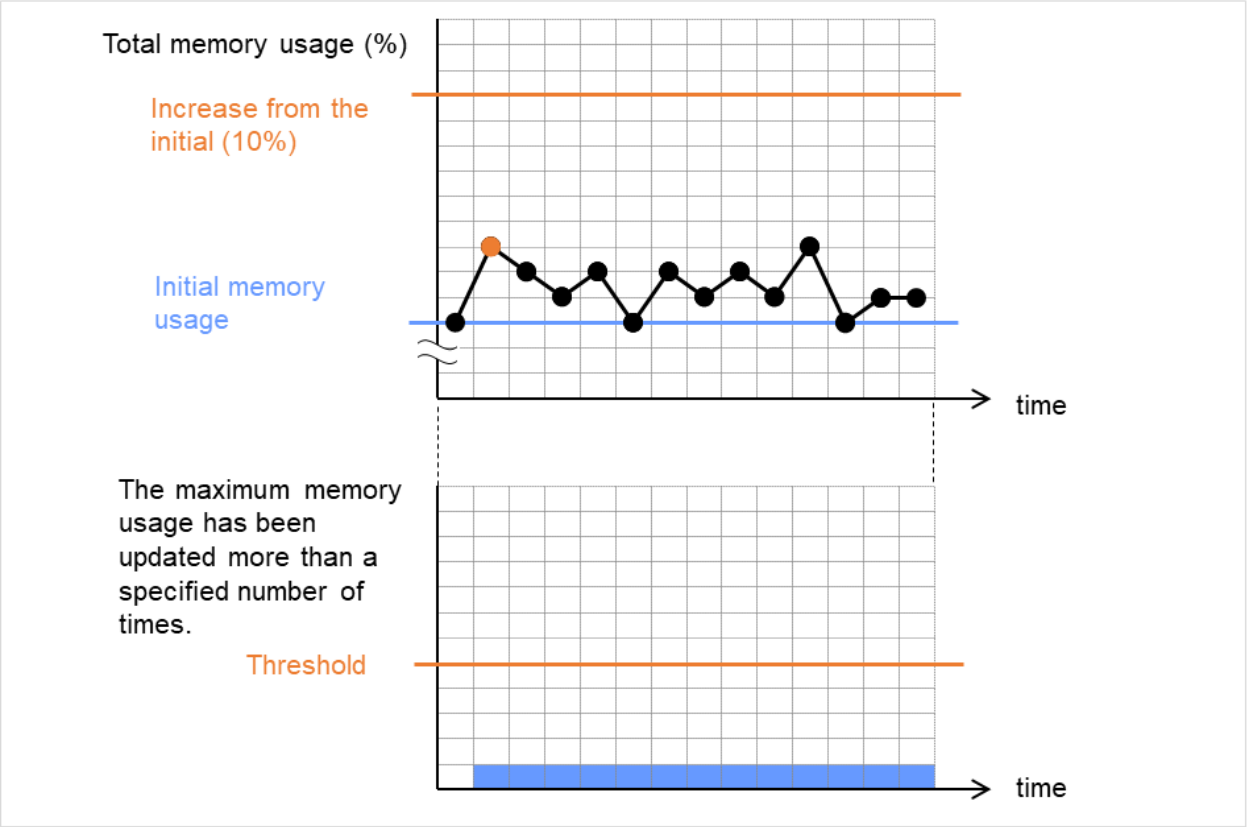
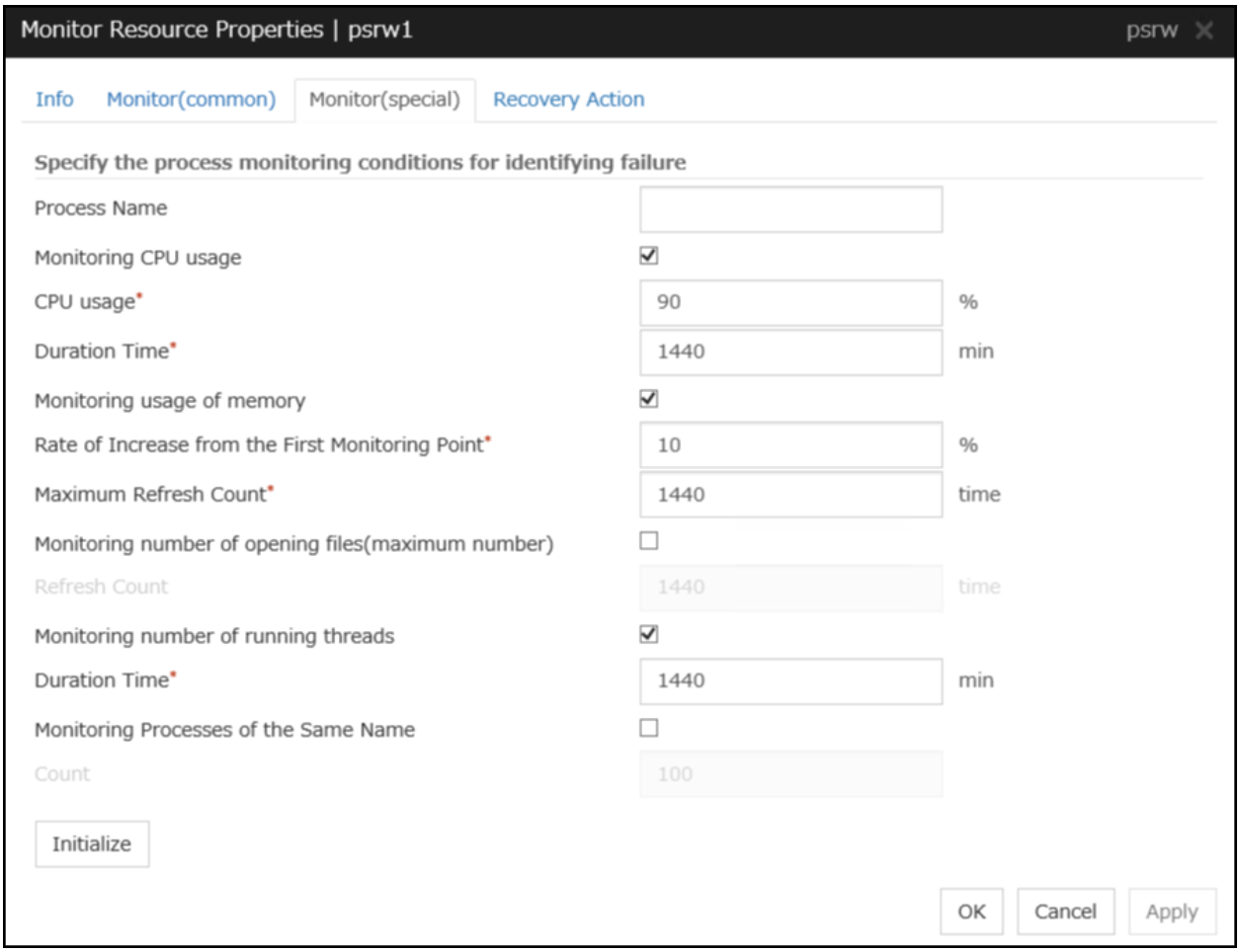


Fig. 5.17: The memory usage increases and decreases within a set range (no error detected)

5.28.3 Monitor (special) tab



Process Name (within 1023 bytes)

Set the name of the target process. Without setting it, all started processes are monitored.

Wild cards can be used to specify process names in the three patterns described below. Patterns other than these cannot be used.

- prefix search : <character string included in process name>*
- suffix search : *<character string included in process name>
- partial search : *<character string included in process name>*

Monitoring CPU usage

Enables CPU usage monitoring.

- When the check box is selected:
  Monitoring is enabled for the CPU usage.
- When the checkbox is not selected:
  Monitoring is disabled for the CPU usage.

CPU usage (1 to 100)

Specify the threshold for the detection of the CPU usage.

Duration Time (1 to 4320)

Specify the duration for detecting the CPU usage.
If the threshold is continuously exceeded over the specified duration, the detection of an error is recognized.

Monitoring usage of memory

Enables the monitoring of the usage of memory.

- When the check box is selected:
  Monitoring is enabled for the usage of memory.
- When the checkbox is not selected:
  Monitoring is disabled for the usage of memory.

Rate of Increase from the First Monitoring Point (1 to 1000)

Specify the threshold for the detection of a memory use amount error.

Maximum Update Count (1 to 4320)

Specify the maximum update count for the detection of a memory use amount error.
Exceeding the threshold consecutively by the specified count leads to the error detection.

Monitoring number of opening files (maximum number)

Enables the monitoring of the number of opening files (maximum number).

- When the check box is selected:
  Monitoring is enabled for the number of opening files.
- When the checkbox is not selected:
  Monitoring is disabled for the number of opening files.

Refresh Count (1 to 4320)

Specify the refresh count for the detection of the number of opening files error.
If the number of opening files maximum value is updated more count than specified, the detection of an error is recognized.

Monitoring number of running threads

Enables the monitoring of the number of running threads.

- When the check box is selected:
  Monitoring is enabled for the number of running threads.
- When the checkbox is not selected:
  Monitoring is disabled for the number of running threads.

Duration Time (1 to 4320)

Specify the duration for detecting an error with the number of running threads.
If the processes for which the number of running threads is passed more than specified times, the detection of an error is recognized.

Monitoring Processes of the Same Name

Enables the monitoring of the processes of the same name

- When the check box is selected:
  Monitoring is enabled for the processes of the same name.
- When the checkbox is not selected:

Monitoring is disabled for the processes of the same name.

Count (1 to 10000)

Specify the count for detecting an error with the processes of the same name.

If the processes of the same name has been exists more than specified numbers, the detection of an error is recognized.

5.29 Setting up user mode monitor resources

The user mode monitor resources monitor any user space stalls.
The user mode monitor resources are registered by default.

5.29.1 Monitoring by user mode monitor resources

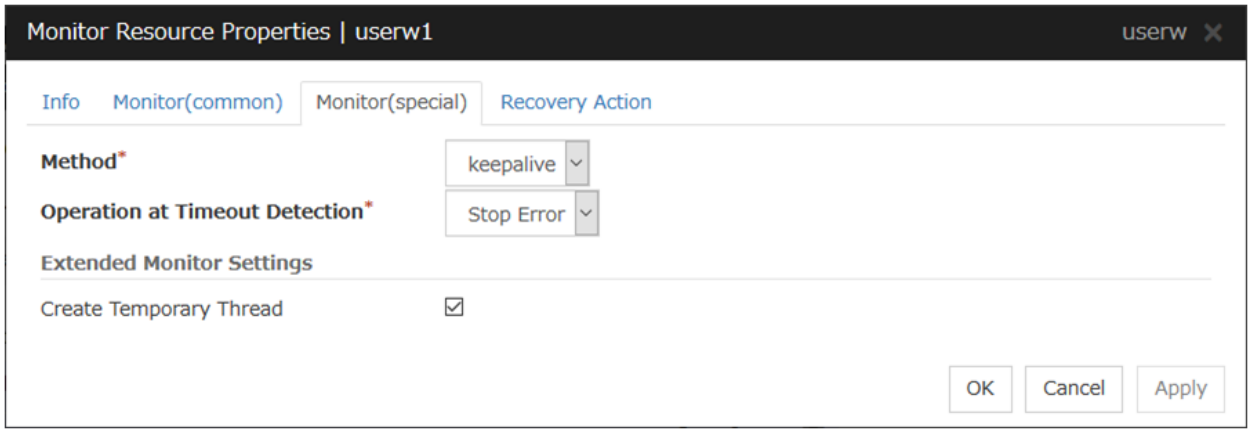
The user mode monitor resources monitor the following:
After the start of monitoring, a user mode monitor resource starts the keepalive timer and then updates the keepalive timer at monitoring intervals. It detects an error if the timer is not updated during a set duration as a result of a user space stall.
A user mode monitor resource has a setting for extending the monitoring by creating a dummy thread. If this setting is enabled, it creates a dummy thread at monitoring intervals. If it fails to create a dummy thread, it does not update the keepalive timer.

The processing logic of the user mode monitor resources is as follows:

- Overview of processing
  The following steps 2 and 3 are repeated.
  1. Set the keepalive timer
  2. Create a dummy thread
  3. Update the keepalive timer

  Step 2 is a process for advanced monitor setting. If this is not set, the process is not started.
- Behavior when a timeout does not occur (steps 2 and 3,above, are processed properly)
  Recovery processing such as reset is not executed.
- Behavior when a timeout occurs (Either of steps 2 or 3, above, is stopped or delayed)
  According to the action settings, a reset or panic is generated by the clphb driver.

5.29.2 Monitor (special) tab



Monitor Method

Specify how the user space is monitored.

- keepalive
  The clphb driver is used.

Action When Timeout Occurs

Specify the action to take when a timeout occurs.

- No Operation
  No action is taken.
- HW Reset
  Reset the hardware.
- Generate an intentional stop error
  Intentionally cause a stop error.

Note: A dummy failure cannot be triggered by an action when a timeout occurs.

Create a Dummy Thread

Specify whether or not to create a dummy thread when monitoring.

- When the checkbox is selected (default value)
  Create a dummy thread.
- When the checkbox is not selected
  Do not create a dummy thread.

CHAPTER

SIX

OTHER SETTING DETAILS

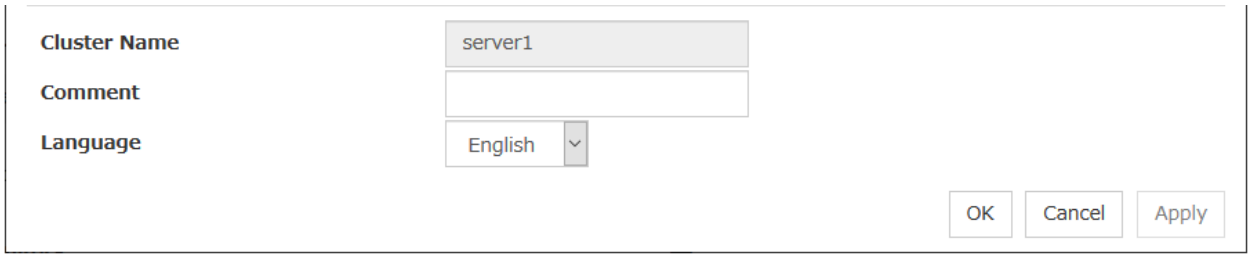
This chapter provides details about the other items to be specified for EXPRESSCLUSTER X SingleServerSafe.
EXPRESSCLUSTER X SingleServerSafe uses windows common to those of the clustering software EXPRESSCLUSTER X to ensure high compatibility with EXPRESSCLUSTER X in terms of operation and other aspects.
This chapter covers:

6.1 Cluster properties

In the **Cluster Properties** window, you can view and change the detailed data of EXPRESSCLUSTER X SingleServerSafe.

6.1.1 Info tab

You can display the server name, and register and make a change to a comment on this tab.



Cluster Name

Displays the server name. You cannot change the name here.

Comment (within 127 bytes)

Enter a new comment. You can only enter one byte English characters.

Language

Choose one of the display languages below. Specify the language (locale) of OS on which the Cluster WebUI runs.

- English
- Japanese
- Chinese

6.1.2 Interconnect tab

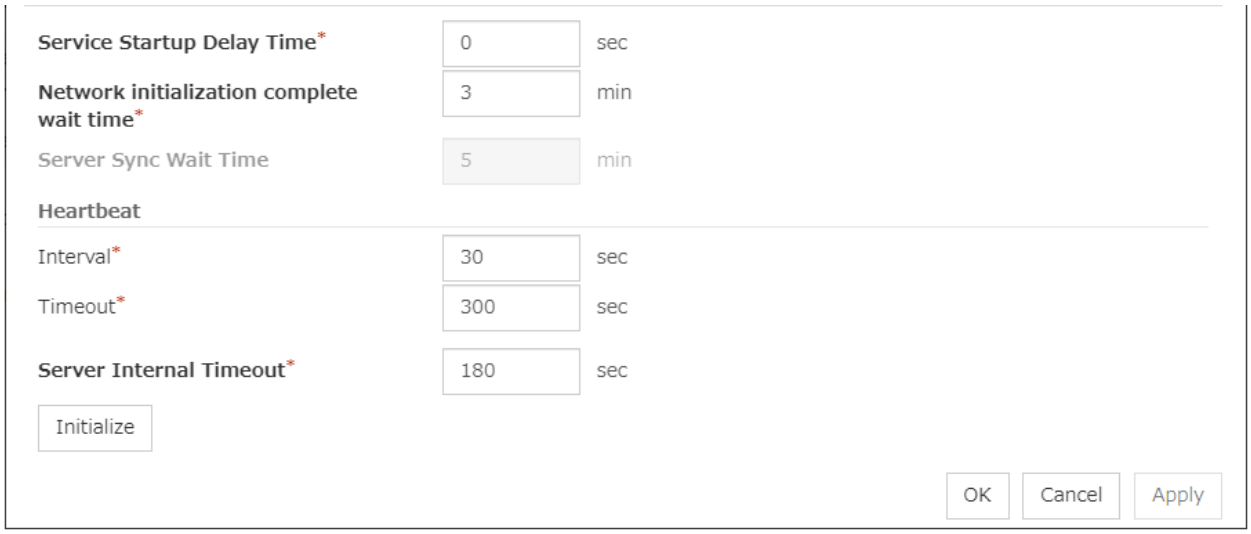
Not used.

6.1.3 Fencing tab

Not used.

6.1.4 Timeout tab

Specify values such as time-out on this tab.



Service Startup Delay Time (0 to 9999)

Specify how long starting the cluster service should be delayed in starting the OS.

Network initialization complete wait time (0 to 99)

This is the time the server waits until its NIC becomes valid after startup.

Server Sync Wait Time (0 to 99)

Not used.

Heartbeat

- **Interval** (1 to 99)
  Interval of heartbeats
- **Timeout** (2 to 9999)
  A server is determined to be failed if there is no response for the time specified here.
  This time-out should be longer than the interval.

Server Internal Timeout (1 to 9999)

The timeout to be used in the EXPRESSCLUSTER Server internal communications that are performed while an EXPRESSCLUSTER command is executed, or an operation is performed or a screen is displayed by Cluster WebUI.

Note:

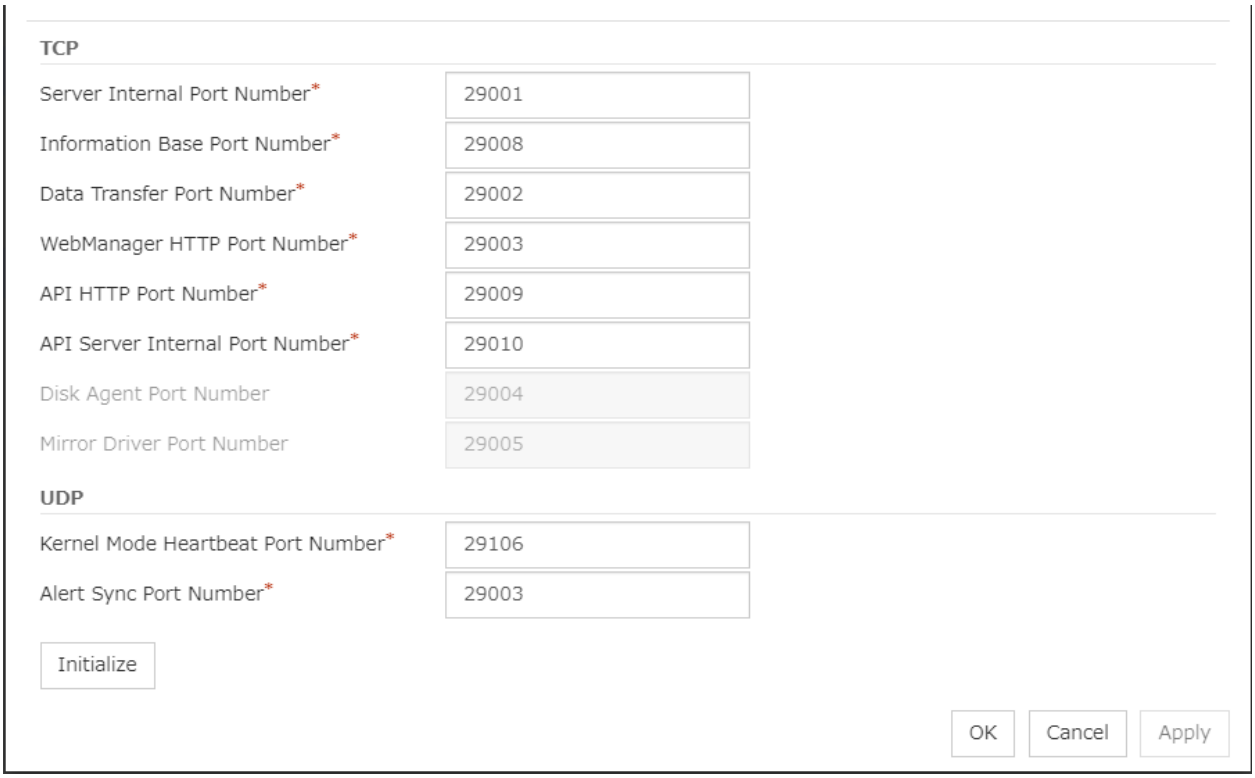
It is recommended to use the default value.
Setting this parameter to an extremely large value significantly affects, in case of a heartbeat loss, the time for executing the clpstat command or for displaying Cluster WebUI.

Initialize

Used for initializing the value to the default value. Click **Initialize** to initialize all the items to their default values.

6.1.5 Port No. tab

Specify TCP port numbers and UDP port numbers.



TCP

No TCP port numbers can be overlapped.

- **Server Internal Port Number** (1 to 65,535[1])
  This port number is used for internal communication.
- **Information Base Port Number** (1 to 65,535[1])
  This port number is used for cluster information management.
- **Data Transfer Port Number** (1 to 65,535[1])
  This port number is used for transactions such as applying and backing up the configuration data, sending and receiving the license data, and running commands.
- **WebManager HTTP Port Number** (1 to 65,535[1])
  This port number is used for a browser to communicate with the EXPRESSCLUSTER Server.
- **API HTTP Port Number** (1 to 65,535[1])
  This port number is used for a RESTful API client to communicate with the EXPRESSCLUSTER server.
- **API Internal Communication Port Number** (1 to 65,535[1])
  This port number is used for RESTful-API internal communication.
- **Disk Agent Port Number** (1 to 65,535[1])
  Not used.

