EXPRESSCLUSTER® X 3.1

for Linux SAP NetWeaver

System Configuration Guide

10/1/2012
First Edition

EXPRESSCLUSTER X

Revision History

Edition	Revised Date	Description
First	10/1/2012	New manual

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Preface

This Guide: Building the cluster system in the [EXPRESSCLUSTER X 3.1 for Linux SAP NetWeaver System Configuration Guide], and giving the example of setting for actuate.

* At the time of writing this Guide, the versions of SAP NetWeaver and EXPRESSCLUSTER X are 7.3 and 3.1 respectively.

Who Should Use This Guide

This Guide is intended for administrators who want to build a cluster system, system engineers who want to provide user support, and maintenance personnel.
This Guide introduces software whose operation in an EXPRESSCLUSTER environment has been checked.
The software and setup examples introduced here are for reference only. They are not meant to guarantee the operation of each software product.

How This Guide is Organized

This Guide consist of the following two guides.

“EXPRESSCLUSTER X 3.1 for Linux SAP NetWeaver System Configuration Guide”
“EXPRESSCLUSTER X 3.1 for Linux SAP NetWeaver Configuration Example”

Conventions

In this guide, **Note**, **Important**, **Related Information** 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.

Related Information:
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]`
#	Prompt to indicate that a Linux user has logged on as root user.	`# clpcl -s -a`
Monospace (courier)	Indicates path names, commands, system output (message, prompt, etc), directory, file names, functions and parameters.	`/Linux/3.0/eng/server/`
Monospace bold (courier)	Indicates the value that a user actually enters from a command line.	Enter the following: **`# clpcl -s -a`**
Monospace italic (courier)	Indicates that users should replace italicized part with values that they are actually working with.	`rpm –i expressclsbuilder -<version_number>-<release_number>.i686.rpm`

Related documents

EXPRESSCLUSTER X Documentation Set

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

EXPRESSCLUSTER X Getting Started Guide
This guide is intended for all users. The guide covers topics such as product overview, system requirements, and known problems.

EXPRESSCLUSTER X Installation and Configuration Guide
This guide is intended for system engineers and administrators who want to build, operate, and maintain a cluster system. Instructions for designing, installing, and configuring a cluster system with EXPRESSCLUSTER are covered in this guide.

EXPRESSCLUSTER X Reference Guide
This guide is intended for system administrators. The guide covers topics such as how to operate EXPRESSCLUSTER, function of each module, maintenance-related information, and troubleshooting. The guide is supplement to the Installation and Configuration Guide.

EXPRESSCLUSTER X Integrated WebManager Administrator's Guide
This guide is intended for system administrators who manage cluster systems using EXPRESSCLUSTER with Integrated WebManager, and also intended for system engineers who introduce Integrated WebManager. This guide describes detailed issues necessary for introducing Integrated WebManager in the actual procedures.

SAP NetWeaver 7.3 documents

The detail of SAP NetWeaver 7.3 may refer following documents

Installation Guide
"SAP Systems Based on SAP NetWeaver 7.3 Application Server ABAP on Linux: SAP MaxDB"

Installation Guides of DB or each OS can be downloaded from the following URL

http://service.sap.com/installnw73/

SAP NOTE

```
#0171356 : SAP software on Linux: Essential information
#0784391 : SAP support terms and 3rd-party Linux kernel drivers
#1048303 : Red Hat Enterprise Linux 5.x: Installation and upgrade
#1496410 : Red Hat Enterprise Linux 6.x: Installation and Upgrade
#0958253 : SUSE LINUX Enterprise Server 10: Installation Notes
#1310037 : SUSE LINUX Enterprise Server 11: Installation Notes
#1567511 : Oracle Linux 5.x SAP installation and upgrade
#1635808 : Oracle Linux 6.x SAP Installation and Upgrade
#1382721 : Linux: Interpreting the output of the command 'free'
#0174911 : Determining the hardware key (customer key)
#0181543 : License key for high availability environment
#0870871 : License key installation
#1391070 : Linux UUID solutions
#0146003 : Application servers cannot be started
#1031096 : Installing Package SAPHOSTAGENT
#1463606 : MaxDB as of 7.8: Directories in UNIX cluster for failover
```

#1553301： EXT Kernel – Usage

Note:
Related documents and URL in this manual are subject to change without notice.