[1] It is strongly recommended not to use well-known ports, especially reserved ports from 1 to 1,023.

- **Mirror Driver Port Number** (1 to 65,535[1])
  Not used.

UDP

No UDP port numbers can be overlapped.

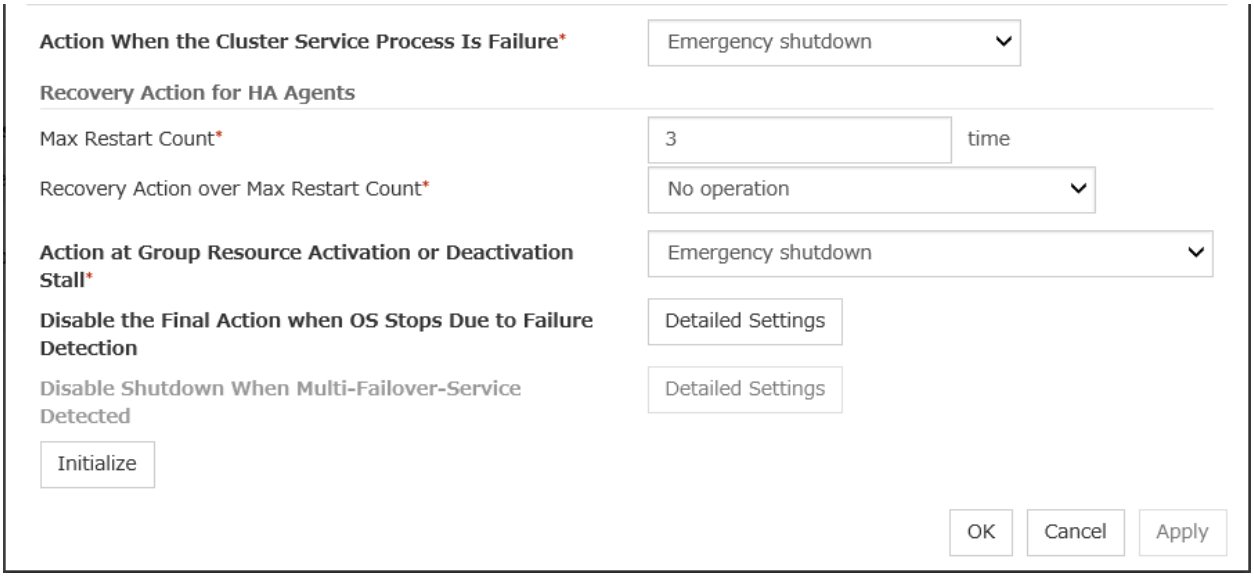
- **Kernel Mode Heartbeat Port Number** (1 to 65,535[1])
  This port number is used for the kernel mode heartbeat.
- **Alert Sync Port Number** (1 to 65,535[1])
  This port number is used to synchronize alert messages.

Initialize

Used for initializing the value to the default value. Click **Initialize** to initialize all the items to their default values.

6.1.6 Recovery tab

Specify the settings for recovery.



Action When the Cluster Service Process Is Failure

Specify an action at process abnormity of the cluster service.

- Emergency shutdown
  Shutdown the server.

Note: With a user mode monitor resource in operation: When a heartbeat timeout occurs during a shutdown, the system may perform a specified action which will be taken on a timeout occurrence in the user mode monitor resource.

- Generate an intentional stop error
  Generate a stop error (Panic) intentionally and restart the server.
- Reset the hardware
  Restart the server by HW reset.

Recovery Action for HA Agents

- Max Restart Count (0 to 99)
  Specify the max restart count when an HA Agent error has occurred.
- Recovery Action over Max Restart Count
  Specify the action when an HA Agent error has occurred.
  - No operation
  - Stop the cluster service
    Stops the cluster service of the server that detected an error.
  - Stop the cluster service and shutdown OS
    Stops the cluster service of the server that detected an error, and then shuts down the OS.
  - Stop the cluster service and reboot OS
    Stops the cluster service of the server that detected an error, and then reboots the OS.

Note: The HA process is used with the system monitor resource, Process resource monitor resource, JVM monitor resource, and system resource information collection function.

Action at Group Resource Activation or Deactivation Stall

Specify the action to apply in the event of an activation/deactivation stall of a group resource.

- Emergency shutdown
  Shutdown the server on which a stall occurred.
- Intentionally causing a stop error
  Intentionally cause a stop error (Panic) on the server on which a stall occurred.
- Nothing (handle a stall as an activation/deactivation failure)
  Use this to perform recovery upon the detection of an activation/deactivation failure of a group resource.

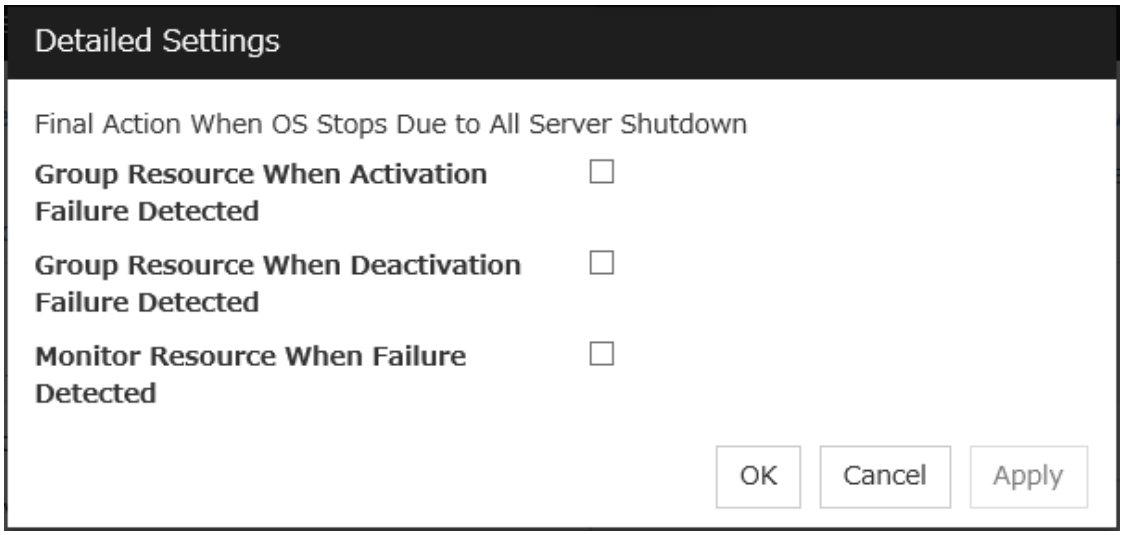
Note: If a stall occurs with "Nothing (handle a stall as an activation/deactivation failure)" specified, the effect on the group resources is undefined, so we do not recommend changing the setting to "Nothing (handle a stall as an activation/deactivation If you do specify "Nothing (handle a stall as an activation/deactivation failure)", set the recovery operation upon the detection of an activation/deactivation failure of a group resource as described below.

- Activation/deactivation retry threshold: 0 (times)
- Failover threshold: 0 (times)
- Final action: Intentionally causing a stop error

If **Stop the cluster service and shut down OS** or **Stop the cluster service and reboot OS** is specified as the final action, it takes a considerable amount of time for the cluster service to stop.

Disable the Final Action when OS Stops Due to Failure Detection

Click **Detailed Settings** to set suppression of the final action which accompanies the OS stop caused by error detection.



- **Group Resource When Activation Failure Detected**
  If the final action caused by an activation error detection in a group resource accompanies the OS stop, the final action is suppressed.
- **Group Resource When Deactivation Failure Detected**
  If the final action caused by a deactivation error detection in a group resource accompanies the OS stop, the final action is suppressed.
- **Monitor Resource When Failure Detected**
  If the final action caused by an error detection in a monitor resource accompanies the OS stop, the final action is suppressed.

Note:

- The eternal link monitor resource does not become the target for which the final action caused by error detection is suppressed.
- The following situations lead to an OS stop during the final action when an activation/deactivation error is detected in a group resource and during the final action when a monitor resource error is detected.
  - Cluster service stop and OS shutdown
  - Cluster service stop and OS restart
  - Generation of an intentional stop error

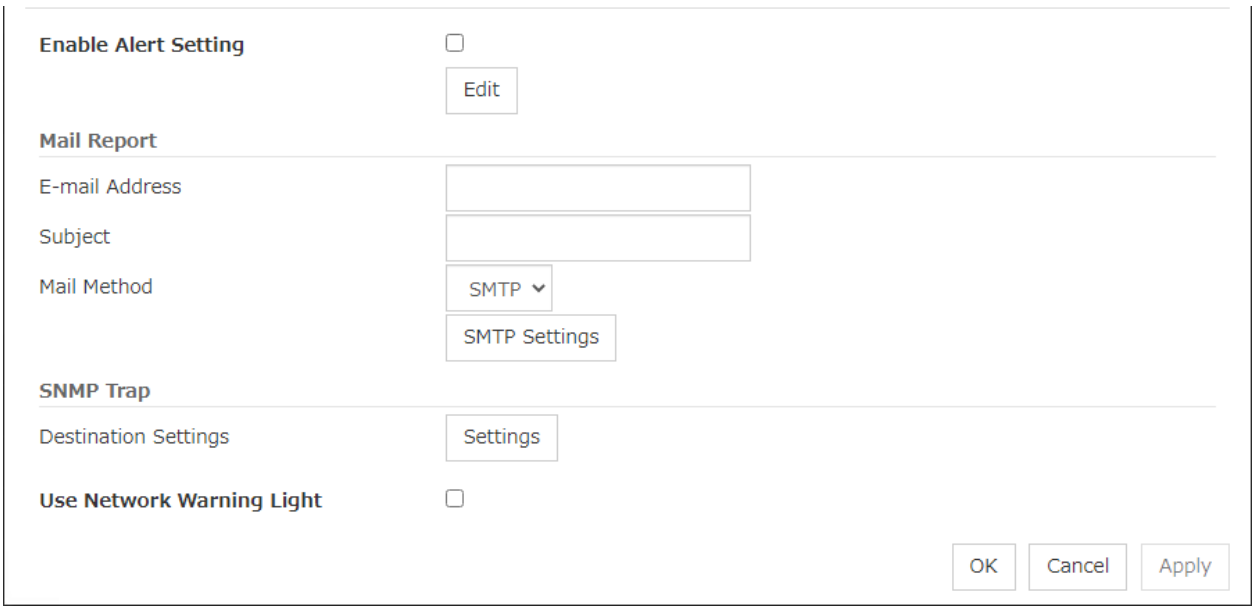
Disable Shutdown When Multi-Failover-Service Detected

Not used.

6.1.7 Alert Service tab

Specify the alert service and network warning light.

Note: To use the mail alert function, obtain EXPRESSCLUSTER X Alert Service 5.2 for Windows, and register the license.



Enable Alert Setting

Allows changing the alert destination from the default value. To change the destination, click **Edit**, then set a new destination in the **Change Alert Destination** dialog box.

If you clear the checkbox, the destination address you have modified returns to the default settings temporarily.

For the default settings of the destination address, see "Messages reported by event log and alert" in "Error messages" in the "EXPRESSCLUSTER X SingleServerSafe Operation Guide".

E-mail Address (within **255 bytes)**

Enter the mail address of alert destination. To specify multiple mail addresses, separate each of them by semi-colon ";".

Subject (within **127 bytes)**

Enter the mail subject.

Mail Method

Configure the mail method. In this version, SMTP is the only option in this.

To use SMTP as a mailing method, click **SMTP Settings**, then set the method in the **SMTP Settings** dialog box.

- SMTP
  Sends the alert by directly communicating with the SMTP server.

Destination Settings

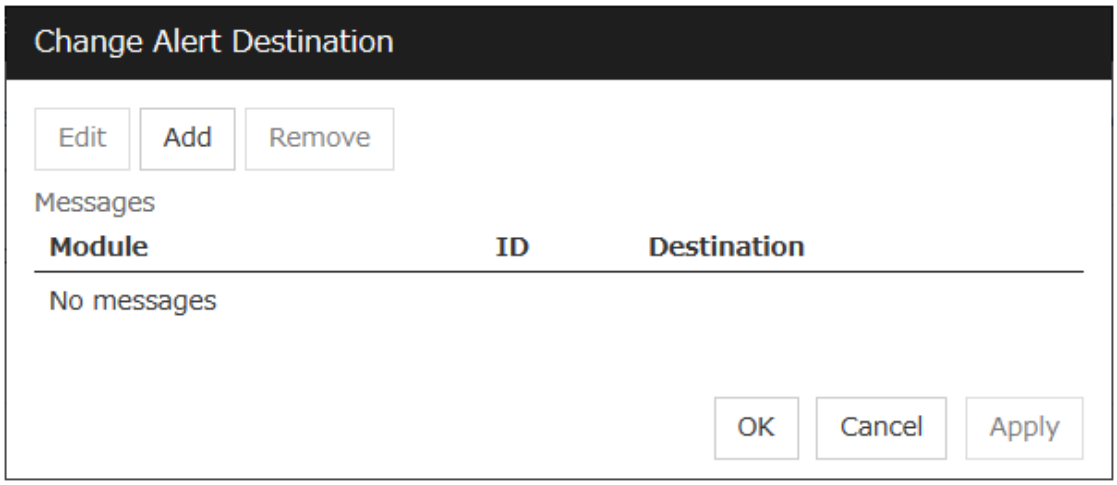
Configure the SNMP trap transmission function: Click **Settings**, then set an SNMP trap transmission destination in the **Destination Settings** dialog box.

Use Network Warning Light

Not used.

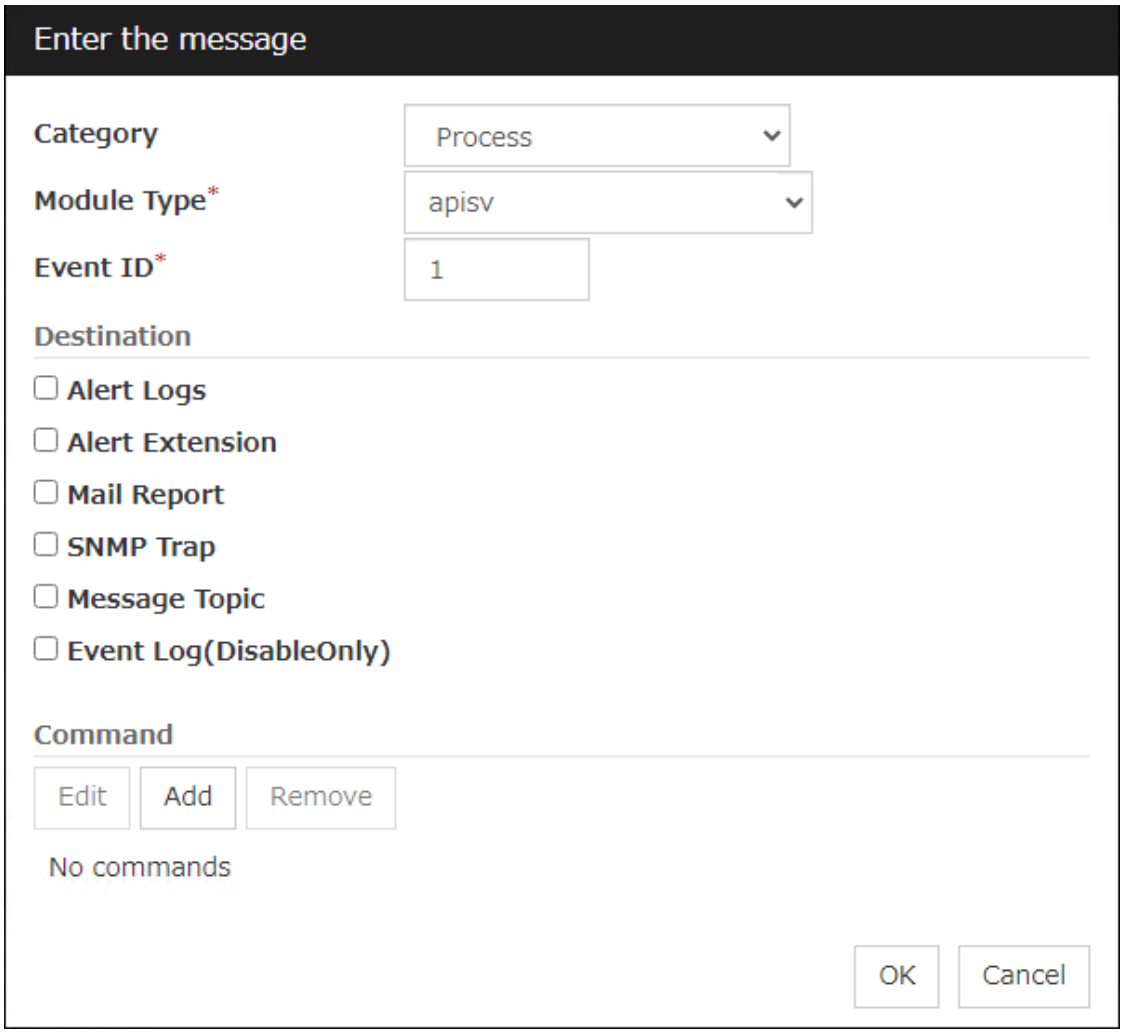
Change Alert Destination

Clicking **Edit** displays the **Change Alert Destination** dialog box.



Add

Add the alert ID of the destination which you want to customize. Click **Add** to open the dialog box for entering the message.



Category

Select a main category of module types.

Module Type (within 31 bytes)

Select the name of the module type for which you want to change the destination address.

Event ID

Enter the message ID of the module type for which you want to change the destination. For the message ID, see "Messages reported by event log and alert" in "Error messages" in the "EXPRESSCLUSTER X SingleServerSafe Operation Guide".

Destination

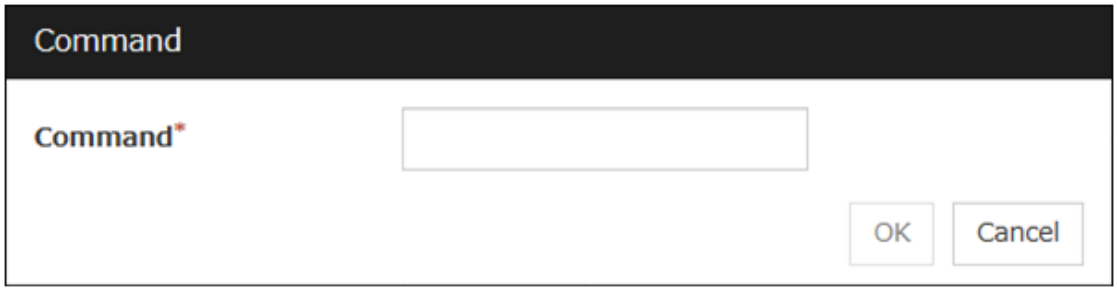
Select a message destination from the following options.

- **Alert logs**
  This sends messages to the alert log.
- **Alert Extension**
  This executes the specified function by using the alert extension function. Modify the extension settings by using the **Add** button and/or the **Edit** button. (The command must be specified within four lines.)

- **Mail Report**
  Uses the mail report function.
- **SNMP Trap**
  Uses the SNMP trap transmission function to send messages.
- **Message Topic**
  This sends message to Amazon SNS.
- **EventLog (DisableOnly)**
  Disables the settings for the OS to report logs to the event log. You cannot configure the settings to report messages that are not reported to event logs.)

Add

Add a command of the alert extension function. Click **Add** button to display the dialog box for entering a command.



Command (within 511 bytes)

Enter any command you want to use.

- Keyword
  If you specify %%MSG%%, the message of the target event ID is inserted.
  You cannot specify multiple %%MSG%% for one command.
  Configure the command within 511 bytes including the description of %%MSG%%.
  The string %%MSG%% may include a space. If you specify it as an argument for a command, add backslashes (\) and double quotation marks ("), as in \"%%MSG%%\".

Remove

Click this to remove a command of the alert extension function. Select the command, and then, click **Remove**.

Edit

Click this to modify a command of the alert extension function. Select the command, and then, click **Edit**.

SMTP Settings

Click **SMTP Settings** to display the **SMTP Settings** dialog box used for the mail alert.

Mail Charset (within 127 bytes)

Configure the character set of the e-mails sent for mail report.

Send Mail Timeout (1 to 999)

Configure the timeout value for the communication with SMTP server.

Subject Encode

Configure whether or not to encode the subject of e-mails.

SMTP Server List

Use this button to display a SMTP server that has been configured. Only one SMTP server can be configured in this version.

Add

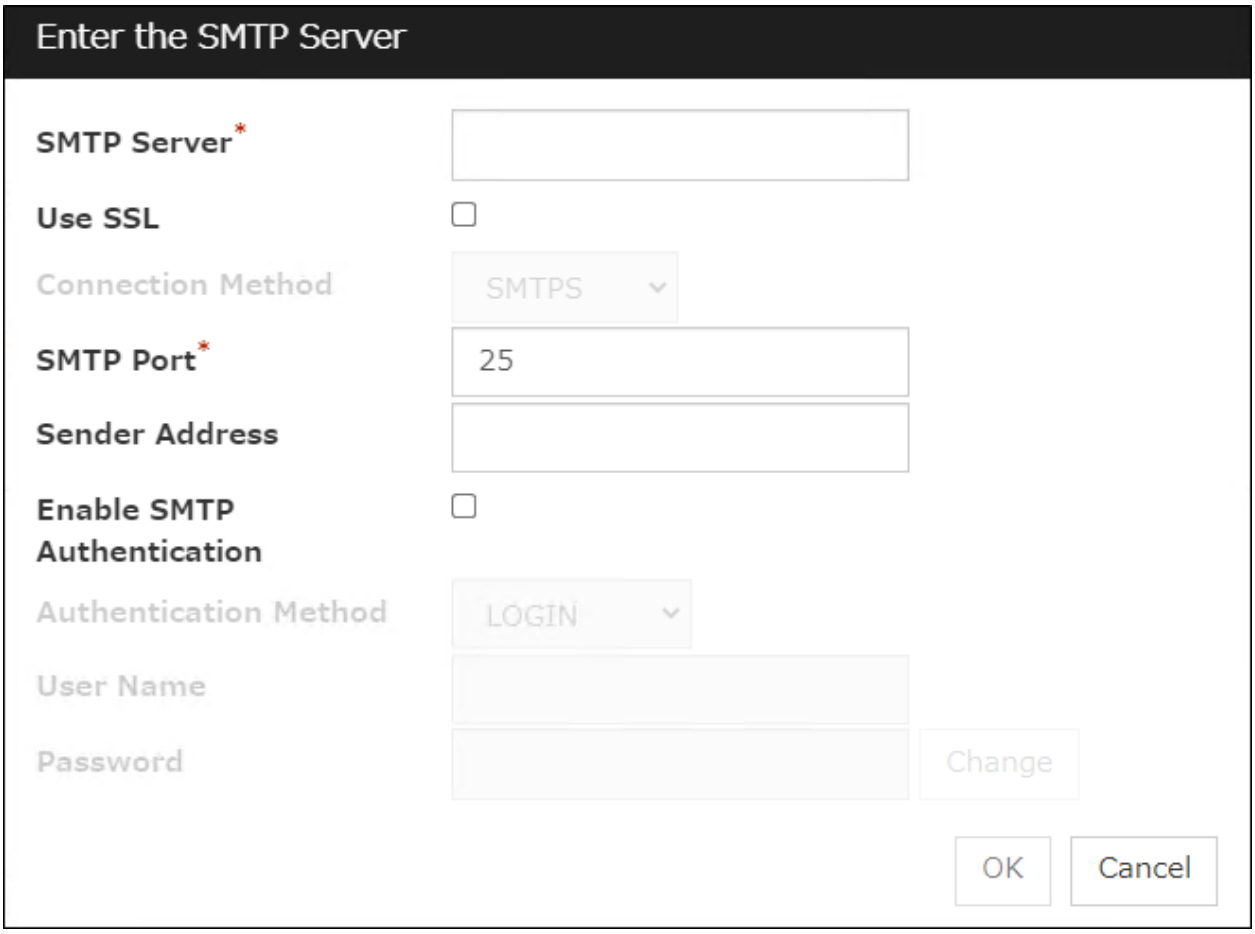
Use this button to add a SMTP server. Click **Add** to open the **Enter the SMTP Server** dialog box.

Remove

Select this to remove the SMTP server.

Edit

Use this button to modify the settings of SMTP server.



SMTP Server (within 255 bytes)

Configure the IP address or host name of the SMTP server.

Use SSL

If you use SSL for communication with the SMTP server, select the checkbox; otherwise uncheck it.

When using SSL, go to the **Encryption** tab, then set **SSL Library** and **Crypto Library**.

For OpenSSL versions supporting this, see "EXPRESSCLUSTER X SingleServerSafe Installation Guide" -> "Checking system requirements for EXPRESSCLUSTER X SingleServerSafe" -> "Operation environment for enabling encryption".

Connection method

- SMTPS
  Use SMTPS for communication with the SMTP server.
- STARTTLS
  Use STARTTLS for communication with the SMTP server.

SMTP Port (1 to 65,535)

Configure the port number of the SMTP server.

Sender Address (within 255 bytes)

Configure the address from which mail report is sent.

Enable SMTP Authentication

Configure whether or not to enable SMTP authentication.

Method

Select a method of SMTP authentication.

User Name (within 255 bytes)

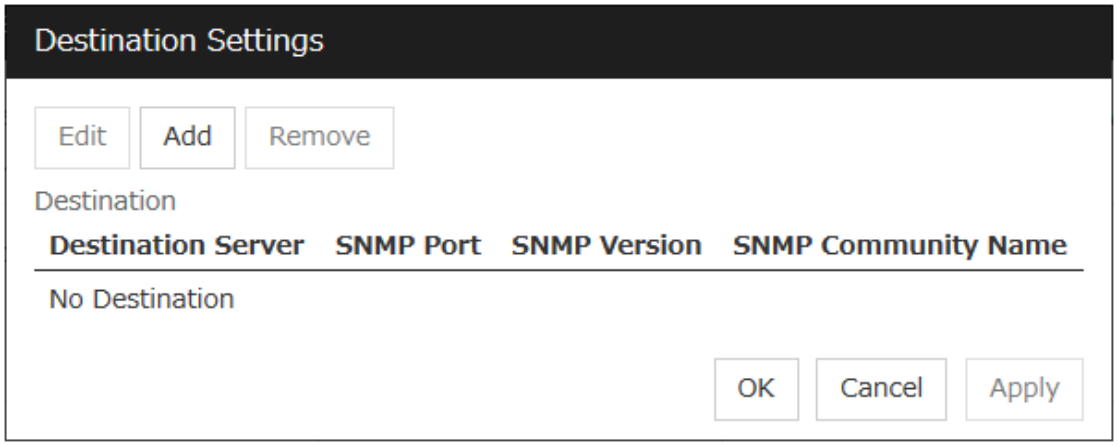
Configure the user name used for SMTP authentication.

Password (within 255 bytes)

Configure the password used for SMTP authentication.

SNMP Settings

Click this to display the **Destination Settings** dialog box which is used for the SNMP trap.



Destination

Displays the set SNMP trap transmission destinations. With this version, up to 32 SNMP trap transmission destinations can be set.

Add

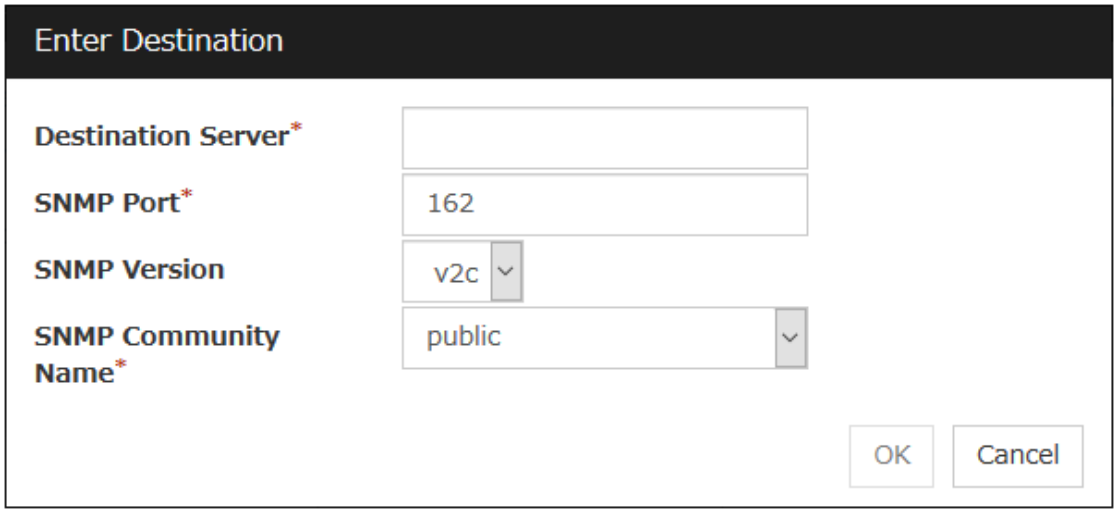
Adds an SNMP trap transmission destination. Click **Add** to display the **Change SNMP Destination** dialog box.

Remove

Use **Remove** to remove the SNMP trap transmission destination settings.

Edit

Use **Edit** to modify the SNMP trap transmission destination settings.



Destination Server (within 255 bytes)

Configure the name of the SNMP trap transmission destination server.

SNMP Port No. (1 to 65535)

Configure the port number of the SNMP trap transmission destination.

SNMP Version

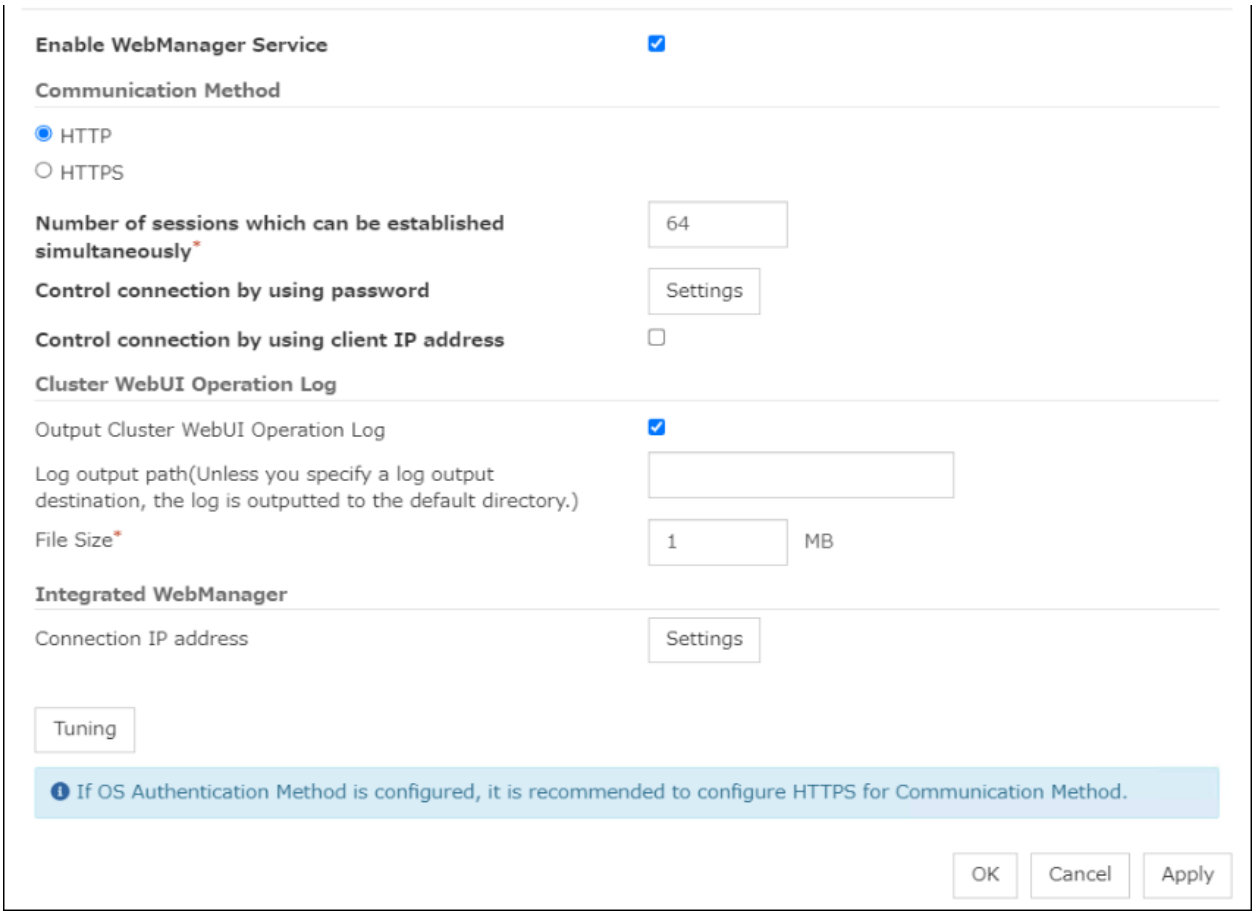
Configure the SNMP version of the SNMP trap transmission destination.

SNMP Community Name (within 255 bytes)

Configure the SNMP community name of the SNMP trap transmission destination.

6.1.8 WebManager tab

Specify the settings for the WebManager Server.



Enable WebManager Service

The WebManager service is enabled.

- When selected:
  The WebManager service is enabled.
- When cleared:
  The WebManager service is disabled.

Communication Method

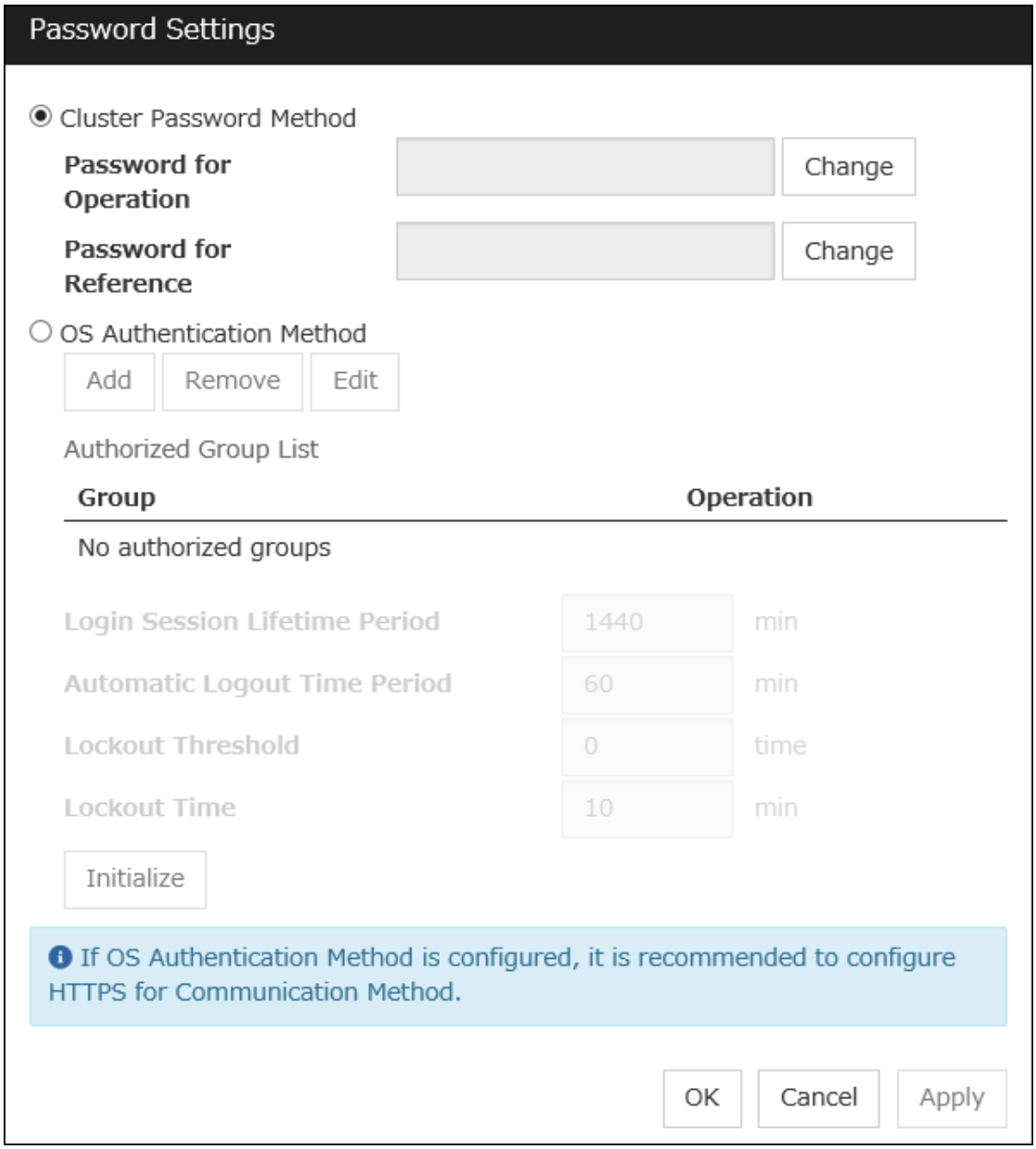
- HTTP
  No encryption is used for communicating with a client.
- HTTPS
  Encryption is used for communicating with a client.

Number of sessions which can be established simultaneously (10 to 999)

Set the number of requests that can be simultaneously received from clients. If more requests than the number set here are generated, the excess requests will be discarded.

Control connection by using password

Click the **Settings** button to open the **Password** dialog box.



Cluster Password Method / OS Authentication Method

Choose a login method for Cluster WebUI from below.

- Cluster Password Method
  Performs authentication with an operation/reference password you set.
- OS Authentication Method
  Performs authentication with user and password of OS.

Cluster Password Method

- Password for Operation
  Set a password to connect to the Cluster WebUI in the operation mode.
  Click **Change** to display the **Enter Password** dialog box.
- Password for Reference

Set a password to connect to the Cluster WebUI in the reference mode.
Click **Change** to display the **Enter Password** dialog box.

- **Old Password** (within 255 bytes)
  Enter the current password.
  If the password is not set, leave it blank.
- **New Password** (within 255 bytes):
  Enter a new password.
  When deleting the old password, leave it blank.
- **Password Confirmation** (within 255 bytes)
  Enter the password again which you entered in **New Password**.

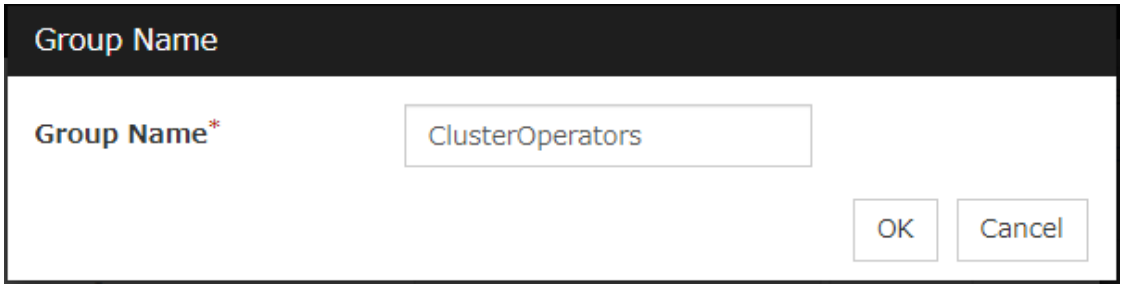
OS Authentication Method

Users must be registered to the server in advance to login to Cluster WebUI. More specifically, a group must be registered to the server and the users must belong to it as the control permission of a cluster is assigned per group,

- If the server belongs to a work group:
  Register users and a group to the server.
- If the server belongs to a domain:
  Register users and a group to a domain.

Add

Used to add a group to **Authorized Group List**. The **Group Name** dialog box appears when **Add** is clicked. To add a group, the **Operation** checkbox must be selected.



- **Group Name** (Within 255 bytes)

Enter the name of the group to be authorized. Users belonging to the specified group are authorized. Groups must be registered to the server in advance.

Remove

Used to delete a group from **Authorized Group List**.
From **Authorized Group List**, select a group to be deleted. Then click **Remove**.

Edit

Used to edit a group. From **Authorized Group List**, select a group to be edited. Then click **Edit**. The **Group Name** dialog box appears with the selected group entered. The control permission does not change in this procedure.

Operation

Set control permission to a group registered in **Authorized Group List**.

- If the check box is checked:
  Users belong to the group can operate the cluster and view the status.
- If the check box is not checked:
  Users belongs to the group can only view the status.

Login Session Lifetime Period (0 to 52560)

Time frame of login session. If this value is set to zero (0), the period becomes limitless.

Automatic Logout Time Period (0 to 99999)

Sets the logout time for the automatic logout when there is no communication between Cluster WebUI and WebManager server. If this is set to zero (0), no automatic logout occurs.

Lockout Threshold (0 to 999)

Locks out a client IP address which fails to login continuously. The client cannot login until **Lockout Time** passes once a client is locked out. If this value is set to zero (0), no client IP address is not be locked out.

Lockout Time (1 to 99999)

Sets lockout time for a client IP address. Once the time passes, the lockout is automatically released.

Initialize

Restores the default value. If **Initialize** is clicked, the values of **Login Session Lifetime Period**, **Automatic Logout Time Period**, **Lockout Threshold** and **Lockout Time** are restored to the default values.

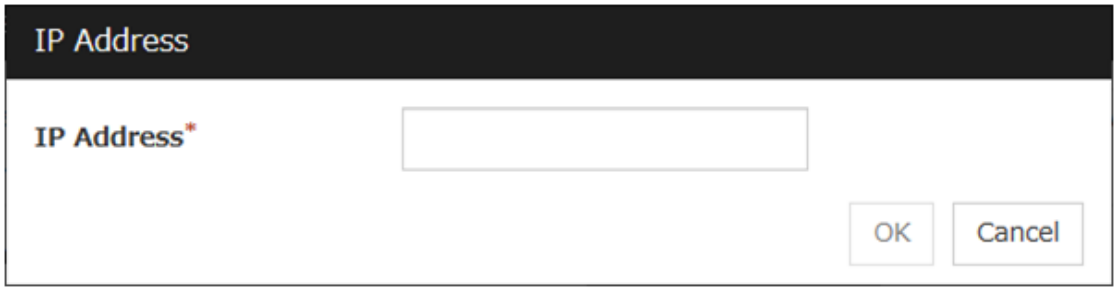
Control connection by using client IP address

If selected, accesses are controlled by client IP addresses.

- When selected:
  Add, **Remove** and **Edit** buttons are displayed.
- When cleared:
  Add, **Remove** and **Edit** buttons are not displayed.

Add

Use **Add** to add an IP address in **Connection Permit Client IP Address List**. By clicking **Add**, the **IP Address Settings** dialog box is displayed to enter an IP address. Newly added IP addresses have the rights for the operation.



- **IP Address** (within 80 bytes)
  Specify a client IP address that can be connected.
  - IP address: 10.0.0.21
  - Network address: 10.0.1.0/24

Remove

Use **Remove** 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** and click **Remove**.

Edit

Use **Edit** to change an IP address. Select an IP address you want to edit in **Connection Permit Client IP Address List** and click **Edit**. A dialog box where the specified IP address is preset is displayed. The rights for operating the edited IP addresses remain the same.

Operation

Specify the operation rights for IP addresses that are registered in **Connection Permit Client IP Address List**.

- When selected:
  A client can operate EXPRESSCLUSTER X SingleServerSafe and display its status.
- When cleared:
  The client can only display the status of EXPRESSCLUSTER X SingleServerSafe.

Output Cluster WebUI Operation Log

Allows you to output the operation log of Cluster WebUI.

- If the check box is checked:
  The operation log of Cluster WebUI is outputted.
- If the check box is not checked:
  The operation log of Cluster WebUI is not outputted.