Terminology in this manual

Terminology used in this manual

Terminology	Description
This product	EXPRESSCLUSTER X for Linux SAP NetWeaver
Configuration Guide	EXPRESSCLUSTER X for Linux SAP NetWeaver System Configuration Guide
Configuration Example	EXPRESSCLUSTER X for Linux SAP NetWeaver Configuration Example
Connecter for Sap	The connecter which links with SAP included in this product.
SAP NW	SAP NetWeaver
ASCS	ABAP SAP Central Services Instance
ERS	Enqueue Replication Server
PAS	Primary Application Server
AAS	Additional Application Server
MaxDB	The database included in SAP NW
DA	Diagnostics Agent

Section I Overview of the cluster system

- Chapter 1 Overview of SAP NetWeaver Cluster
- Chapter 2 OS Installation and Basic Setting

Chapter 1 Overview of SAP NetWeaver Cluster

1.1. Functional Overview

A cluster with the following configuration can be built by combining SAP NetWeaver (hereafter, referred to as SAP NW) and EXPRESSCLUSTER.

SAP NW cluster configuration using EXPRESSCLUSTER

Set up the following components to EXPRESSCLUSTER as independent active-standby failover groups to perform failover from the active node to the standby node if a failure occurs in order to improve the availability of the SAP NW environment.

- ABAP SAP Central Services Instance (hereafter, ASCS)
- MaxDB

Set up the following components as failover groups for a single server configuration in which failover groups operate on each node.

- Enqueue Replication Server Instance (hereafter, ERS)
- Primary Application Server Instance (hereafter, PAS)
- Additional Application Server Instance (hereafter, AAS)
- Diagnostics Agent (hereafter, DA)
- saphostexec

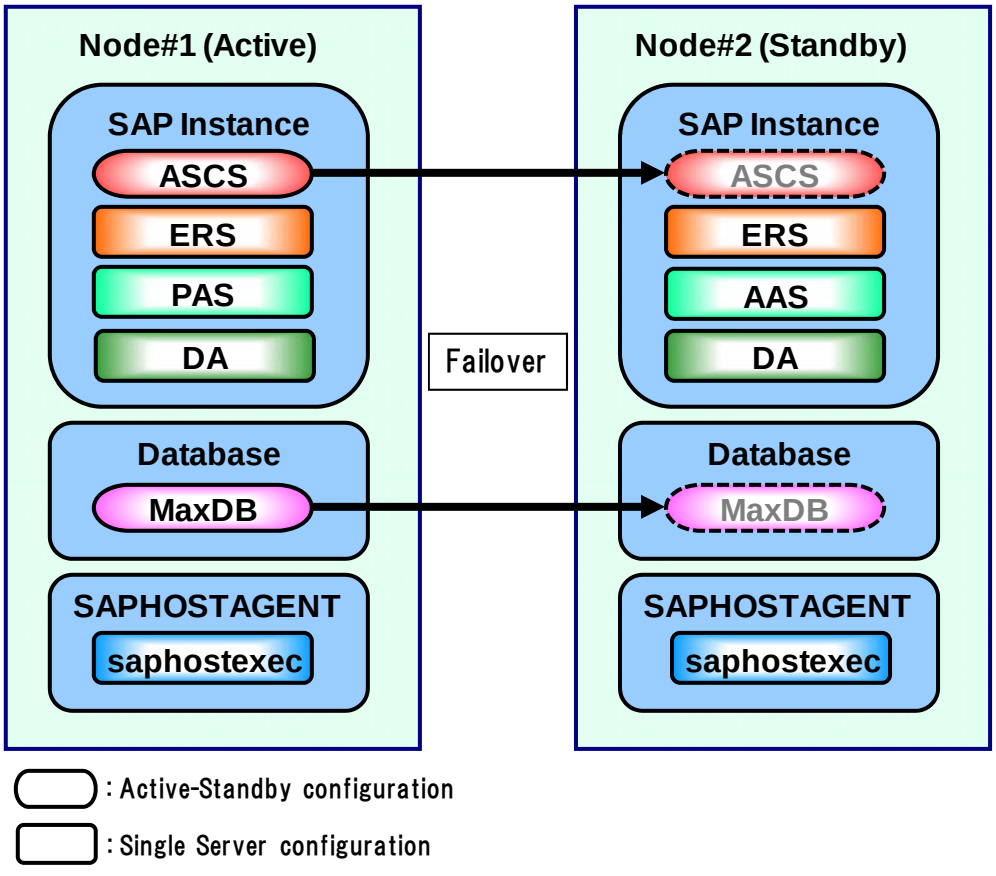

Figure 1.1-1 Cluster System of SAP NW

Dependency between failover groups

The SAP NW components must be started and stopped in a specific order.
In EXPRESSCLUSTER, control the order in which the SAP NW components start and stop by specifying the order as a dependency between failover groups.

SAP NW monitoring using EXPRESSCLUSTER

In addition to the monitoring function provided by EXPRESSCLUSTER, the SAP NW cluster system uses a monitoring package that supports the SAP system and an SAP NW-specific monitoring command to monitor the SAP NW components for response errors and hang-ups.

Illustration of linkage between SAP NW and EXPRESSCLUSTER

User's operation request to SAP NW is sent to EXPRESSCLUSTER via the Connecter for SAP (clp_shi_connector).The cluster built by EXPRESSCLUSTER is operated by SAP NW.