Log output path (Within 255 bytes)

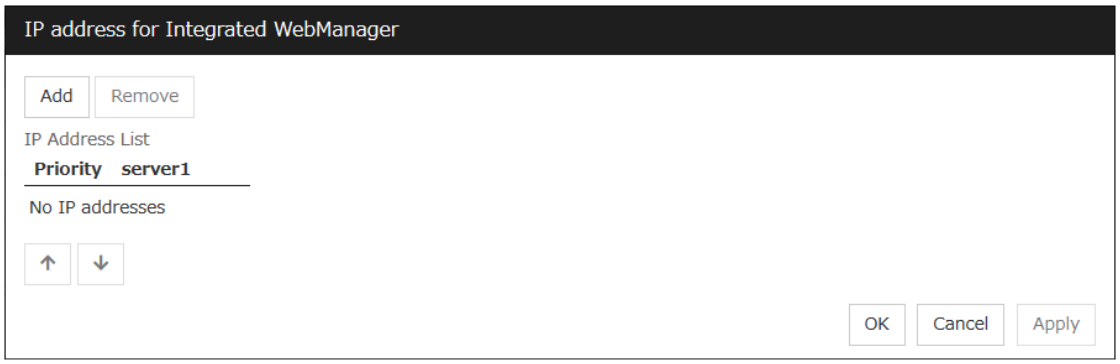
Specify the output destination directory of the Cluster WebUI operation log with an absolute path consisting of ASCII characters.
If no directory is specified, the Cluster WebUI operation log is outputted to <installation path>\log.

File Size (1 to 10)

Specify the size of Cluster WebUI operation log.
When the log data reaches the specified size, a rotation occurs. Up to five generations of the data are saved.

IP address for Integrated WebManager

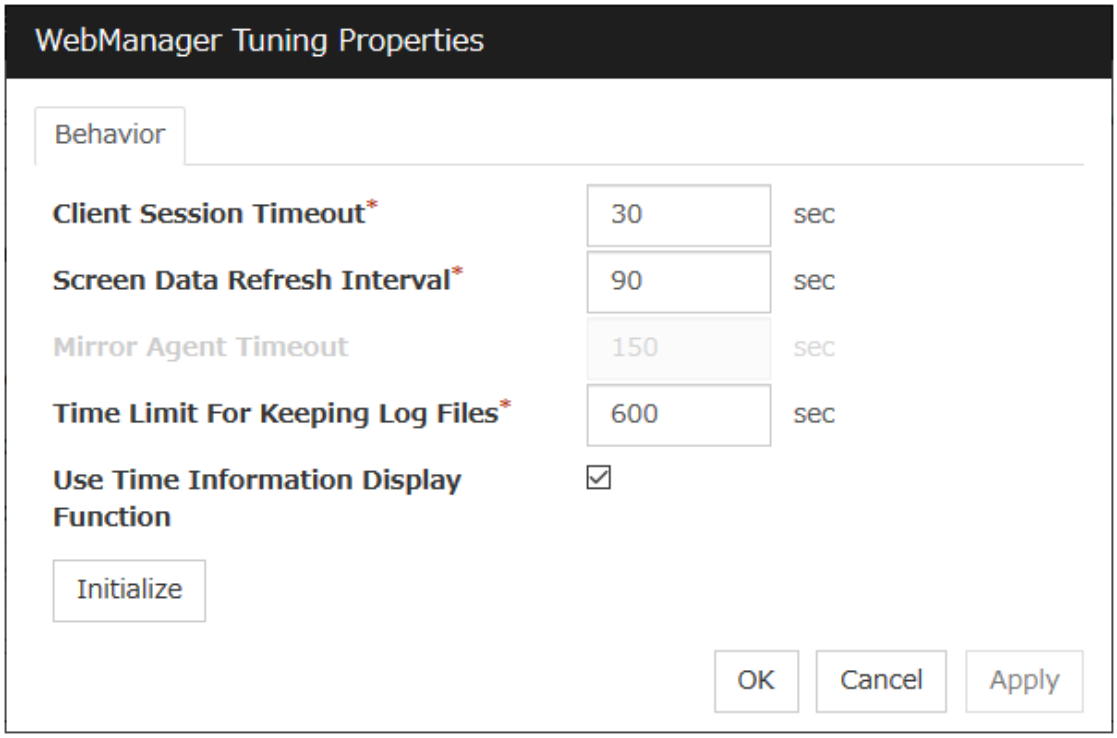
Click the **Settings** button to open the IP address dialog box for the Integrated WebManager.



- **Add**
  Add IP addresses for the Integrated WebManager. Click the column cell of server and select or enter IP address for the IP address of server.
- **Remove**
  Remove the communication path. Select the communication path to be removed and click **Remove**, then the selected path is removed.
- **Priority**
  When multiple IP addresses for Integrated WebManager are configured, the communication path with the smallest number in the **Priority** column is used preferentially for the internal communication among cluster servers. When changing the priority, the arrows to change the order of the selected row.

Tuning

Use **Tuning** to tune the WebManager Server. Click **Tuning** to open the **WebManager Tuning Properties** dialog box.

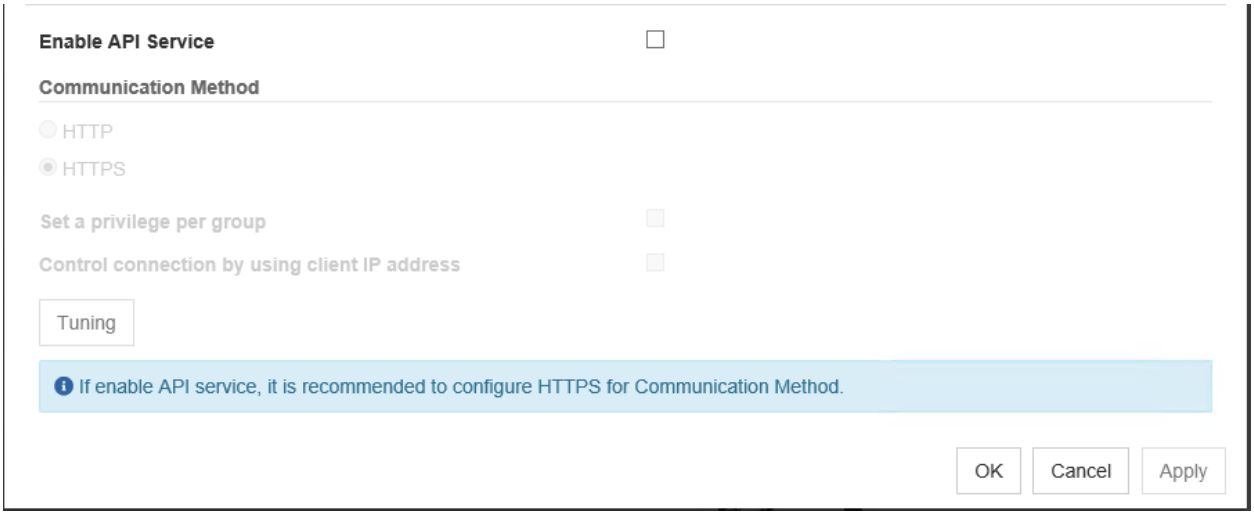


- **Client Session Timeout** (1 to 999)
  A timeout is determined if the time specified here elapses after the last communication between the WebManager Server and the Cluster WebUI.
- **Reload Interval** (0 to 999)
  At this time interval, the Cluster WebUI screen is refreshed.
- **Mirror Agent Timeout** (1 to 999)
  Not used.
- Time Limit For Keeping Log Files (60 to 43,200)
  Time limit determines when the log collection information temporarily saved on the server will be deleted. When the time specified here has elapsed, the log collection information will be deleted unless you save the file when the dialog box asking you if you save the log collection information is displayed.
- **Use Time Info**
  Specify whether the time information display function is enabled or disabled.
  - **When the check box is selected**
    The time information display function is enabled.
  - **When the check box is not selected**
    The time information display function is disabled.

- Initialize
  Used for initializing the value to the default value. Click Initialize to initialize all the items to their default values.

6.1.9 API Tab

Specify the settings for the API service.



Enable API Service

API services are enabled.

- If the check box is checked:
  API services are enabled.
- If the check box is not checked:

API services are disabled.

Communication Method

- HTTP
  No encryption is used for communicating with a client.
- HTTPS
  Encryption is used for communicating with a client.

Control a privilege of operating clusters per group

Allows you to set and control a privilege of operating clusters per group.

- If the check box is checked:
  Add, **Remove**, and **Edit** are displayed.
- If the check box is not checked:
  Add, **Remove**, or **Edit** is not displayed.

Login users must be registered beforehand in the server which issues the request. More specifically, a group must be registered to the server and the users must belong to it as the control permission of a cluster is assigned per group.

- If the server belongs to a work group:
  Register the same user name and group name in each of the servers which issues the request.
- If the server belongs to a domain:
  Register users and groups in the domain.

Add

Allows you to add a group to **Authorized Group List**. Clicking **Add** displays the **Group Name** dialog box. Any group added here has the **Operation** box checked.

- Group name (up to 255 bytes)
  Enter the name of a group. Users belonging to the group are to be given the permission.
  The group must be registered to a server in advance.

Remove

Use this option to delete a group from **Authorized Group List**.
From **Authorized Group List**, select a group to be deleted. Then, click **Remove**.

Edit

Use this option to edit a group. From **Authorized Group List**, select a group to be edited. Then click **Edit**. The **Group Name** dialog box appears with the selected group entered. Editing the group here does not change its operation right.

Operation

Set operation rights for any of the groups registered in **Authorized Group List**.

- If the check box is checked:
  The users of the group can operate the cluster and obtain its status.
- If the check box is not checked:
  The users of the group can only obtain the status of the cluster.

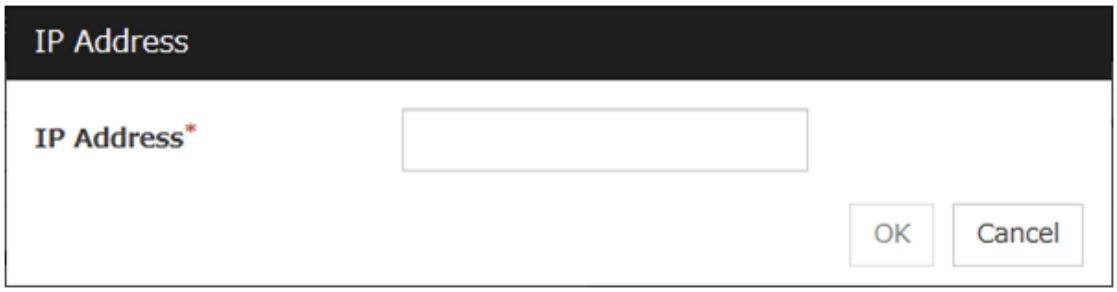
Control connection by using client IP address

The connection is controlled by the client IP address.

- If the check box is checked:
  Add, **Remove** and **Edit** are displayed.
- If the check box is not checked:
  Add, **Remove** and **Edit** are not displayed.

Add

Used to add an IP address to **Connection Permit Client IP Address List**. Click **Add to display** the **IP Address** dialog box. Newly added IP addresses have the rights for the operation.



- **IP Address (Within 80 bytes)**

  Specify a client IP address allowed for the connection.

  - Example for IP address: 10.0.0.21
  - Example for network address: 10.0.1.0/24

Remove

Used to remove an IP address from **Connection Permit Client IP Address List**. From **Connection Permit Client IP Address List**, select the IP address to be removed, and click **Remove**.

Edit

Used to edit an IP address. From **Connection Permit Client IP Address List**, select the IP address you want to edit, and click **Edit**. Then the **IP address** dialog box where the specified IP address is preset is displayed.

Operation

Set operation rights for any of the IP addresses registered in **Connection Permit Client IP Address List**.

- When the check box is selected:
  A client can operate a cluster and display its status.
- When the check box is not selected:
  A client can only view the status of a cluster.

Output API Service Operation Log

Allows you to output the operation log of API services.

- If the check box is checked:
  The operation log of API services is outputted.
- If the check box is not checked:
  The operation log of API services is not outputted.

Log output path (Within 255 bytes)

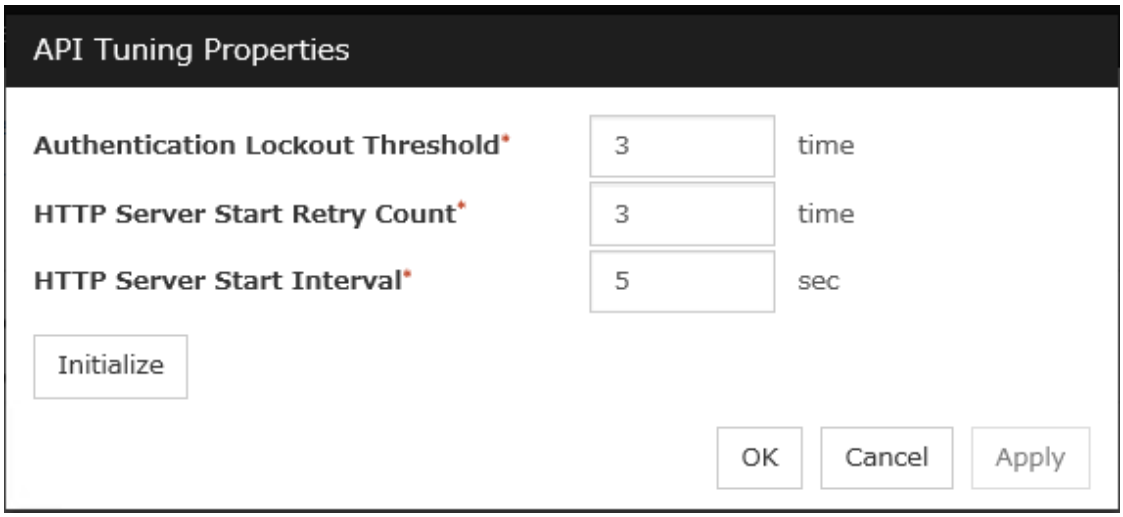
Specify the output destination directory of the API service operation log with an absolute path consisting of ASCII characters.
If no directory is specified, the API service operation log is outputted to <installation path>\log.

File Size (1 to 10)

Specify the size of API service operation log.
When the log data reaches the specified size, a rotation occurs. Up to five generations of the data are saved.

Tuning

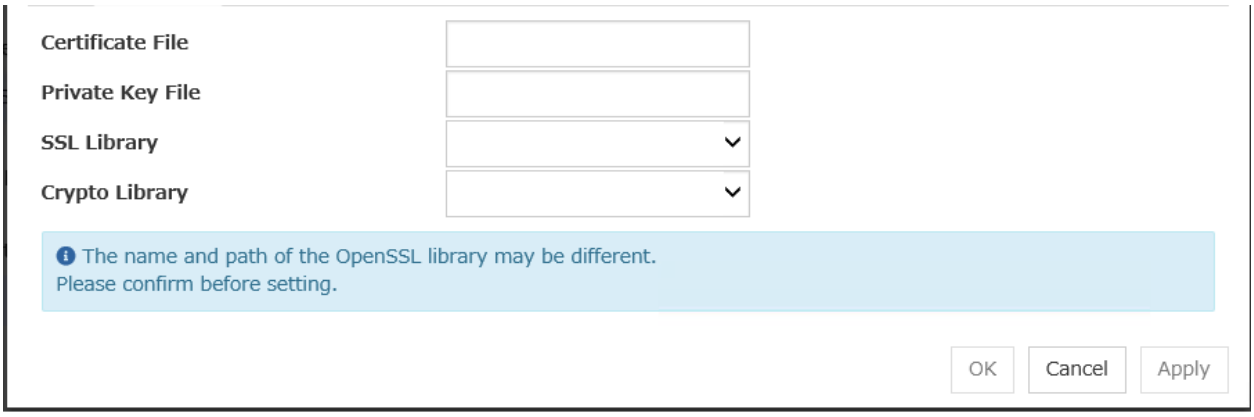
Used to adjust the API service. Click **Tuning** to display the **API Tuning Properties** dialog box.



- **Authentication Lockout Threshold**
  Specify the number of times of repeated authentication failures to log in to HTTP server that sets the lockout.
- **HTTP Server Start Retry Count**
  Specify the maximum number of HTTP server startup retry when API service fails to start it up.
- **HTTP Server Start Interval**
  Specify the interval between when API service fails to start up HTTP server and when it retries the startup next time.
- **Initialize**
  Used to restore the default value. All the items restore the default values when **Initialize** is clicked.

6.1.10 Encryption tab

Specify the settings for a file and a library to be used for the encryption of cluster related services.



Certificate File

Sets the server credential file used for connecting to a client. Users need to prepare the server credential file.

Private Key File

Sets the private key file used for connecting to a client. Users need to prepare the private key file.

SSL Library

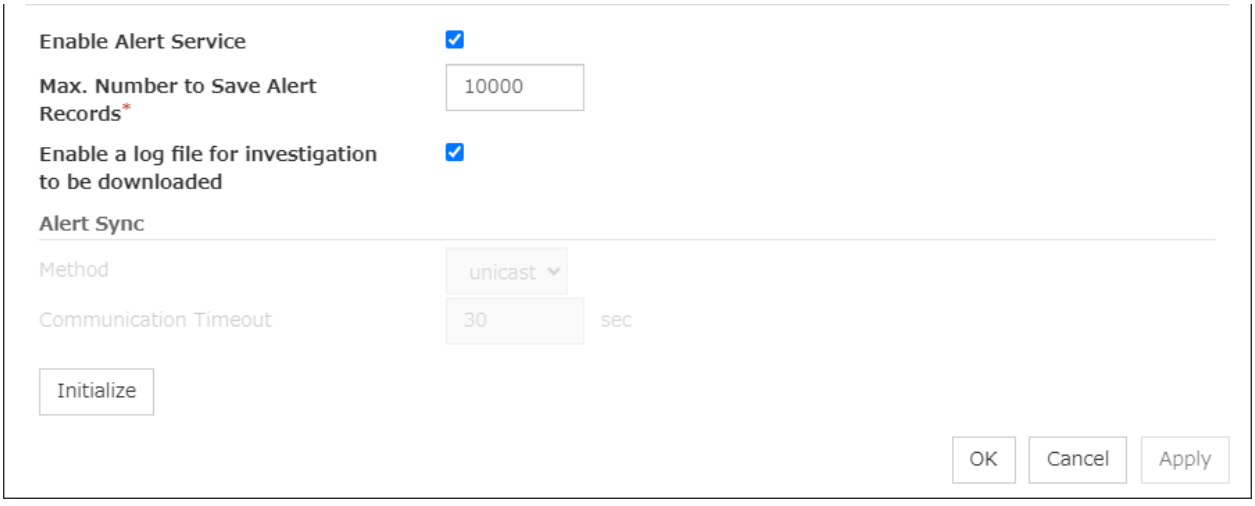
Sets the SSL library file used for encryption and selects the SSL library file included in OpenSSL. Users need to change it based on the environment, such as an installation folder.

Crypto Library

Sets the Crypto library file used for encryption and selects the Crypto library file included in OpenSSL. Users need to change it based on the environment, such as an installation folder.

6.1.11 Alert Log tab

Specify the settings for the alert log.



Enable Alert Service

Select this to start EXPRESSCLUSTER Web Alert service for the server.

- When selected:
  EXPRESSCLUSTER Web Alert service is enabled.
- When cleared:
  EXPRESSCLUSTER Web Alert service is disabled.

Max. Number to Save Alert Records (1 to 99,999)

Specify the maximum number of alert records that can be retained. EXPRESSCLUSTER Web Alert service for server can retain alert messages up to this number.

Enable a log file for investigation to be downloaded

Enable or disable downloading a log file for investigation through Cluster WebUI in response to the occurrence of a failure. For more information on the log file, see "Function for obtaining a log file for investigation" in " The system maintenance information" in the "Maintenance Guide".

- When the check box is selected:
  The log file is downloadable through Cluster WebUI.
- When the check box is not selected:
  The log file is not downloadable through Cluster WebUI.

Alert Sync: Method

Not used.

Alert Sync: Communication Timeout (1 to 300)

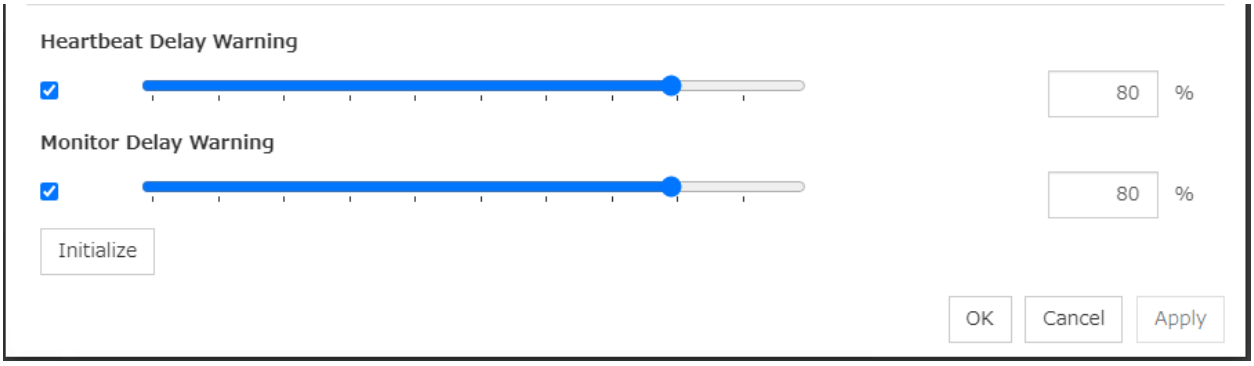
Not used.

Initialize

Used for initializing the value to the default value. Click Initialize to initialize all the items to their default values.

6.1.12 Delay Warning tab

Specify the settings for **Delay Warning** on this tab. For details about **Delay Warning**, see "*Delay warning of a monitor resource*" in "*7. Monitoring details*".



Heartbeat Delay Warning (1 to 99)

Set a percentage of heartbeat timeout at which the heartbeat delay warning is issued. If the time for the percentage passes without any heartbeat response, the warning will be produced in an alert log.

Monitor Delay Warning (1 to 99)

Set a percentage of monitor timeout at which the monitor delay warning is issued. If the time for the percentage passes without any monitor response, the warning will be produced in an alert log.

Initialize

Used for initializing the value to the default value. Click Initialize to initialize all the items to their default values.

6.1.13 Disk tab

Not used.

6.1.14 Mirror Disk tab

Not used.

6.1.15 Account tab

The **Account** tab is used to register and/or delete the user account that is used in the script executed by the cluster system. You can set up to 16 (sixteen) user accounts.

Add

Use **Add** to add a user account on the Account List. Click **Add** to display the **Enter account** dialog box.

- User Name
  Enter a user account name to be registered. When specifying an account of a domain, enter, for example, "*Domain Name**Account Name*".
- Password
  Enter a password of the user account to be registered.

Remove

Use **Remove** to remove a user account from the Account List. Select the user account you want to remove from **Account** and then click **Remove**.

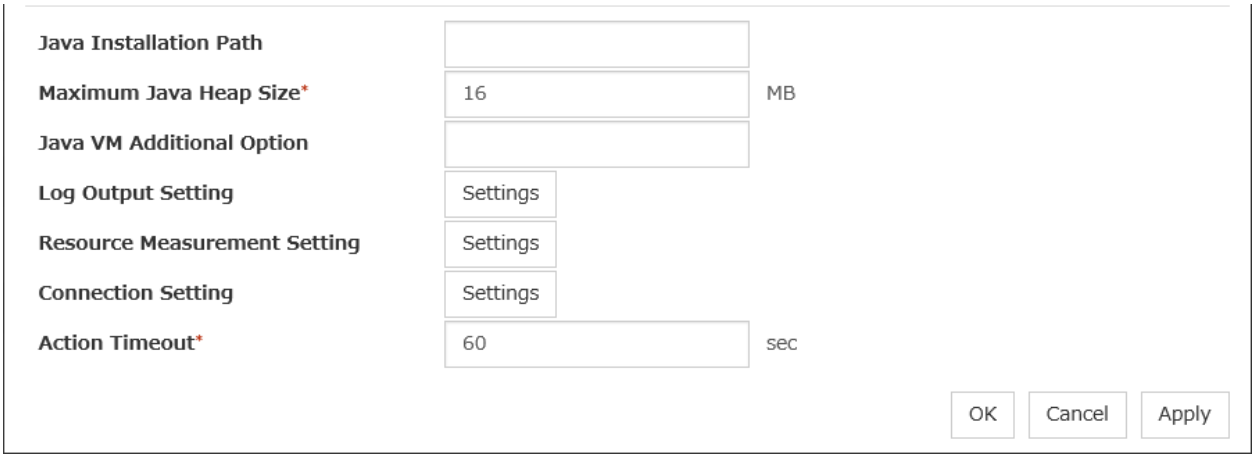
Edit

Use **Edit** to edit a user account. Select the user account you want to edit from **Account** and then click **Edit**. The **Enter account** dialog box where the selected account was entered is displayed.

6.1.16 JVM monitor tab

Configure detailed parameters for the JVM monitor.

Note: To display the **JVM monitor** tab in the config mode of Cluster WebUI, you need to execute **Update Server Info** after the license for Java Resource Agent is registered.



Java Installation Path (Within 255 bytes)

Set the Java VM install path used by the JVM monitor. Specify an absolute path using ASCII characters. Do not add "\" to the end of the path. Specification example: `C:\Program Files\Java\jdk1.8.0_102`

Maximum Java Heap Size (7 to 4096)

Set, in megabytes, the maximum Java VM heap size used by the JVM monitor (equivalent to -Xmx of the Java VM startup option).

Java VM Additional Option (Within 1024 bytes)

Set the Java VM startup option used by the JVM monitor. However, specify -Xmx for **Maximum Java Heap Size**. Specification example: -XX:+UseSerialGC

Log Output Setting

Click the **Settings** button to open the **Log Output Setting** dialog box.

Resource measurement Setting

Click the **Settings** button to open the **Resource Measurement Setting** dialog box.

Connection Setting

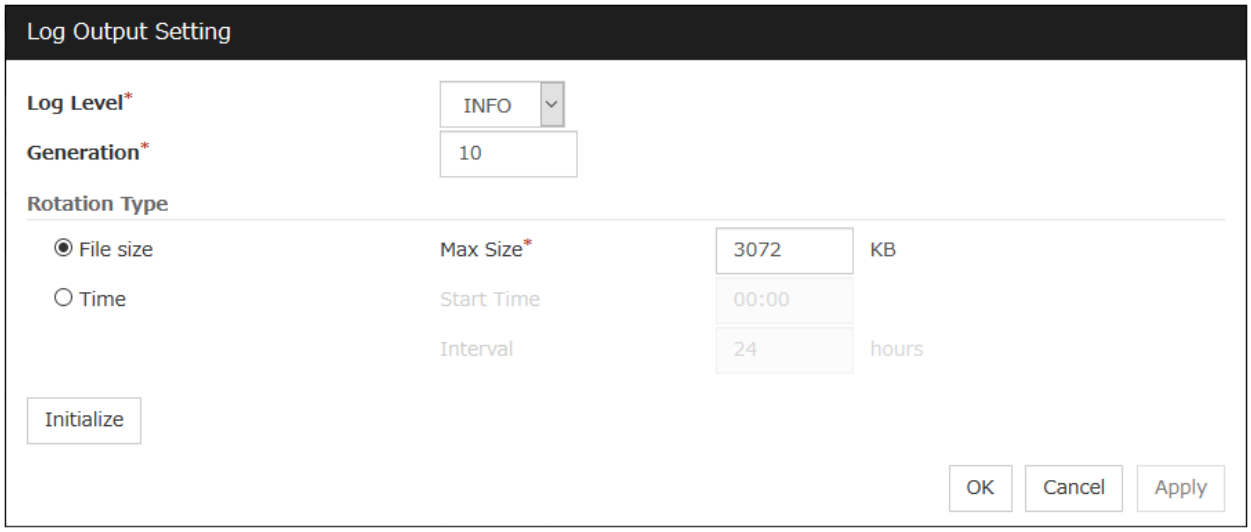
Click the **Settings** button to open the **Connection Setting** dialog box.

Action Timeout (30 to 300)

Set a timeout value for the **Command** that has been specified on each window of the JVM monitor. This setting becomes common for all of the **Commands**.

Log Output Setting

Clicking **Settings** displays the **Log Output Setting** dialog box.



Log Level

Select the log level of the log output by the JVM monitor.

Generation (2 to 100)

Set the number of generations to be retained for the log output by the JVM monitor. When Period is selected for Rotation Type, the rotation count is reset when cluster is suspended. Therefore, note that log files under the `<EXPRESSCLUSTER_install_path>log\ha\jra` increase per cluster suspend.

Rotation Type

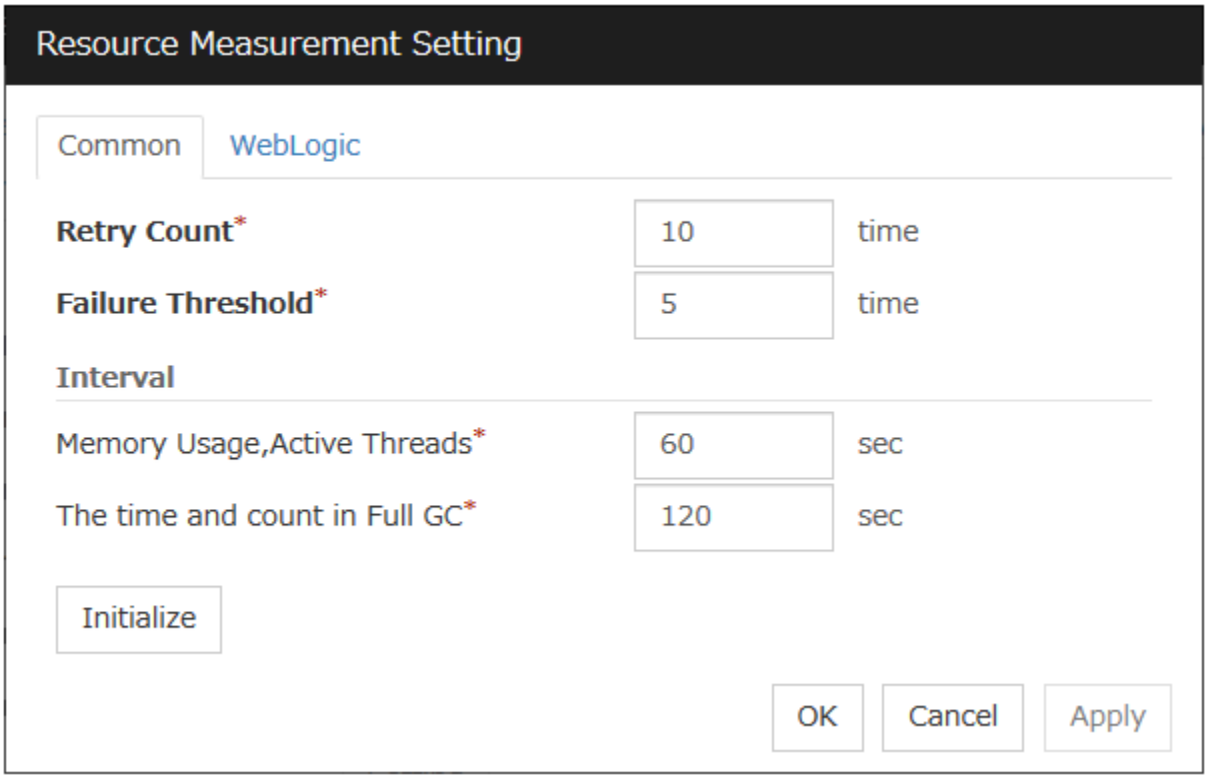
Select a rotation type for the log output by the JVM monitor. If you select **File Capacity** as the rotation type, set the maximum size (200 to 2097151), in kilobytes, for each log file such as the JVM operation log. If you select **Period** as the rotation type, set the log rotation start time in "hh:mm" format (hh: 0 to 23, mm: 0 to 59) and the rotation interval (1 to 8784) in hours.

Initialize

Clicking **Initialize** returns the log level, generation, and rotation type items to their default values.

Resource Measurement Setting [Common]

Clicking **Settings** displays the **Resource Measurement Setting** dialog box. For details on the scheme for error judgment by the JVM monitor, see "*5. Monitor resource details*".



Retry Count (1 to 1440)

Set the resource measurement retry count to be applied if the JVM monitor fails in resource measurement.

Error Threshold (1 to 10)

Set the number of times abnormal judgment is performed when the usage of the Java VM or the application server resources collected by the JVM monitor via resource measurement continuously exceed the customer-defined threshold.

Memory Usage, Active Threads (15 to 600)

Set the interval at which the JVM monitor measures the memory usage and active thread count.

The time and count in Full GC (15 to 600)

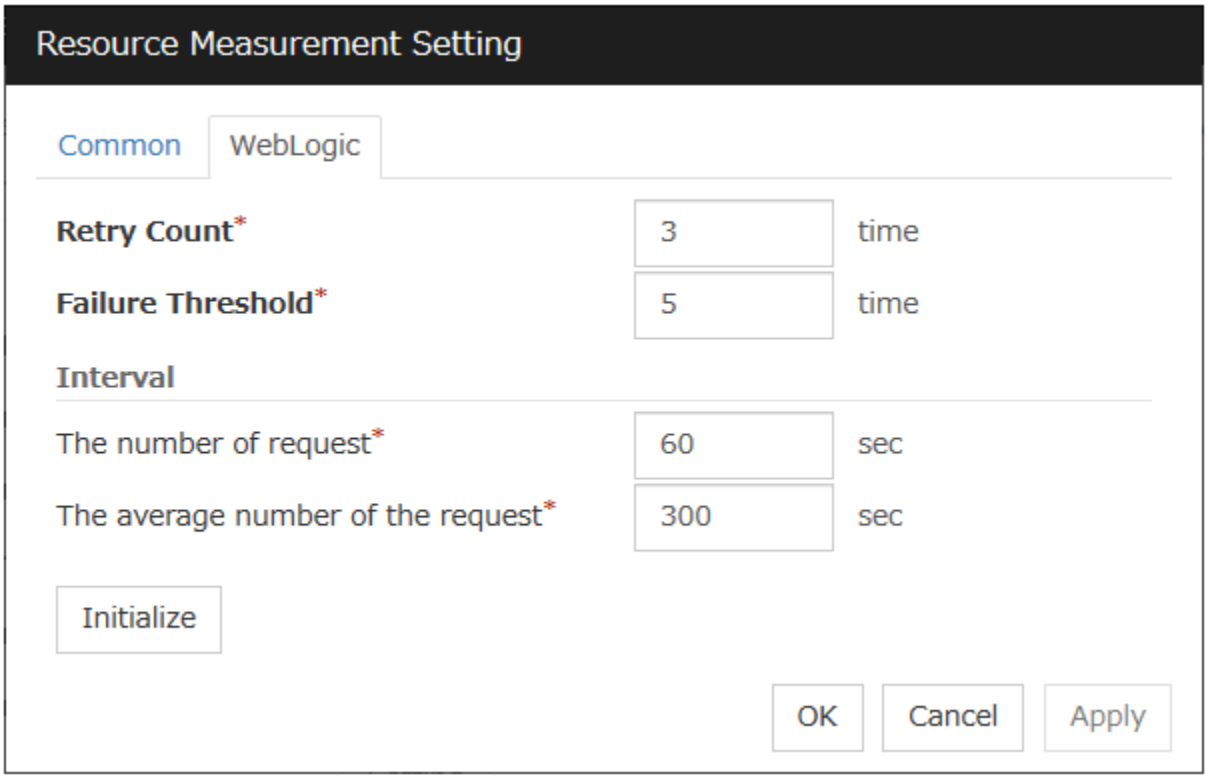
Set the interval at which the JVM monitor measures the time and count in Full GC execution.

Initialize

Clicking **Initialize** returns the retry count, error threshold, and interval items to their default values.

Resource Measurement Setting [WebLogic]

Clicking **Settings** displays the **Resource Measurement Setting** dialog box. For details on the scheme for error judgment by the JVM monitor, see "5. *Monitor resource details*".



Retry Count (1 to 5)

Set the resource measurement retry count to be applied if the JVM monitor fails in resource measurement.

Error Threshold (1 to 10)

Set the number of times abnormal judgment is performed when the usage of the Java VM or the application server resources collected by the JVM monitor via resource measurement continuously exceed the customer-defined threshold.

The number of request (15 to 600)

Set the interval at which the JVM monitor measures the number of work manager or thread pool requests during WebLogic monitor.

The average number of the request (15 to 600)

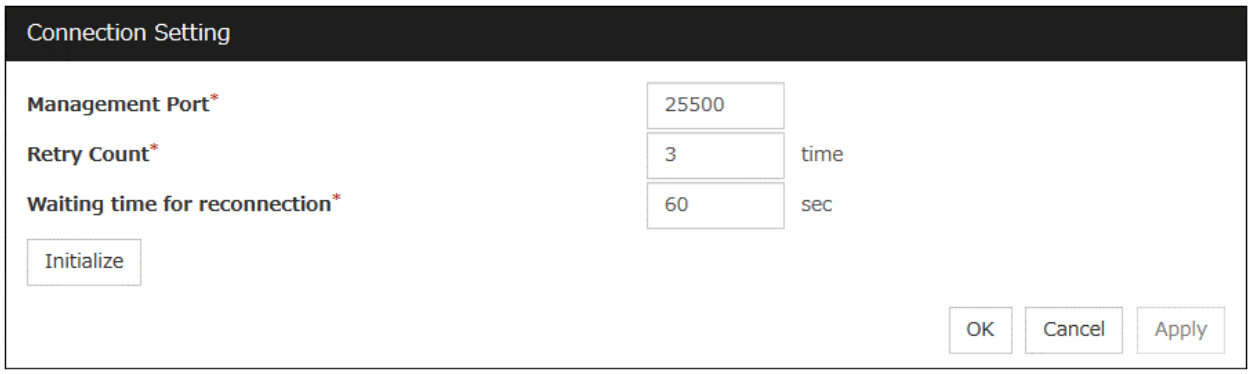
Set the interval at which the JVM monitor measures the average number of work manager or thread pool requests during WebLogic monitor. Set a value that is an integer multiple of the value set in **Interval: The number of request**.

Initialize

Clicking **Initialize** returns the retry count, error threshold, and interval items to their default values.

Connection Setting

Clicking **Settings** displays the **Connection Settings** dialog box.



Management Port (1 to 65535)

Sets the port number internally used by the JVM monitor resource. Make sure not to set the port number that has been used by other functions or programs.Set the number of the port connected to the monitor target Java VM. Do not set 42424 to 61000.

Retry Count for (1 to 5)

Set the retry count to be applied if connection to the monitor target Java VM fails.

Waiting time for reconnection (15 to 60)

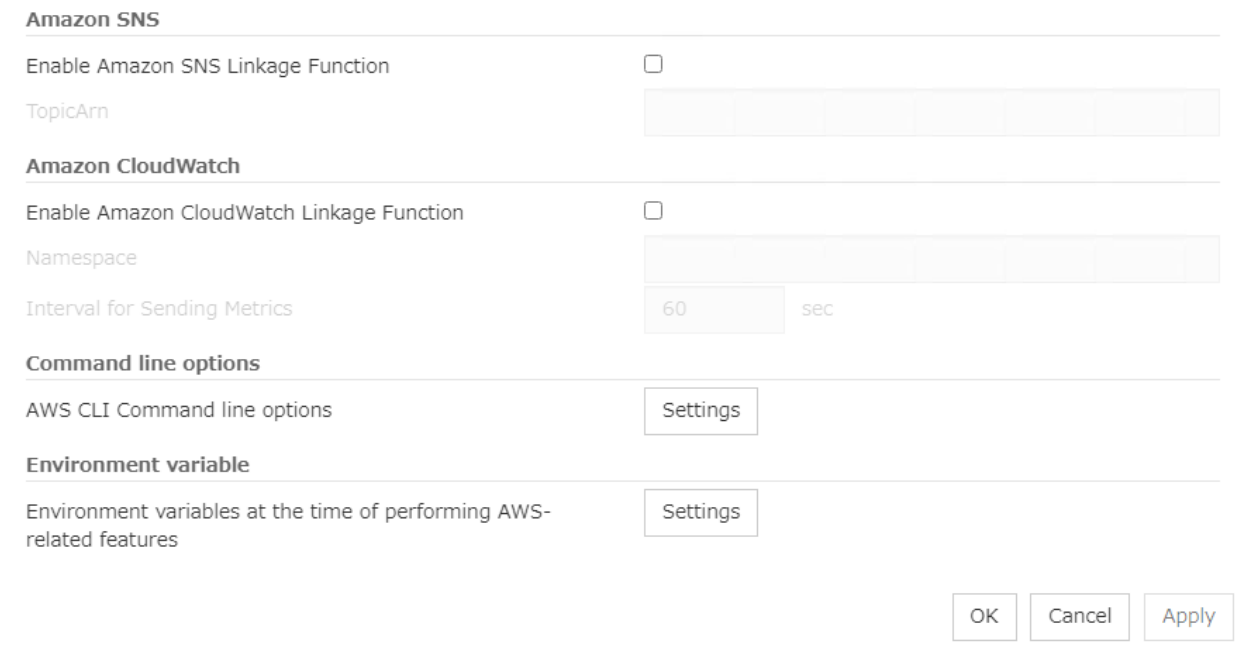
Set the interval at which the JVM monitor retries connection if it fails in Java VM connection.

Initialize

Clicking **Initialize** sets the management port, retry count, and waiting time for reconnection items to their default values.

6.1.17 Cloud tab

Configure functions for cloud environments.



Enable Amazon SNS linkage function

Enable or disable the Amazon SNS linkage function.

- If the check box is checked:
  The Amazon SNS linkage function is enabled.
  Amazon SNS is used as a destination of EXPRESSCLUSTER messages.
  By default, the messages are sent as shown in "Error messages" in the "EXPRESSCLUSTER X SingleServerSafe Operation Guide": the "o"-marked lines of the [8] column in the table of "Messages reported by event log and alert".
  To send other messages:
  Go to **Cluster Properties** -> the **Alert Service** tab -> **Change Alert Destination** -> **Destination**, and then select **Message Topic**.
- If the check box is not checked:
  The Amazon SNS linkage function is disabled.

TopicArn

Set TopicArn for the Amazon SNS linkage function.

Enable Amazon CloudWatch linkage function

Enable or disable the Amazon CloudWatch linkage function.

- If the check box is checked:
  The Amazon CloudWatch linkage function is enabled.
  Amazon CloudWatch is informed of the monitoring process time taken by the monitor resource.
- If the check box is not checked:
  The Amazon CloudWatch linkage function is disabled.

Note: Using the Amazon CloudWatch linkage function requires turning on **Enable Amazon CloudWatch linkage function**, and enabling **Send polling time metrics** of the **Monitor (common)** tab for the target monitor resource.

Namespace

Set Namespace for the Amazon CloudWatch linkage function.

Interval for Sending Metrics

Set the frequency of informing Amazon CloudWatch of the monitoring process time taken by the monitor resource.

AWS CLI command line options

Clicking **Settings** displays a text box for each AWS service.
For each AWS service, set AWS CLI command line options to be applied.

Environment variables at the time of performing AWS-related features

Clicking **Settings** displays a dialog box listing environment variables.

Environment variable List

Clicking **Edit** displays a dialog box to edit the selected environment variable.
Clicking **Add** displays a dialog box to add a new environment variable.
Clicking *Remove** deletes the selected environment variable.

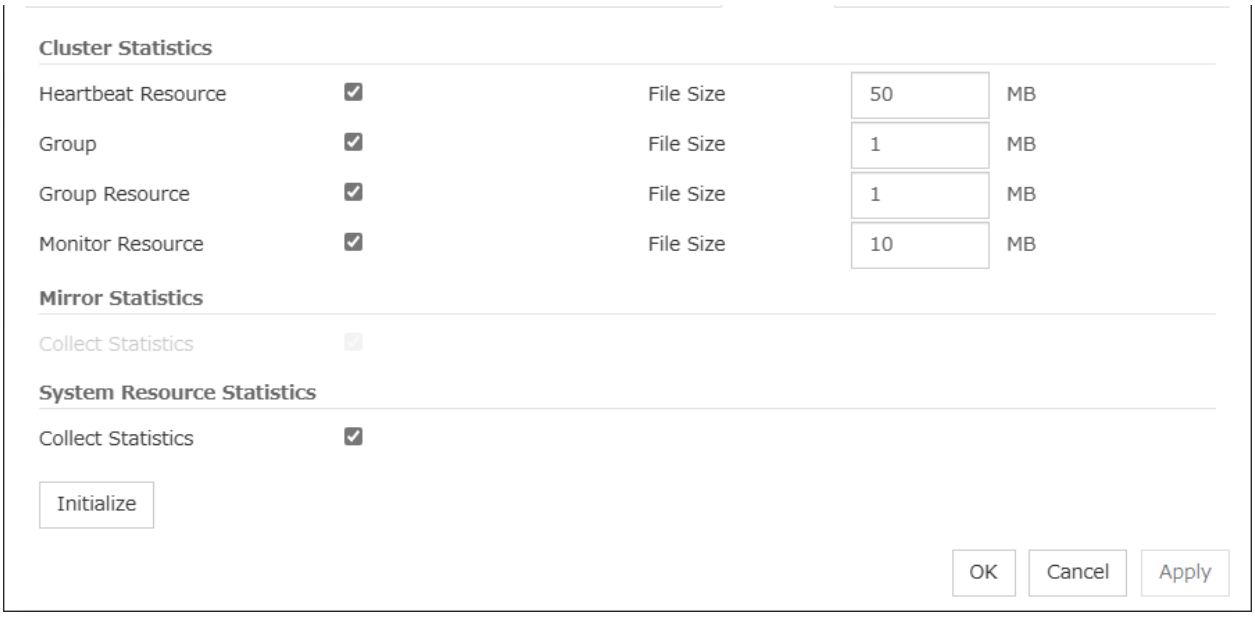
Enter environment variable

Enter the name and value of an environment variable.