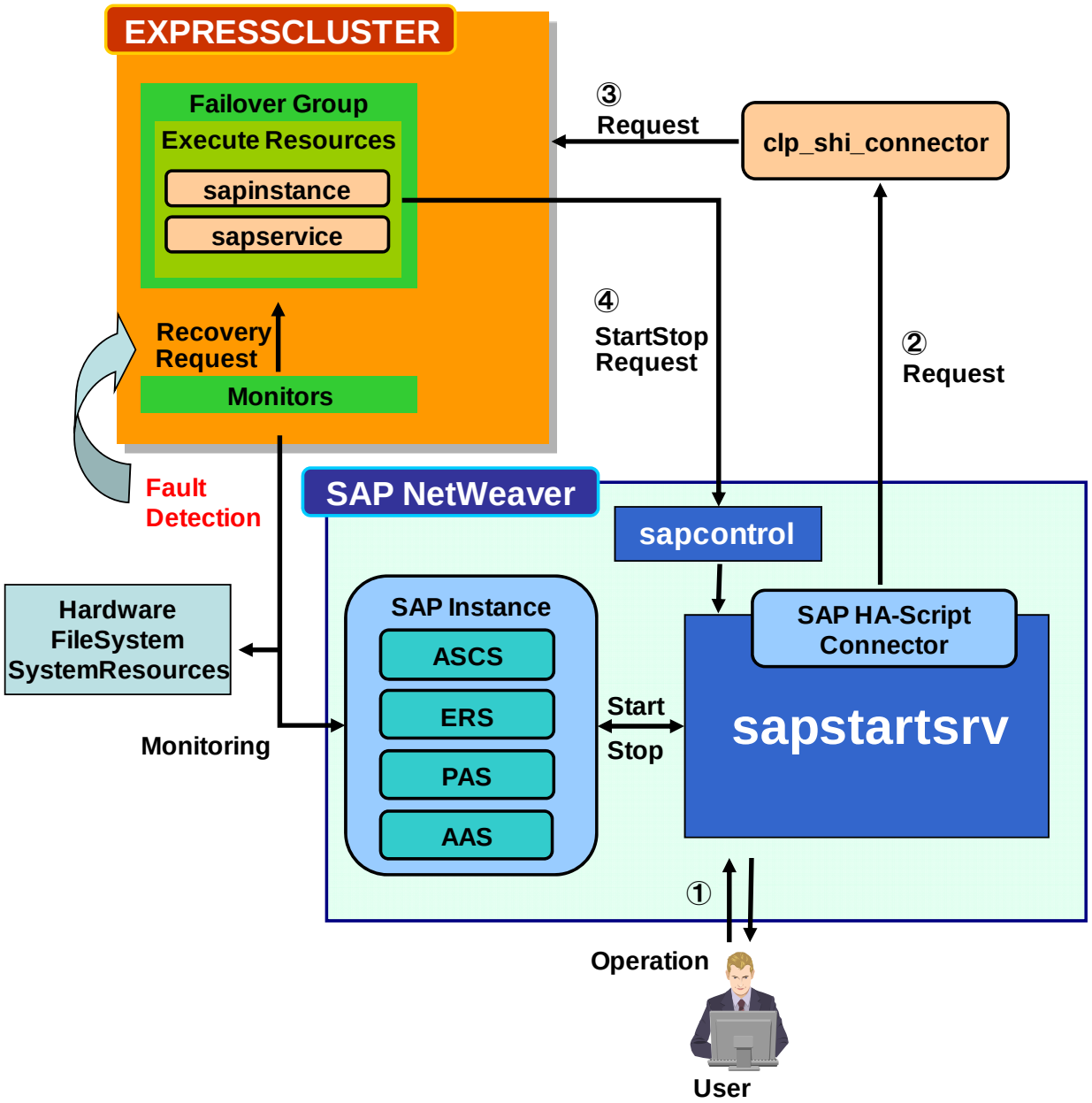

Figure 1.1-2: Cooperation System

1.2. Operating Environment

For the hardware and software requirements, refer to the documents for each product.

1.3. Building Procedure

The flow of building the SAP NW cluster is shown below.

(1) Installation and basic setup of Linux OS
(2) Setup of shared disk and network
(3) Installation of EXPRESSCLUSTER
(4) Building of cluster with NAS resource and node with floating IP
(5) Installation of SAP NW and MaxDB
(6) Setup of SAP NW and MaxDB cluster in EXPRESSCLUSTER

Chapter 2 OS Installation and Basic Setting

Refer to the following SAP NOTE for SAP NW installation and needed software on Node#1 and Node#2.

SAP NOTE
```
#0171356 : SAP software on Linux: Essential information
#0784391 : SAP support terms and 3rd-party Linux kernel drivers
#1391070 : Linux UUID solutions
#0146003 : Application servers cannot be started
```

Refer to the following SAP NOTE for installation of each distribution.

RedHat Enterprise Linux
```
#1048303 : Red Hat Enterprise Linux 5.x: Installation and upgrade
#1496410 : Red Hat Enterprise Linux 6.x: Installation and Upgrade
```

SUSE LINUX Enterprise Server
```
#0958253 : SUSE LINUX Enterprise Server 10: Installation Notes
#1310037 : SUSE LINUX Enterprise Server 11: Installation Notes
```

Oracle Linux
```
#1567511 : Oracle Linux 5.x SAP installation and upgrade
#1635808 : Oracle Linux 6.x SAP Installation and Upgrade
```

For examples of setting in this manual, refer to “1.3 An example of setting OS” in the supplied “Configuration Example” document.

Section II Installation of EXPRESSCLUSTER and SAP NetWeaver

- Chapter 3 Setting of Shared Disk and Network
- Chapter 4 Preparation of EXPRESSCLUSTER
- Chapter 5 Setup of SAP NetWeaver Environment
- Chapter 6 Setup of EXPRESSCLUSTER
- Chapter 7 Connector for SAP
- Chapter 8 Notes and Restrictions

Chapter 3 Setting of Shared Disk and Network

A cluster type of “shared disk, mirror disk or etc” is able to be built by EXPRESSCLUSTER.
This manual describes a configuration example where Node#1 is the active node, Node#2 is the standby node, and the NFS server is used as the shared space.