- Name (within 259 bytes)
  Specify the name of an environment variable.
- Value (within 2047 bytes)
  Specify the value of the environment variable.

6.1.18 Statistics tab

Configure the settings for statistics.



Cluster Statistics

You can collect and see data on the cluster operation such as the required time of a group failover and that of resource activation.
For details, see "Cluster statistics information collection function" in "The system maintenance information" in the "EXPRESSCLUSTER X Maintenance Guide".

- When the check box is selected:
  The cluster statistical information is collected.
  - **File Size** (whose setting range depends on the type)
    Specify the size of the cluster statistical information file.
    When the collected information reaches the specified size, rotation occurs to save up to two generations of the data.
- When the check box is not selected:
  The cluster statistical information is not collected.

Note:

In **Cluster Statistics**, **File Size** can be specified as follows:

- Heartbeat resource: 1 to 50 (MB)
- Group: 1 to 5 (MB)

- Group resource: 1 to 5 (MB)
- Monitor resource: 1 to 10 (MB)

Mirror Statistics

Not used.

System Resource Statistics

Select whether to collect system resource information.

System resource information is collected regularly so as to improve system operability. System resource information is useful for investigating the operation status of EXPRESSCLUSTER, and makes it easy to determine the cause of a failure attributable to a shortage of system resources.

For details, see "System resource statistics information collection function" and "Process resource statistics information collection function" in "The system maintenance information" in the "EXPRESSCLUSTER X Maintenance Guide".

- When the check box is selected:

  System resource information related to the CPU, memory, processes, and others is collected regularly while the cluster is running.

  The collected system resource information is collected when the clplogcc command or Cluster WebUI collects logs.

  Specify type 1 to collect the log by the clplogcc command; specify Pattern 1 to collect the log by the Cluster WebUI. For details on log collection, see "Collecting logs (clplogcc command)" in "EXPRESSCLUSTER X SingleServerSafe command reference" in the "EXPRESSCLUSTER X SingleServerSafe Operation Guide", or the online manual.

  A disk area of 450 MB or more is required to store the resource information, depending on the system operating conditions such as the number of processes that are running.

- When the check box is not selected:

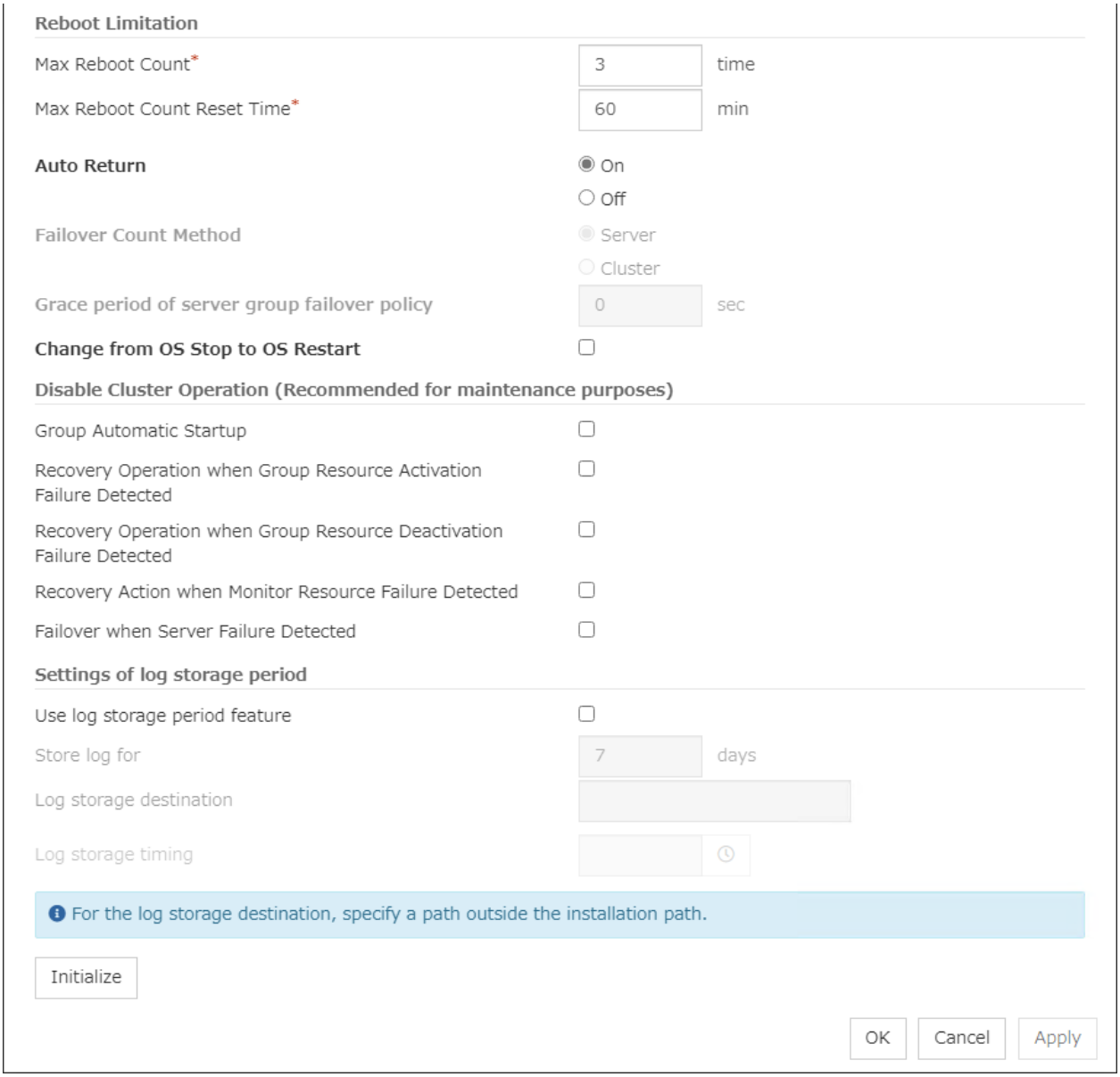
  No system resource information is collected.

Initialize

Used for initializing the value to the default value. Click **Initialize** to initialize all the items to their default values.

6.1.19 Extension tab

Configure other cluster settings.



Reboot Limitation

You can specify the **Reboot OS** or **Shut down OS** as the final action at abnormality detection for group resources and monitor resources. If either of them is selected, reboot may be repeated infinitely. By setting the reboot limit, you can prevent repeated reboots.

- Max Reboot Count (0 to 99)
  Specify how many times the operating system can reboot. The number specified here is separately counted for group resource and monitor resource.
  With **Max Reboot Count** set to zero, the reboot can be unlimitedly repeated.
- Max Reboot Count Reset Time (0 to 999)

When the max reboot count is specified, if the operation from the cluster startup keeps running normally for the time specified here, the reboot count is reset. The time specified here is separately counted for group resource and monitor resource.

Note: If **Max Reboot Count** is set to 1 or greater, set **Max Reboot Count Reset Time** also to 1 or greater. If the time to reset the maximum reboot count is set to zero (0), the number of reboot will be unavailable, thus, shutdown/reboot are executed every time at failure detection regardless of the maximum reboot count.

Auto Return

- On
  Select this to perform the auto recovery.
- Off
  Select this not to perform the auto recovery.

Failover Count Method

Not used.

Grace period of server group failover policy (0 to 99999)

Not used.

Change from OS Stop to OS Restart

Determine whether the OS stop action is collectively changed to OS restart action.

- If the check box is checked:
  The action change is made.
- If the check box is not checked:
  The action change is not made.

The changed action changes the following actions.
No actions other than those below are changed.

- Action with an abnormal cluster service process
  - With **Emergency shutdown** selected
    Changes to **Reboot the OS** after the emergency shutdown.
- Action in case of an activation/deactivation stall of a group resource
  - With **Emergency shutdown** selected
    Changes to **Reboot the OS** after the emergency shutdown.
- Final action with the abnormal activation/deactivation of a group resource
  - With **Stop cluster service and shutdown OS** selected:
    Changes to **Stop cluster service and reboot OS**.
- Final action with an abnormal monitor resource
  - With **Stop cluster service and shutdown OS** selected:
    Changes to **Stop cluster service and reboot OS**.

Note: The action change does not affect the following monitor resources:

- Eternal link monitor resources
- User mode monitor resources

Disable Cluster Operation

- Group Automatic Startup
  - If the check box is checked:
    The group automatic startup is disabled.
  - If the check box is not checked:
    The group automatic startup is not disabled.
- Recovery Operation when Group Resource Activation Failure Detected
  - If the check box is checked:
    This disables the recovery operation when group resource activation failure detected.
  - If the check box is not checked:
    This does not disable the recovery operation when group resource activation failure detected.
- Recovery Operation when Group Resource Deactivation Failure Detected
  - If the check box is checked:
    This disables the recovery operation when group resource deactivation failure detected.
  - If the check box is not checked:
    This does not disable the recovery operation when group resource deactivation failure detected.
- Recovery Action when Monitor Resource Failure Detected
  - If the check box is checked:
    This disables the recovery action when monitor resource failure detected.
  - If the check box is not checked:
    This does not disable the recovery action when monitor resource failure detected.
- Failover when server failure detected
  - Not used.

Note:

Disabling the recovery action when monitor resource failure detected does not affect the following actions.
- Action when the stall failure of disk RW monitor resources is detected
- Action when the user mode monitor resources timeout occurs
- Recovery action of the eternal link monitor resource

Settings of log storage period

- Use log storage period feature
  Renames (not deletes) an old log file (whose name ends with 0.log, 1.log, or pre) in the following folders to <date and time when the file was last updated>_<type name>.log, when the file is rotated:
  - <installation path>/log
  - <installation path>/perf

The log file renamed as above is compressed at a specified time, then saved as <date when the file was compressed_server name>.zip to a given log storage destination.

- Store log (1 to 9999)
  Specify a log storage period (up to 9999 days). When this period elapses, the corresponding log files are automatically removed.
- Log storage destination (within 170 characters)
  Specify an absolute path to the storage folder, in ASCII characters.
  The specified folder needs to be created in advance outside the installation path.
  Make sure that free space and write performance are sufficiently available.
- Log storage timing
  Specify a time at which the storage occurs every day, in the pop-up window opened by clicking the timepiece icon.

Initialize

Used for initializing the value to the default value. Click Initialize to initialize all the items to their default values.

6.2 Server properties

In the **Server Properties** window, you can add, remove, and edit interfaces, such as IP addresses and devices, that are used by the server. From the aspect of network environment, IP addresses have the following restrictions:

- One server cannot have two or more IP addresses that belong to the same network address. Likewise, containment is not allowed as follows.
  - IP address: 10.1.1.10, Subnet mask: 255.255.0.0
  - IP address: 10.1.2.10, Subnet mask: 255.255.255.0

6.2.1 Info tab

You can display the server name, and register and make a change to a comment on this tab.

Name:

The selected server name is displayed. You cannot change the name here.

Comment (within 127 bytes)

You can specify a comment for the server. You can only enter one byte English characters.

6.2.2 Warning Light tab

Not used.

6.2.3 HBA tab

Not used.

6.3 Upper limits of registration

	Version	You can register up to
Server	4.0.0-1 or later	1
Group	4.0.0-1 or later	128
Group resource (Per one group)	4.0.0-1 or later	512
Monitor resource	4.0.0-1 or later	384

CHAPTER

SEVEN

MONITORING DETAILS

This chapter provides details about how several different types of errors are detected, in order to help you find out how to best set up the monitor interval, monitor timeout, and monitor retry count.

This chapter covers:

7.1 Always monitor and Monitors while activated

When **Always monitor** is selected, monitoring begins when the server is up and running and EXPRESSCLUSTER X SingleServerSafe is ready to run.

When **Monitors while activated** is selected, monitoring is performed from when a specified resource is activated (until that resource is deactivated (stopped)).

Some monitor resources have a fixed monitor timing, while others allow you to choose between two monitor timing options.

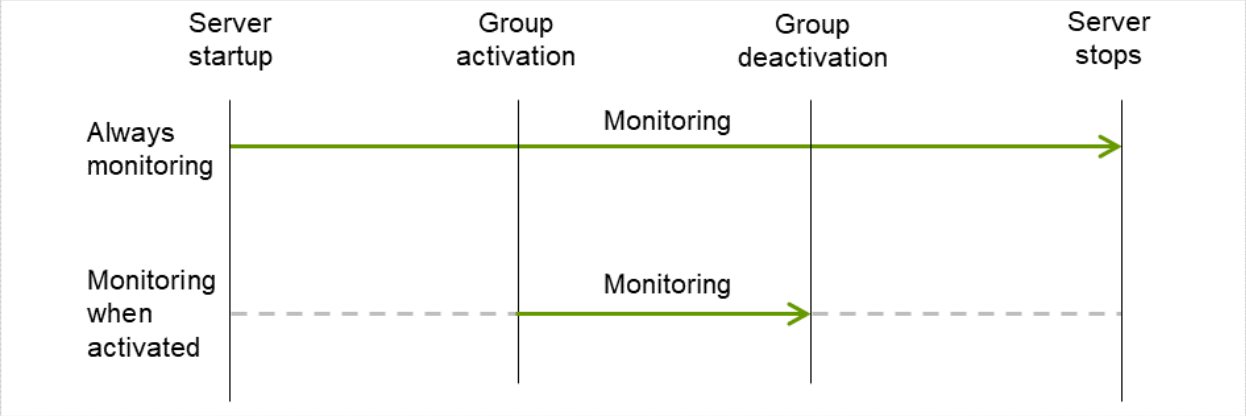


Fig. 7.1: Always monitor and Monitors while activated for a monitor resource

7.2 Enabling and disabling Dummy failure of monitor resources

You can enable and disable dummy failure of monitor resources.
Use one of the following methods to enable or disable dummy failure.

- Operation on Cluster WebUI (verification mode)
  On the Cluster WebUI(Verification mode), shortcut menus of the monitor resources which cannot control monitoring are disabled.
- Operation by using the clpmonctrl command
  The clpmonctrl command can control only monitor resources on the server where this command is run. When the clpmonctrl command is executed on monitor resource which cannot be controlled, dummy failure is not enabled even though the command succeeds.

Some monitor resources can enable and disable dummy failure and others cannot.
For details, refer to "Controlling monitor resources (clpmonctrl command)" in "EXPRESSCLUSTER X SingleServerSafe command reference" in the "EXPRESSCLUSTER X SingleServerSafe Operation Guide".

Dummy failure of a monitor resource is disabled if the following operations are performed.

- Dummy failure was disabled on Cluster WebUI (verification mode)
- "Yes" was selected from the dialog displayed when the Cluster WebUI mode changes from verification mode to a different mode.
- -n was specified to enable dummy failure by using the clpmonctrl command
- Stop the cluster
- Suspend the cluster

7.3 Monitor resource monitor interval

All monitor resources monitor their targets at every monitoring interval.

Following are different timelines illustrating how a monitor resource performs monitoring with or without an error based on the specified monitor interval.

When no error is detected

Examples of behavior when the following values are set.

<Monitor>
Monitor Interval 30 sec
Monitor Timeout 60 sec
Monitor Retry Count 0 times

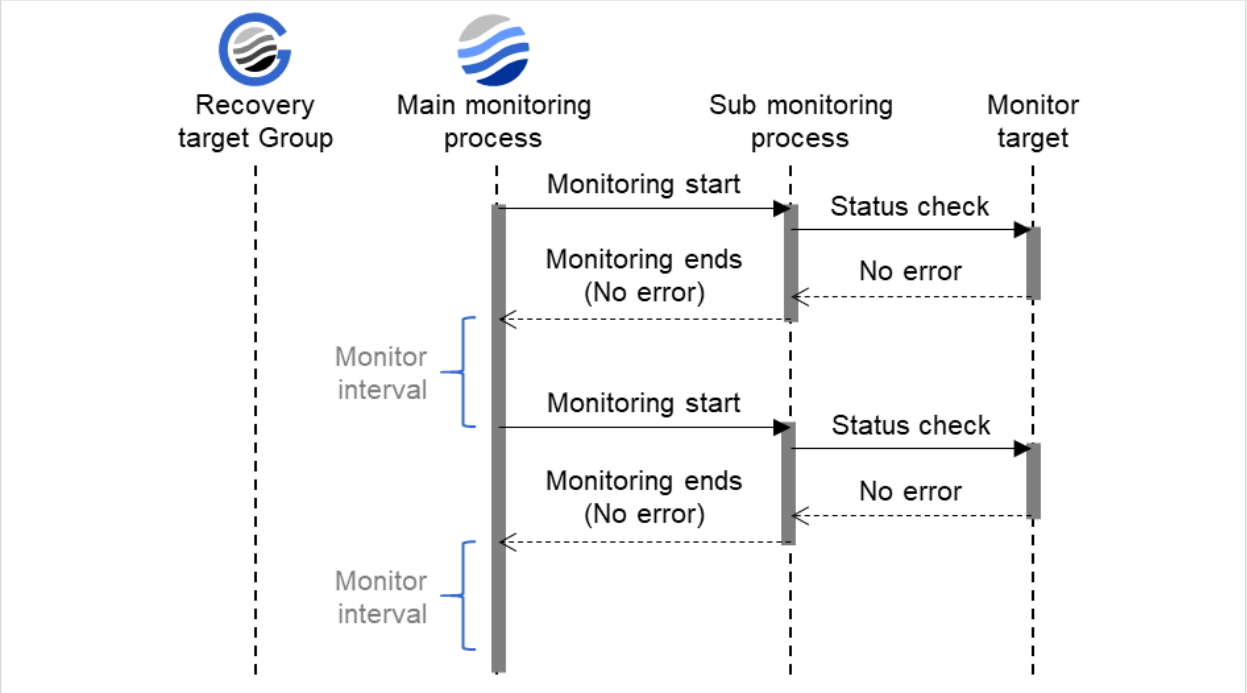


Fig. 7.2: Monitoring interval (no error detected)

When an error is detected (without monitor retry settings)

After an error occurs, it is detected next time monitoring is performed, and then the recovery target is reactivated.

Examples of behavior when the following values are set.

<Monitor>
Monitor Interval 30 sec
Monitor Timeout 60 sec

Monitor Retry Count 0 times

<Error Detection>
Recovery Action Restart the recovery target
Recovery Target Group
Recovery Script Execution Count 0 time
Reactivation Threshold 0 time
Final Action No Operation

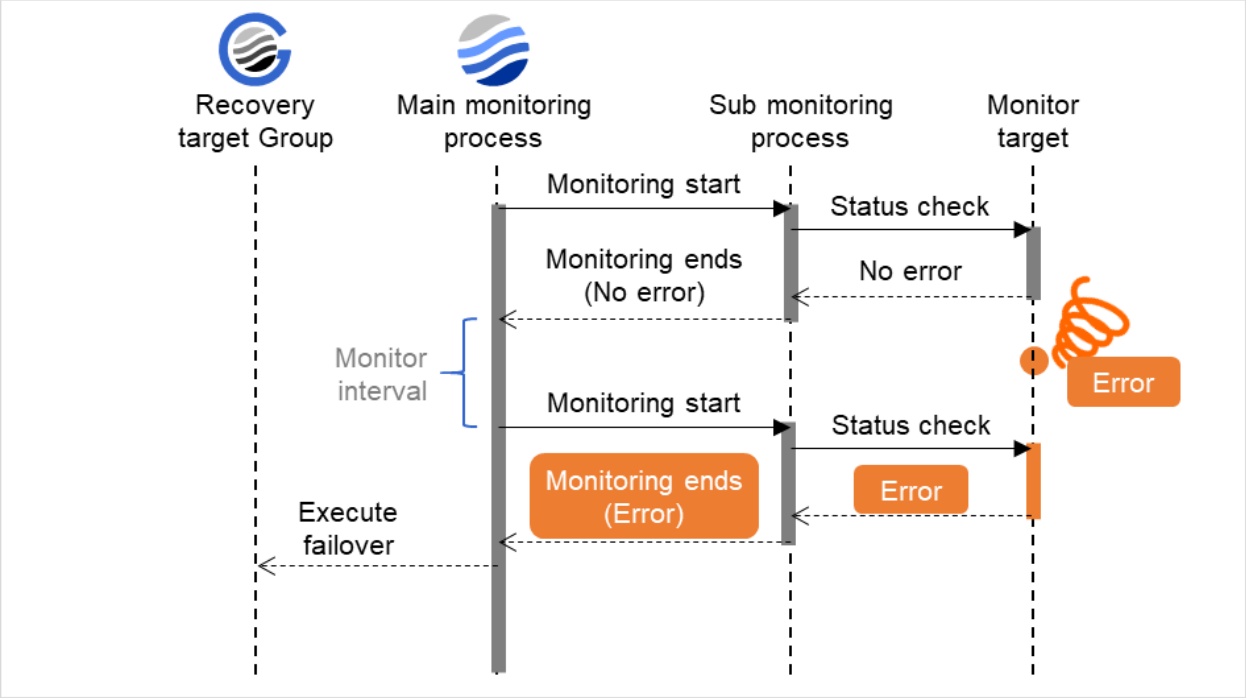


Fig. 7.3: Monitoring interval (an error detected, without monitor retry settings)

When an error is detected (with monitor retry settings)

After an error occurs, it is detected next time monitoring is performed, and then, if recovery cannot be achieved before the monitor retry count is reached, the recovery target is reactivated.

Examples of behavior when the following values are set.

<Monitor>
Monitor Interval 30 sec
Monitor Timeout 60 sec
Monitor Retry Count 2 times

<Error Detection>
Recovery Action Restart the recovery target

Recovery Target Group
Recovery Script Execution Count 0 time
Reactivation Threshold 0 time
Final Action No Operation

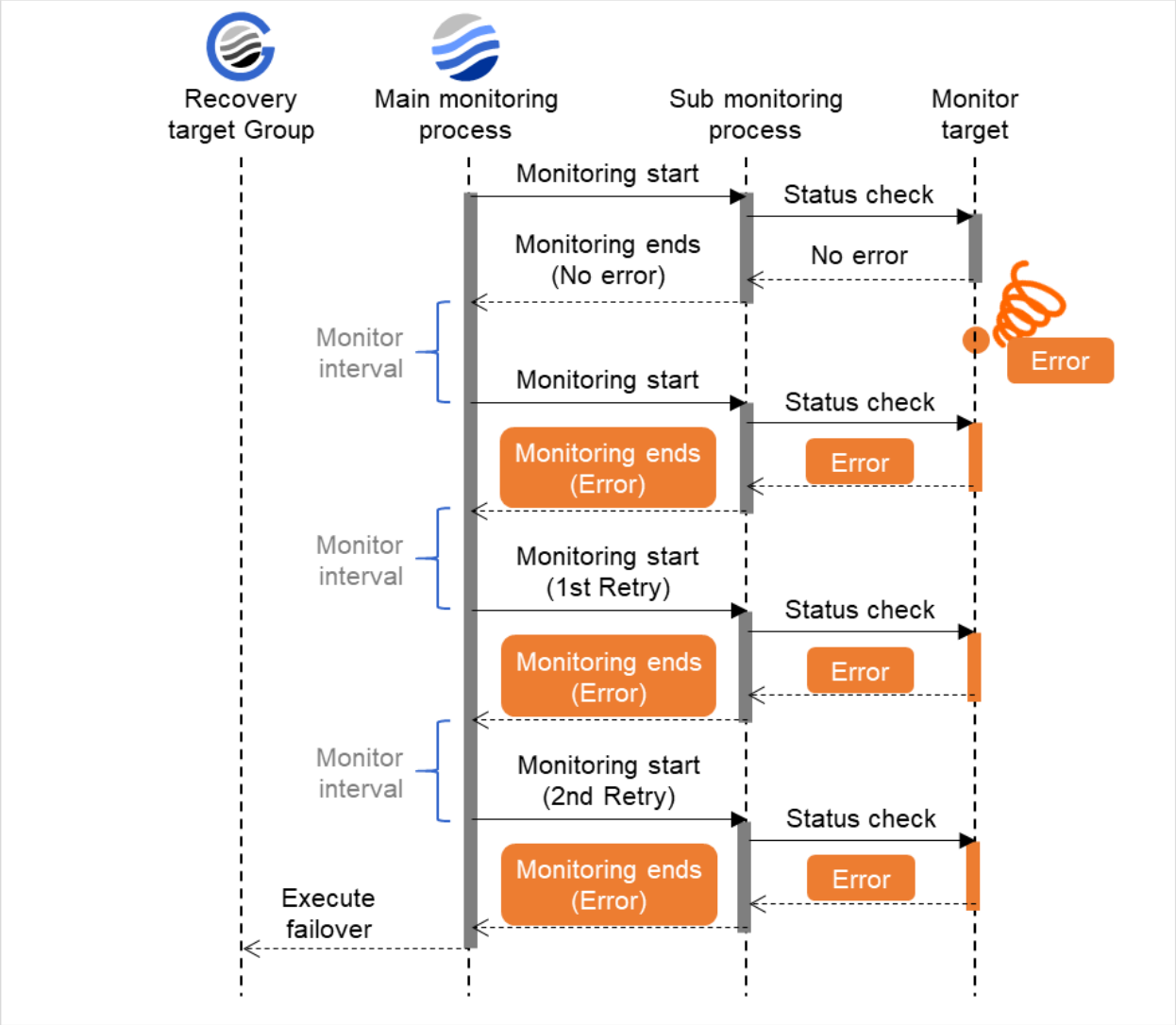


Fig. 7.4: Monitoring interval (an error detected, with monitor retry settings)

When an error is detected (without monitor retry settings)

After a monitor timeout occurs, the recovery target is immediately reactivated for the recovery action.

Examples of behavior when the following values are set.

<Monitor>
Monitor Interval 30 sec
Monitor Timeout 60 sec

Monitor Retry Count 0 times

<Error Detection>
Recovery Action Restart the recovery target
Recovery Target Group
Recovery Script Execution Count 0 time
Reactivation Threshold 0 time
Final Action No Operation

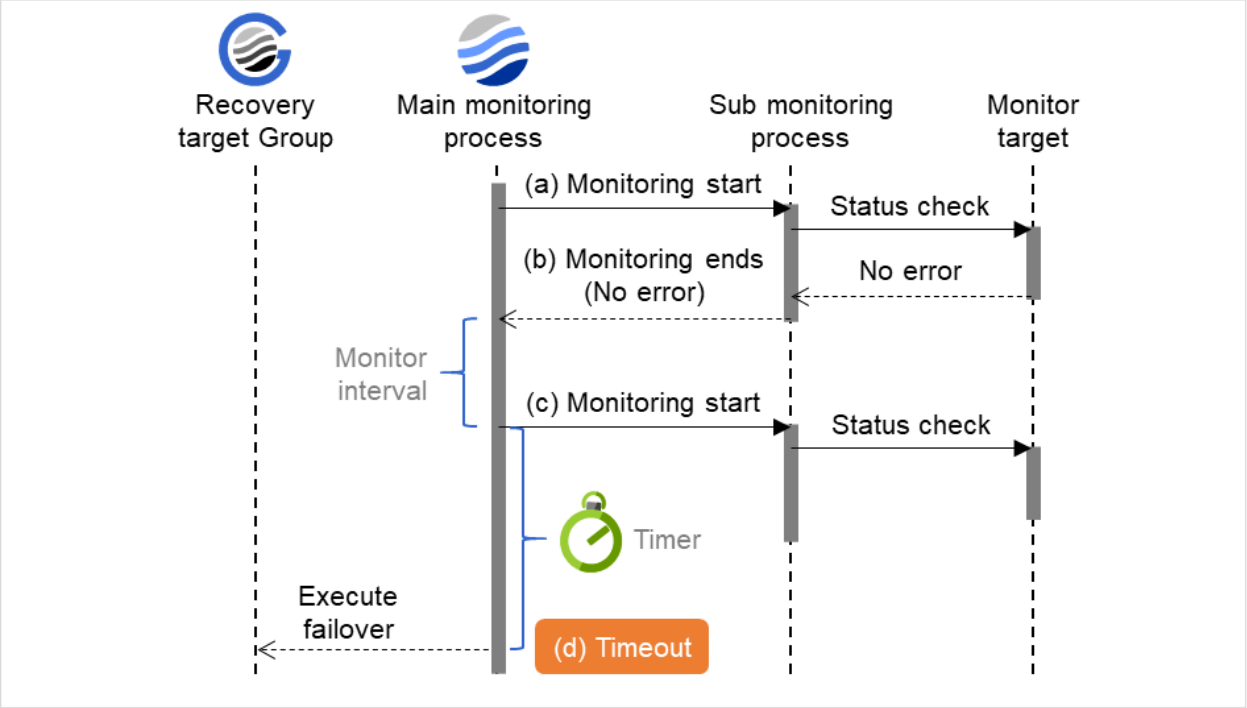


Fig. 7.5: Monitoring interval (a monitoring timeout detected, without monitor retry settings)

When a monitoring timeout is detected (with monitor retry setting)

After a monitor timeout occurs, another monitor attempt is made and, if it fails, the recovery target is reactivated.

Examples of behavior when the following values are set.

<Monitor>
Monitor Interval 30 sec
Monitor Timeout 60 sec
Monitor Retry Count 1 times

<Error Detection>
Recovery Action Restart the recovery target

Recovery Target Group
Recovery Script Execution Count 0 time
Reactivation Threshold 0 time
Final Action No Operation

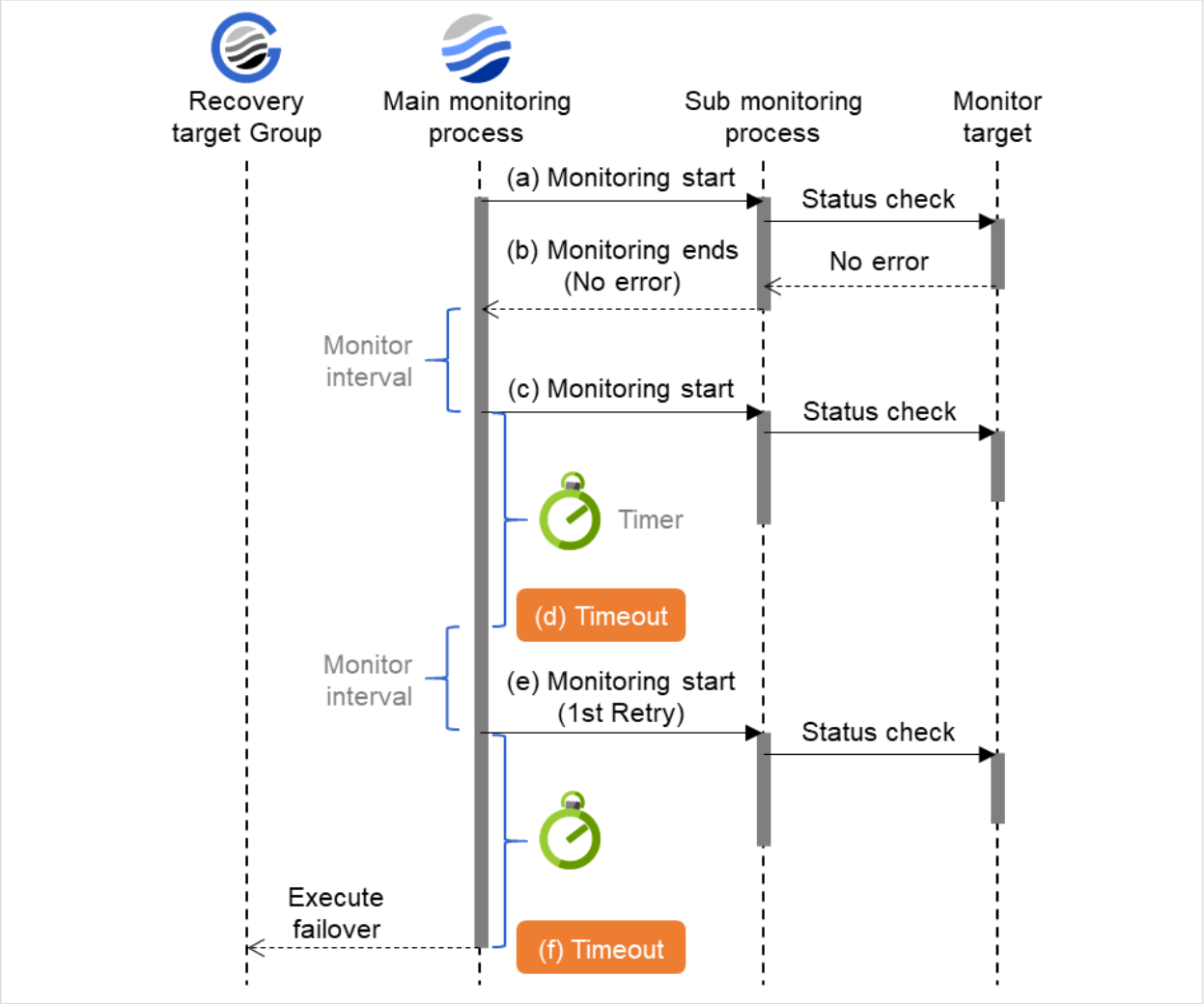


Fig. 7.6: Monitoring interval (a monitoring timeout detected, with monitor retry settings)

7.4 Action when an error is detected by a monitor resource

When an error is detected, the following recovery actions are taken against the recovery target in sequence:

- Execution of the recovery script: this takes place when an error is detected in a monitor target.
- Reactivation of the recovery target: this takes place if the recovery script is executed up to the recovery script execution count. When the execution of a pre-reactivation script is specified, reactivation starts after that script has been executed.
- When an error is detected in the monitor target, the recovery target is reactivated. (This is not the case if **Execute Only Final Action** is selected for **Recovery Action** or if **Maximum Reactivation Count** is set to 0 in **Custom**).
- If reactivation fails or the error is detected again after reactivation, the final action is performed. (If **Maximum Reactivation Count** is set to 2 or greater in **Custom**, reactivation is retried the specified number of times.).

No recovery action is taken if the status of the recovery target is:

Recovery Target	Status	Reactivation[2]	Final Action[3]
Group/Group Resource	Already stopped	No	No
	Being activated/stopped	No	No
	Already activated	Yes	Yes
	Error	Yes	Yes
Local Server	-	-	Yes

Yes: Recovery action is taken No: Recovery action is not taken

---

Note: Do not perform the following operations by using the Cluster WebUI or command line while recovery processing is changing (reactivation -> last operation), if a group resource (an application resource, service resource, or other resource) is specified as a recovery target and when a monitor resource detects an error.

- Stopping/suspending the cluster
- Starting/stopping/moving a group

If you perform the above-mentioned operations while recovery caused by detection of an error by a monitor resource is in progress, other group resources of the group with an error may not stop.

However, you can perform them when the final action is completed.

When the status of the monitor resource recovers from the error (becomes normal), the settings for the reactivation count and whether to execute the final action are reset. Note that, when a group or group resource is specified as the recovery target, these counters are reset only when the status of all the monitor resources for which the same recovery target is specified become normal.

An unsuccessful recovery action is also counted as part of the reactivation count.

---

[2] Effective only when the value for the reactivation threshold is set to 1 (one) or greater.
[3] Effective only when an option other than No Operation is selected.

7.5 Recovering from a monitor error (normal)

When the recovery of a monitor resource is detected during a recovery action or after all recovery actions are completed following the detection of a monitor error, the counter for the reactivation threshold maintained by that monitor resource is reset. Note that, when a group or group resource is specified as the recovery target, these counters are reset only when the status of all the monitor resources for which the same recovery target is specified become normal.

Whether or not to execute the final action is reset (execution required).

7.6 Activation or deactivation error for the recovery target during recovery

When the monitoring target of the monitor resource is the device used for the group resource of the recovery target, an activation/deactivation error of the group resource may be detected during recovery when a monitoring error is detected.

7.7 Recovery/pre-recovery action script

Upon the detection of a monitor resource error, a recovery script can be configured to run. Alternatively, before the reactivation or final action of a recovery target, a pre-recovery action script can be configured to run.
The script is a common file.

Environment variables used in the recovery/pre-recovery action script

EXPRESSCLUSTER sets status information (the recovery action type) in the environment variables upon the execution of the script.
The script allows you to specify the following environment variables as branch conditions according to the operation of the system.

Environment variable	Value of the environment variable	Description
CLP_MONITORNAME ...Monitor resource name	Monitor resource name	Name of the monitor resource in which an error that causes the recovery/pre-recovery action script to run is detected.
CLP_VERSION_FULL ...EXPRESSCLUSTER full version	EXPRESSCLUSTER full version	Represents the EXPRESSCLUSTER full version. Example: 13.21
CLP_VERSION_MAJOR ...EXPRESSCLUSTER major version	EXPRESSCLUSTER major version	Represents the EXPRESSCLUSTER major version. Example: 13
CLP_PATH ...EXPRESSCLUSTER installation path	EXPRESSCLUSTER installation path	Represents the path where EXPRESSCLUSTER is installed. Example: `C:\Program Files\EXPRESSCLUSTER SSS`
CLP_OSNAME ...Server OS name	Server OS name	Represents the OS name of the server where the script was executed. Example: Windows Server 2016 Standard

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Table 7.2 – continued from previous page

Environment variable	Value of the environment variable	Description
CLP_OSVER ...Server OS version	Server OS version	Represents the OS version of the server where the script was executed. Example: 6.2.0.0.274.3
CLP_ACTION ...Recovery action type	RECOVERY	Execution as a recovery script.
	RESTART	Execution before reactivation.
	FAILOVER	Not used.
	FINALACTION	Execution before final action.
CLP_RECOVERYCOUNT ...Recovery script execution count	Recovery Script Execution Count	Count for recovery script execution.
CLP_RESTARTCOUNT ...Reactivation count	Reactivation count	Count for reactivation.
CLP_FAILOVERCOUNT ...Failover count	Failover count	Not used.

Writing recovery/pre-recovery action scripts

This section explains the environment variables mentioned above, using a practical scripting example.

Example of a recovery/pre-recovery action script

```
rem ***************************************************
rem *                    preaction.bat                *
rem ***************************************************

echo START

IF "%CLP_ACTION%"=="" GOTO NO_CLP

IF "%CLP_ACTION%"=="RECOVERY" GOTO RECOVERY
IF "%CLP_ACTION%"=="RESTART" GOTO RESTART
IF "%CLP_ACTION%"=="FINALACTION" GOTO FINALACTION
GOTO NO_CLP

:RECOVERY
echo RECOVERY COUNT: %CLP_RECOVERYCOUNT%

rem Write the recovery process here.
rem This process is executed at the following timing:
rem
```

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```
rem  Recovery action: Recovery script

GOTO EXIT


:RESTART
echo RESTART COUNT: %CLP_RESTARTCOUNT%

rem Write the pre-reactivation process here.
rem This process is executed at the following timing:
rem
rem  Recovery action: Reactivation

GOTO EXIT


:FINALACTION
echo FINALACTION

rem Write the recovery process here.
rem This process is executed at the following timing:
rem
rem  Recovery action: Final action