3.1. Setting Mount Points

Set mount points to the NFS server that can be accessed from each node before installing SAP NW.

In this manual, some mount points (ASCS, `sapdata` and `saplog`) are set up so that the NAS resource in EXPRESSCLUSTER is used to switch from the active node to the standby node during failover.

For an example of setting up mount points using the NFS server described in this manual, refer to “1.1 Mount Point” in the supplied “Configuration Example” document.

3.2. Network Setting

Assign the floating IPs shown below before installing SAP NW.
In addition, note that the host names associated with the floating IPs must be able to be resolved.

- Floating IP for WebManager in EXPRESSCLUSTER
- Floating IP for ASCS instance (used in 4.5 and 5.2)
- Floating IP for MaxDB (used in 4.5 and 5.3)

For an example of setting up the floating IP described in this manual, refer to “1.2 Floating IP” in the supplied “Configuration Example” document.

Chapter 4 Preparation of EXPRESSCLUSTER

For how to build an EXPRESSCLUSTER environment, refer to the “Installation and Configuration Guide.”

Build a cluster environment with two nodes and a NFS server in the order shown below.

Completely install this product, build a cluster with a NAS resource and a floating IP, and start EXPRESSCLUSTER before installing SAP NW.

Preparations before installing SAP NW

- Installation of EXPRESSCLUSTER
- Registration of License
- Creation of cluster configuration information
  - Creation of cluster
  - Creation of failover group
  - Addition of group resource
- Specification of Dependency between Failover Groups

For examples of setting in this manual, refer to “2.1 An example of setting EXPRESSCLUSTER” in the supplied “Configuration Example” document.

After completing the above processes, continue by executing the processes in “Chapter 5 Setup of SAP NetWeaver Environment” and “Chapter 6 Setup of EXPRESSCLUSTER.”

4.1. Installation of EXPRESSCLUSTER

Install this product in each node (Node#1 and Node#2).

For how to install EXPRESSCLUSTER, refer to the following document:

“Installation and Configuration Guide”

- “Chapter X Installing EXPRESSCLUSTER”
- “Chapter X Registering the license”

After completing the installation of EXRESSCLUSTER, enter the following command and install the Connecter for SAP.

```
# rpm -i expresscls_spnw-[version].x86_64.rpm
```

4.2. Registration of License

The license must be registered to make EXPRESSCLUSTER ready for use.

For how to register the license, refer to the following document:
"Installation and Configuration Guide"

- "Chapter X Registering the license"

This product contains the following four licenses.

Licensed Product Name
EXPRESSCLUSTER X for Linux
EXPRESSCLUSTER X System Resource Agent for Linux
EXPRESSCLUSTER X File Server Agent for Linux
EXPRESSCLUSTER X Database Agent for Linux

4.3. Creation of Cluster

Create a cluster from EXPRESSCLUSTER WebManager (hereafter referred to as WebManager).

For how to create a cluster, refer to the following document:
"Installation and Configuration Guide"

- "Chapter X Creating the cluster configuration data"
- "Chapter X Creating the cluster configuration data"-"Creating a cluster"

4.4. Creation of Failover Group

Create the failover groups to which each node belongs from WebManager.

For how to create a failover group, refer to the following document:

- "Installation and Configuration Guide"
  "Chapter X Creating the cluster configuration data"-"Creating a failover group"

Here, create the following failover groups:

- ASCS instance
- ERS1 instance
- ERS2 instance
- PAS instance
- AAS instance
- MaxDB
- DA1 instance (This is installed when installing a PAS instance.)
- DA2 instance (This is installed when installing a PAS instance.)
- hostexec1
- hostexec2

The name "ERS1" is ERS on Node#1. The name "DA1" is DA on Node#1. The name "hostexec1" is saphostexec on Node#1.
The name "ERS2" is ERS on Node#2. The name "DA2" is DA on Node#2. The name "hostexec2" is saphostexec on Node#2.

4.5. Addition of Group Resource

Add the floating IP resource and NAS resource to the failover groups created in the previous section.