GOTO EXIT

:NO_CLP

:EXIT
echo EXIT
exit
```

Tips for recovery/pre-recovery action script coding

Pay careful attention to the following points when coding the script.

- When the script contains a command that requires a long time to run, log the end of execution of that command. The logged information can be used to identify the nature of the error if a problem occurs. clplogcmd is used to log the information.

Note on the recovery/pre-recovery action script

- None.

7.8 Delay warning of a monitor resource

When a server is heavily loaded, due to a reason such as applications running concurrently, a monitor resource may detect a monitoring timeout. It is possible to have settings to issue an alert at the time when the time for monitor processing (the actual elapsed time) reaches a certain percentages of the monitoring time before a timeout is detected.

The following figure shows timeline until a delay warning of the monitor resource is used.

In this example, the monitoring timeout is set to 60 seconds and the delay warning rate is set to 80%, which is the default value.

In this example, the monitoring timeout is set to 60 seconds, the delay warning rate is set to the default value, 80% (48 seconds), and the arrows show the polling time for the monitoring.

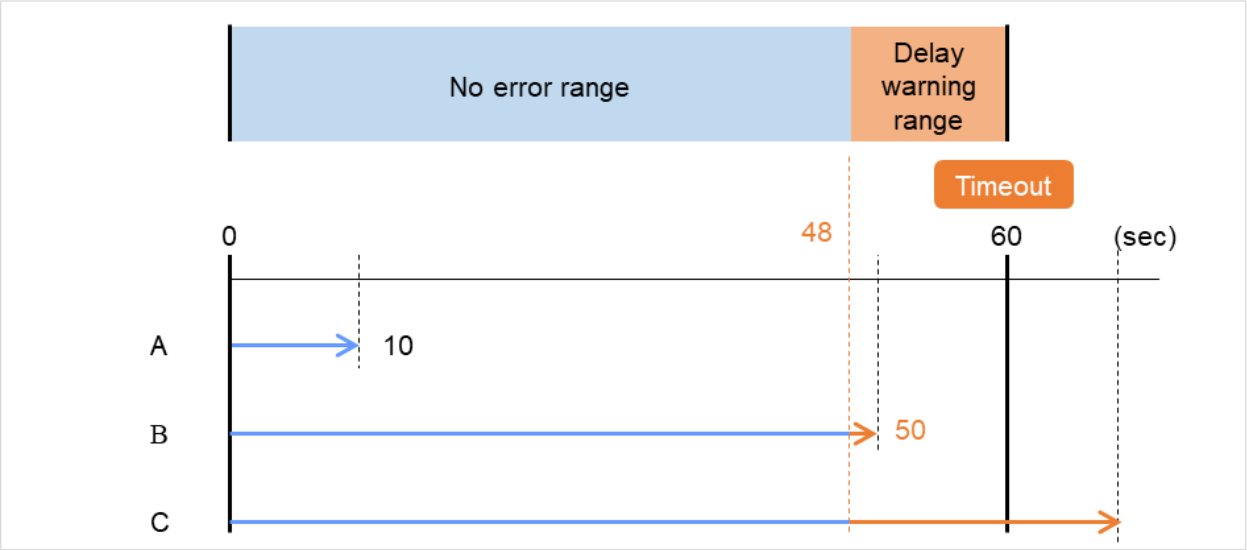

Fig. 7.7: Monitoring polling time and delay warning

A. The time for monitor processing is 10 seconds. The monitor resource is in normal status.
   In this case, no alert is used.

B. The time for monitor processing is 50 seconds and the delay of monitoring is detected during this time. The monitor resource is in the normal status.
   In this case, an alert is used because the delay warning rate has exceeded 80%.

C. The time for monitor processing has exceeded 60 seconds of the monitoring timeout and the delay of monitoring is detected. The monitor resource has a problem.
   In this case, no alert is used.

See also:

To configure the delay warning of monitor resources, click **Cluster Properties** and select **Monitor Delay Warning** in the **Delay Warning** tab.

7.9 Waiting for a monitor resource to start monitoring

"Wait Time to Start Monitoring" refers to start monitoring after the time period specified as the waiting time elapses. The following describes how monitoring differs when the wait time to start monitoring is set to 0 second and 30 seconds.

Configuration of monitor resource

<Monitor>
Interval 30 sec
Timeout 60 sec
Retry Count 0 times
Wait Time to Start Monitoring 0 sec

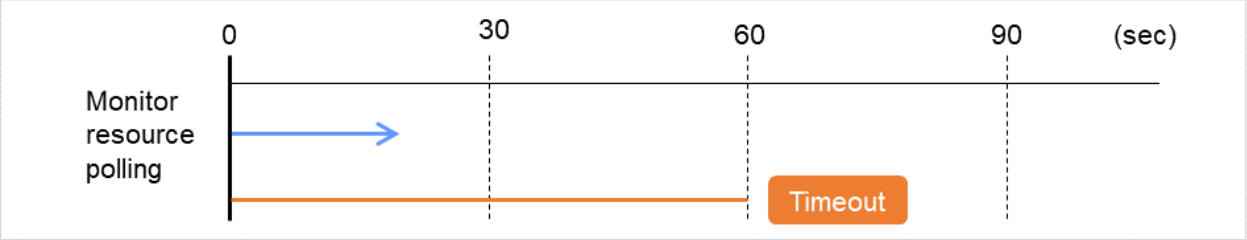

Fig. 7.8: Waiting for a monitor resource to start monitoring (the wait time to start monitoring set to 0 second)

Configuration of monitor resource

<Monitor>
Interval 30 sec
Timeout 60 sec
Retry Count 0 times
Wait Time to Start Monitoring 30 sec

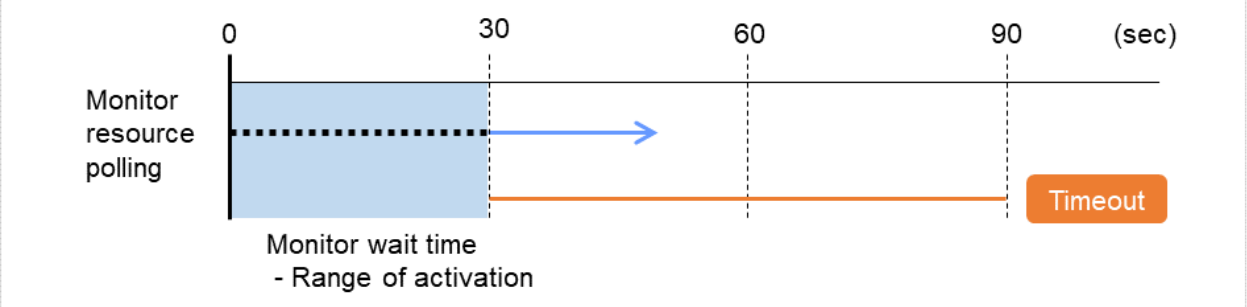

Fig. 7.9: Waiting for a monitor resource to start monitoring (the wait time to start monitoring set to 30 second)

Note: Monitoring will restart after the time specified to wait for start monitoring has elapsed even when the monitor resource is suspended and/or resumed by using the monitoring control commands.

The wait time to start monitoring is used when there is a possibility for monitoring to be terminated right after the start of monitoring due to incorrect application settings, such as the application resource monitored by application monitor resource, and when they cannot be recovered by reactivation.

For example, when the monitor wait time is set to 0 (zero), recovery may be endlessly repeated. See the example below:

Configuration of application monitor resource

<Monitor>
Interval 5 sec
Timeout 60 sec
Retry Count 0 times
Wait Time to Start Monitoring 0 sec (default)

<Error Detection>
Recovery Action Restart the following target
Recovery Target appli1
Final Action Stop Group

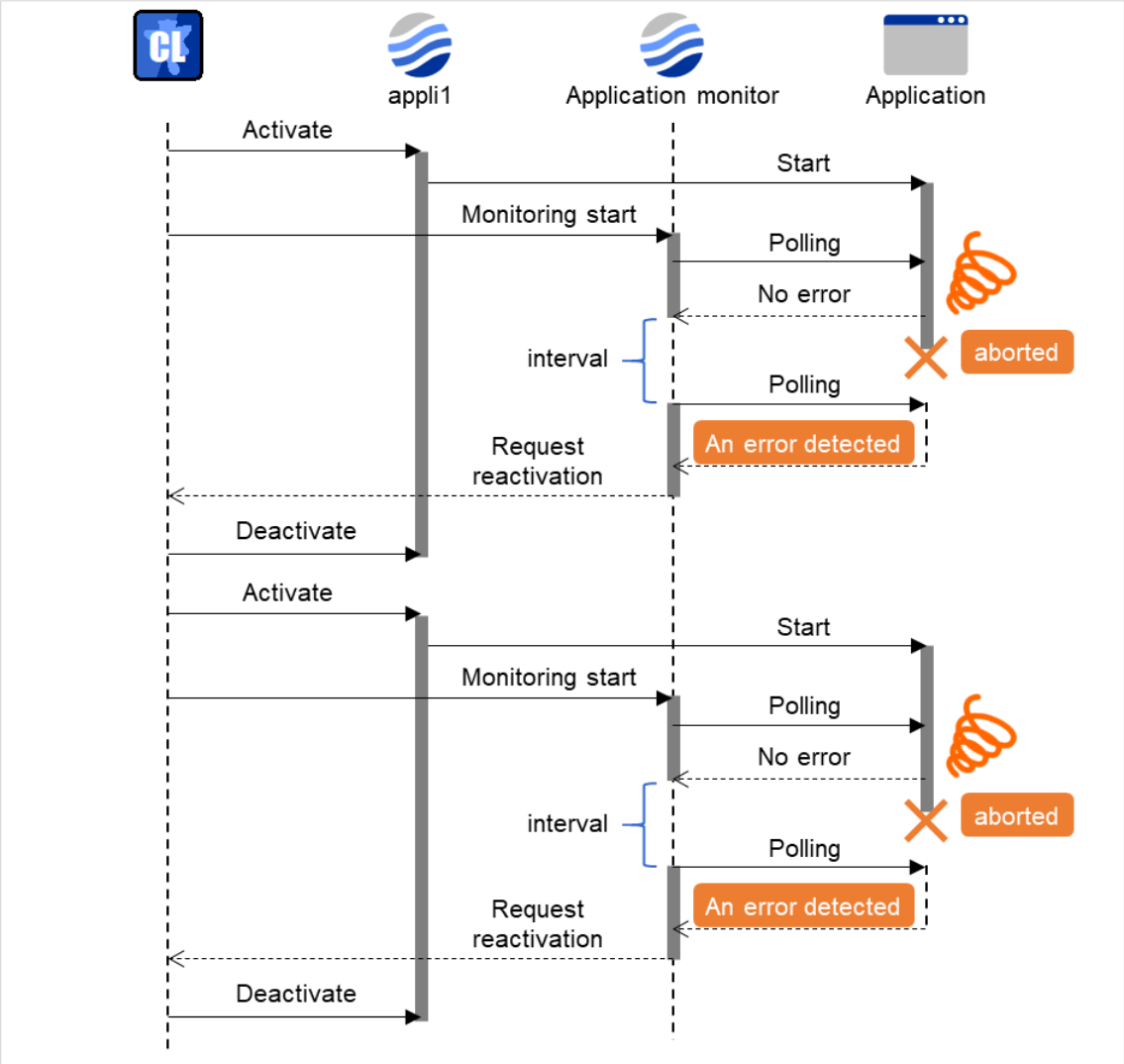

Fig. 7.10: Waiting for a monitor resource to start monitoring (the wait time to start monitoring set to 0 second)

The reason why recovery action is endlessly repeated is because the initial monitor resource polling has terminated successfully. The current count of recoveries the monitor resource has executed is reset when the status of the monitor resource becomes normal (finds no error in the monitor target). Because of this, the current count is always reset to 0 and reactivation for recovery is endlessly repeated.

You can prevent this problem by setting the wait time to start monitoring.

By default, 60 seconds is set as the wait time from the application startup to the end.

Configuration of application monitor resource

<Monitor>
Interval 5 sec
Timeout 60 sec
Retry Count 0 times

Wait Time to Start Monitoring: 60 sec

<Error Detection>
Recovery Action Restart the following target
Recovery Target appli1
Final Action Stop Group

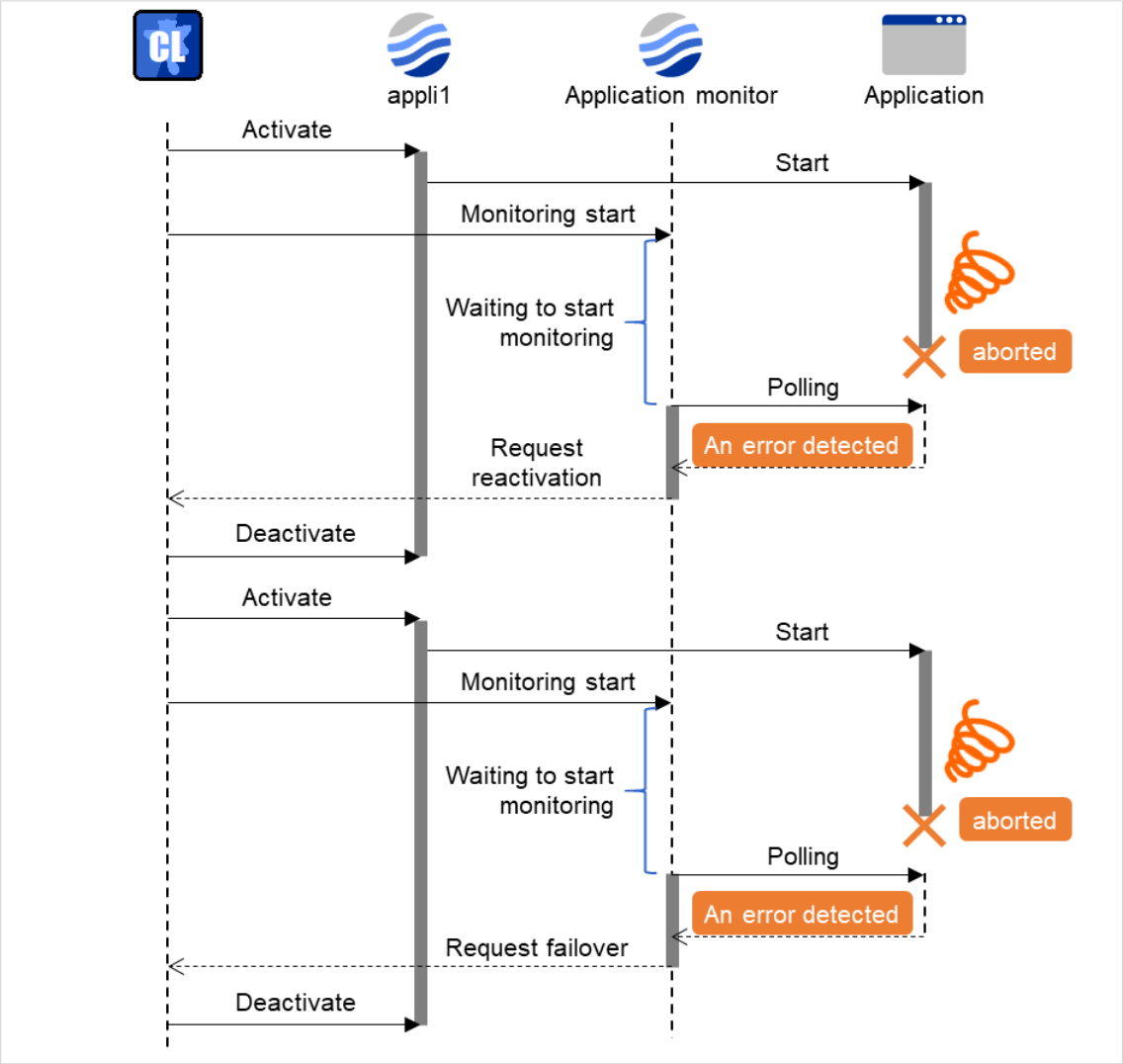

Fig. 7.11: Waiting for a monitor resource to start monitoring (the wait time to start monitoring set to 60 second)

7.10 Limiting the reboot count for error detection by a monitor resource

When **Stop cluster service and shutdown OS** or **Stop cluster service and reboot OS** is selected as a final action to be taken when an error is detected by the monitor resource, the number of shutdowns or reboots can be limited.

Run the clpregctrl command to reset the reboot count. For details about the clpregctrl command, see " EXPRESSCLUSTER X SingleServerSafe command reference" in the "EXPRESSCLUSTER X SingleServerSafe Operation Guide".

Note:

The number of reboots resulting from the final action due to group activation or deactivation errors and that resulting from the final action due to monitor resource errors are recorded separately.

If the time to reset the maximum reboot count is set to zero (0), the number of reboots will not be reset.

CHAPTER

EIGHT

NOTES AND RESTRICTIONS

This chapter provides information on known problems and how to troubleshoot the problems.

This chapter covers:

8.1 Designing a system configuration

This section describes the items to note when selecting hardware and designing a system configuration.

8.1.1 EXPRESSCLUSTER X Alert Service

The license for the EXPRESSCLUSTER X Alert Service allows you to use the mail report function, but not the warning light function.

8.1.2 JVM monitor resources

- Up to 25 Java VMs can be monitored concurrently. The Java VMs that can be monitored concurrently are those which are uniquely identified by the Cluster WebUI (with **Identifier** in the **Monitor (special)** tab)
- Connections between Java VMs and JVM monitor resources do not support SSL.
- If, during the monitoring of Java VM, there is another process with the same name as the monitoring target, C heap monitoring may be performed for a different monitoring target.
- It may not be possible to detect thread deadlocks. This is a known problem in Java VM. For details, refer to "Bug ID: 6380127" in the Oracle Bug Database
- The JVM monitor resources can monitor only the Java VMs on the server on which the JVM monitor resources are running.
- Application monitoring is disabled when an application to be monitored on the IA32 version is running on an x86_64 version OS.
- If a large value such as 3,000 or more is specified as the maximum Java heap size by the Cluster WebUI (by using **Maximum Java Heap Size** on the **JVM monitor** tab in **Cluster Property**), The JVM monitor resources will fail to start up. The maximum heap size differs depending on the environment, so be sure to specify a value based on the capacity of the mounted system memory.

8.1.3 Cluster WebUI

We recommend you to use Cluster WebUI with HTTPS used as a securer communication method.

For information on how to set it, see "*Other setting details*" -> "*Cluster properties*" -> "*WebManager tab*" and "*Encryption tab*".

8.2 Notes when creating the cluster configuration data

This section describes the items to note before designing and creating configuration data based on the system configuration.

8.2.1 Folders and files in the location pointed to by the EXPRESSCLUSTER X SingleServerSafe installation path

The folders and files in the location pointed to by the EXPRESSCLUSTER X SingleServerSafe installation path must not be handled (edited, created, added, or deleted) by using any application or tool other than EXPRESSCLUSTER X SingleServerSafe.
Any effect on the operation of a folder or file caused by using an application or tool other than EXPRESSCLUSTER X SingleServerSafe will be outside the scope of NEC technical support.

8.2.2 Final action for a group resource deactivation error

If select **No Operation** as the final action when a deactivation error is detected, the group does not stop but remains in the deactivation error status.
Make sure not to specify **No Operation** in the actual production environment.

8.2.3 Delay warning rate

If the delay warning rate is set to 0 or 100, the following can be achieved:

- When 0 is set to the delay monitoring rate
  An alert for the delay warning is issued at every monitoring.
  By using this feature, you can calculate the polling time for the monitor resource at the time the server is heavily loaded, which will allow you to determine the time for monitoring timeout of a monitor resource.
- When 100 is specified as the delay monitoring rate
  The delay warning will not be issued.

Be sure not to set a low value, such as 0%, except for a test operation.

8.2.4 Double-byte character set that can be used in script comments

Scripts edited in Windows environment are dealt as Shift-JIS code, and scripts edited in Linux environment are dealt as EUC code. In case that other character codes are used, character corruption may occur depending on environment.

8.2.5 JVM monitor resource settings

- When the monitoring target is WebLogic, the maximum values of the following JVM monitor resource settings may be limited due to the system environment (including the amount of installed memory):
  - **The number** under **Monitor the requests in Work Manager**
  - **Average** under **Monitor the requests in Work Manager**
  - **The number** of **Waiting Requests** under **Monitor the requests in Thread Pool**
  - **Average** of **Waiting Requests** under **Monitor the requests in Thread Pool**

  - **The number** of **Executing Requests** under **Monitor the requests in Thread Pool**
  - **Average** of **Executing Requests** under **Monitor the requests in Thread Pool**

- To use the Java Resource Agent, install the Java runtime environment (JRE) described in " Operation environment for JVM monitor" in " Checking system requirements for EXPRESSCLUSTER X SingleServerSafe" in " About EXPRESSCLUSTER X SingleServerSafe" in the " Installation Guide", or a Java development kit (JDK). You can use either the same JRE or JDK as that used by the monitoring target (WebLogic Server or WebOTX) or a different one. If both JRE and JDK are installed on a server, you can use either one.
  - To monitor resource name must not include a blank.

8.2.6 System monitor resource settings

- Pattern of detection by resource monitoring
  The System Resource Agent performs detection by using thresholds and monitoring duration time as parameters.
  The System Resource Agent collects the data (used size of memory, CPU usage rate, and used size of virtual memory) on individual system resources continuously, and detects errors when data keeps exceeding a threshold for a certain time (specified as the duration time).

8.2.7 Recovery operation on systems with Windows Server 2012 or later when a service fails

This applies to systems with Windows Server 2012 or later, with **Restart Computer** selected as the recovery option to be exercised when a service fails (abends): If the failure actually occurs, the OS is restarted not in the same way as on Windows Server 2008 or earlier but with a STOP error.

The EXPRESSCLUSTER services for which **Restart Computer** is set as the recovery operation by default are the following:

- EXPRESSCLUSTER Disk Agent service
- EXPRESSCLUSTER Server service
- EXPRESSCLUSTER Transaction service

8.2.8 AWS CLI command line options

AWS-related features run the AWS CLI.

You can specify command line options to be applied to processes with the AWS CLI, by going to **Cluster properties** -> the **Cloud** tab and setting **AWS CLI command line options**.
This is effective when, for example, you specify the URL of an endpoint to which a request is sent with the AWS CLI running.

To specify two or more of the command line options, separate each of them with a space.

The command line options can be specified for each AWS service.
The following lists the features for which the settings of **AWS CLI command line options** are effective:

aws cloudwatch

- Amazon CloudWatch linkage

aws ec2

- Obtaining cloud environment information with Cluster WebUI

aws sns

- Amazon SNS linkage

For more information on the command line options for the AWS CLI, see AWS documents.

Note:

Using any of the following characters disables the command line options specified for the AWS CLI: ;, &&, ||, or `.
Using the --output option disables the command line options specified for the AWS CLI.

8.2.9 Environment variables for running AWS-related features

AWS-related features access instance metadata as well as the AWS CLI.

You can specify environment variables to be applied to processes for running AWS-related features, by going to **Cluster properties** -> the **Cloud** tab and setting **Environment variables at the time of performing AWS-related features**. This is effective when you, for example, use a proxy server in an AWS environment or specify for the AWS CLI a configuration file and an authentication data file.

The following lists the features for which the settings of **Environment variables at the time of performing AWS-related features** are effective:

- Amazon SNS linkage
- Amazon CloudWatch linkage
- Obtaining cloud environment information with Cluster WebUI

The environment variables can also be specified by using the environment variable configuration file. In this case, do not set **Environment variables at the time of performing AWS-related features**. With **Environment variables at the time of performing AWS-related features** set, the environment variable configuration file cannot be used.

Note: The environment variable configuration file is for ensuring compatibility with old versions. Using **Environment variables at the time of performing AWS-related features** is recommended for configuring the environment variables.

The environment variable configuration file is stored in the following location.

<EXPRESSCLUSTER Installation path>/cloud/aws/clpaws_setting.conf

The format of the environment variable configuration file is as follows:

Environment variable name = Value

(Example)

```
[ENVIRONMENT]
HTTP_PROXY = http://10.0.0.1:3128
HTTPS_PROXY = http://10.0.0.1:3128
NO_PROXY = 169.254.169.254,ec2.ap-northeast-1.amazonaws.com
```

The specifications of the environment variable configuration file are as follows:

- Write [ENVIRONMENT] on the first line, otherwise the environment variables may not be set.
- If the environment variable configuration file does not exist or you do not have read permission for the file, the variables are ignored. This does not cause an activation failure or a monitor error.
- If the same environment variables already exist in the file, the values are overwritten.
- If an environment variable name follows a space or tab, or if = is placed between two tabs, then the setting may not be applied.
- Environment variable names are case sensitive.
- Even if a value contains spaces, you do not have to enclose the value in "" (double quotation marks).
- The environment variables are not applied to scripts which are common to group and monitor resources (e.g., scripts before final action, ones before and after activation/deactivation).

8.2.10 Configuration file and authentication data file, for running AWS-related features

The AWS CLI run from AWS-related features uses the configuration file and authentication data file stored in the following folder:

<System drive>\Users\Administrator\.aws

To use a configuration file and an authentication data file, in a folder other than the above, you must specify the environment variables.
For information on specifying environment variables for the AWS CLI run from AWS-related features, see "*Notes and Restrictions*" -> "*Notes when creating the cluster configuration data*" -> "*Environment variables for running AWS-related features*".

The following are the names of the environment variables to specify such a configuration file and an authentication data file:

```
AWS_CONFIG_FILE
AWS_SHARED_CREDENTIALS_FILE
```

With these environment variable names, specify the path to a configuration file and that to an authentication data file respectively.

For more information on environment variables for the AWS CLI, see AWS documents.

8.3 Notes when changing the EXPRESSCLUSTER configuration

The section describes what happens when the configuration is changed after starting to use EXPRESSCLUSTER in the cluster configuration.

8.3.1 Dependency between resource properties

When the dependency between resources has been changed, the change is applied by suspending and resuming the cluster.
If a change in the dependency between resources that requires the resources to be stopped during application is made, the startup status of the resources after the resume may not reflect the changed dependency.
Dependency control will be performed at the next group startup.

8.3.2 Setting cluster statistics information of eternal link monitor resources

Once the settings of cluster statistics information of monitor resource has been changed, the settings of cluster statistics information are not applied to eternal link monitor resources even if you execute the suspend and resume. Reboot the OS to apply the settings to the eternal link monitor resources.

8.3.3 Changing a port number

If you have changed a port number with the server firewall enabled, the firewall configuration needs to be changed as well by using the clpfwctrl command. For more information, see "EXPRESSCLUSTER X SingleServerSafe Operation Guide" -> "EXPRESSCLUSTER X SingleServerSafe command reference" -> "Adding a firewall rule (clpfwctrl command)".

CHAPTER

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CHAPTER

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REVISION HISTORY

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1st	Apr 15, 2024	New manual
2nd	Jul 12, 2024	Corresponds to the internal version 13.21.
3rd	Aug 30, 2024	Corrected typographical errors.