For how to add a group resource, refer to the following document:
"Reference Guide"
- "Understanding floating IP resource"
- "Understanding NAS resource"

Here, add the following group resources to each failover group:

ASCS instance group	Add a floating IP resource and assigned the IP address setting in 3.2. Add a NAS resource and assigned the mount point of ASCS.
MaxDB group	Add a floating IP resource and assigned the IP address setting in 3.2. Add a NAS resource and assigned the mount point of MAXDB.

4.6. Specification of Dependency between Failover Groups

Specify the dependency between failover groups.

The dependency between each instance in SAP NW (starting order) is shown below.

①		②		③
				ERS
MaxDB	→	ASCS	→	PAS
				AAS

Each instance must be stopped in the reverse order.

Note:
Do not need to specify the dependency to DA and hostexec.

For how to specify dependencies in EXPRESSCLUSTER, refer to the following document:
"Reference Guide"
- "Understanding setting of group start dependence and group stop dependence"
- "Understanding the settings of dependency among group resources (Common to group resources)"

Chapter 5 Setup of SAP NetWeaver Environment

Terminology used in Chapter 5 and Chapter 6.

Terminology	Description
SID	SAP System ID
DBSID	Database System ID
DASID	Diagnostics Agent System ID
INO	Instance Number

The installation path and installation procedure for the product files for SAP NetWeaver (hereafter referred to as SAP NW) may vary depending on your configuration.

For how to build the SAP NW environment, refer to the following document:

Installation Guide
"SAP Systems Based on SAP NetWeaver 7.3 Application Server ABAP on Linux: SAP MaxDB"

The installation guide for each database and OS type supported by SAP NW can be downloaded from the following URL:
http://service.sap.com/installnw73/

SAP NOTE

```
#1048303 : Red Hat Enterprise Linux 5.x: Installation and upgrade
#1496410 : Red Hat Enterprise Linux 6.x: Installation and Upgrade
#0958253 : SUSE LINUX Enterprise Server 10: Installation Notes
#1310037 : SUSE LINUX Enterprise Server 11: Installation Notes
#1567511 : Oracle Linux 5.x SAP installation and upgrade
#1635808 : Oracle Linux 6.x SAP Installation and Upgrade
#0174911 : Determining the hardware key (customer key)
#0181543 : License key for high availability environment
#0870871 : License key installation
#0146003 : Application servers cannot be started
#1553301 : 7.20 EXT Kernel - Usage
```

Build the environment for SAP NW in the order shown below.
For how to install SAP NW, refer to the following document:

- "SAP Systems Based on SAP NetWeaver 7.3 Application Server ABAP on Linux: SAP MaxDB"
  "5.Installation"

(1) Preparing to install SAP NW on Node#1 and Node#2 (Section 5.1)
(2) Installation of ASCS/ERS instances on Node#1 (Section 5.2)
(3) Installation of MaxDB on Node#1 (Section 5.3)
(4) Installation of PAS instance on Node#1 (Section 5.4)
(5) Preparing to install MaxDB on Node#2 (Section 5.5)
(6) Installation of ERS instance on Node#2 (Section 5.6)
(7) Installation of AAS instance on Node#2 (Section 5.7)
(8) Update of SAPHOSTAGENT on Node#1 and Node#2 (Section 5.8)
(9) Activation of Connector for SAP on Node#1 and Node#2 (Section 5.9)
(10) Registration of SAP license (Section 5.10)
(11) Disabling the automatic startup of SAP（Section 5.11）

Sections 5.2 through 5.4 describe how to install SAP NW and MaxDB in Node#1.
Sections 5.5 through 5.7 describe how to install SAP NW and MaxDB in Node#2.
Sections 5.8 through 5.9 describe how to set up Node#1 and Node#2 to use the Connector for SAP.
Section 5.10 describes how to register SAP license.
Section 5.11 describes how to disable the automatic startup of SAP in Node#1 and Node#2.

For an example of setting up the instance name and instance number in this manual, refer to “1.4 SAP NW Setting Example” in the supplied “Configuration Example” document.

Note:
The SAP NW instance number must be unique across the cluster nodes. If some SAP NW instances have duplicate numbers, starting and stopping of SAP NW instances cannot be normally controlled.

5.1. Preparing to Install SAP NW (Node#1 and Node#2)

Completely install EXPRESSCLUSTER, specify a floating IP and NAS resource, start EXPRESSCLUSTER, and activate the floating IP and NAS resource in Node#1 before installing SAP NW.

The location to save the sapinst command described later varies depending on your environment, such as the installation media used (CD-ROM or DVD-ROM) or the shared folder on the network. The sapinst command is a command used to install SAP NW.

5.2. Installation of ASCS and ERS Instances (Node#1)

Perform this work on Node#1.

Specify the host name associated with the floating IP of ASCS for `SAPINST_USE_HOSTNAME` as an environment variable and execute sapinst.

```
# env SAPINST_USE_HOSTNAME=ASCS_Hostname ./sapinst
```

Note:
Enter the host name for *`ASCS_Hostname`*.

The SIDs (SAP System IDs) and instance numbers for ACSC and ERS specified during installation are used in 6.1.1 (ASCS) and 6.1.2 (ERS1).

In this manual, set SID and INO as follows:

Instance	SID	INO
ASCS	NEC	10
ERS1	NEC	20

5.3. Installation of MaxDB (Node#1)

Perform this work on Node#1.

Specify the host name associated with the floating IP of MaxDB for `SAPINST_USE_HOSTNAME` as an environment variable and execute sapinst.

```
# env SAPINST_USE_HOSTNAME=Maxdb_Hostname ./sapinst
```

Note:
Enter the host name for *`Maxdb_Hostname`*.

The DBSID (Database ID) specified during installation is used in 3.1 and 3.2 in the supplied “Configuration Example” document.

In this manual, set DBSID as follows:

Data Base	DBSID
MaxDB	NEC

5.4. Installation of PAS Instance (Node#1)

Perform this work on Node#1.

Because the PAS only operates on Node#1, it is not necessary to specify a floating IP.
Execute `sapinst` without specifying an environment variable.

```
# ./sapinst
```

The SID (SAP System ID) and instance number for PAS specified during installation are used in 6.1.4.
The DASID (Diagnostics Agent SAP System ID) and instance number for DA specified during installation are used in 6.1.7 (DA1).

In this manual, set SID and INO as follows:

Instance	SID	INO
PAS	NEC	30
DA1	DAA	97

Note:
DA (Diagnostics Agent) is the instance installed when installing of a PAS instance.

5.5. Preparing to Install MaxDB (Node#2)

Perform this work on Node#2.

Preparations are required to install MaxDB in the cluster configuration.
For the preparations required to install SAP NW in Node#2, refer to the following document:

SAP Note
#1463606： MaxDB as of 7.8: Directories in UNIX cluster for failover

Note:
This manual describes how to build a cluster configuration in which MaxDB is used.

For a setting example in this manual, refer to “1.5 MaxDB Cluster Configuration Setting Example” in the supplied “Configuration Example” document.

5.6. Installation of ERS Instance (Node#2)

Perform this work on Node#2.

Because the ERS only operates on Node#2, it is not necessary to specify a floating IP. Execute `sapinst` without specifying an environment variable.

```
# ./sapinst
```

The SID (SAP System ID) and instance number for ERS specified during installation are used in 6.1.3 (ERS2).

In this manual, set SID and INO as follows:

Instance	SID	INO
ERS2	NEC	21

5.7. Installation of AAS Instance (Node#2)

Perform this work on Node#2.

Because the AAS only operates on Node#2, it is not necessary to specify a floating IP. Execute `sapinst` without specifying an environment variable.

```
# ./sapinst
```

The SID (SAP System ID) and instance number for AAS specified during installation are used in 6.1.5.
The DASID (Diagnostics Agent System ID) and instance number for DA specified during installation are used in 6.1.8 (DA2).

In this manual, set SID and INO as follows:

Instance	SID	INO
AAS	NEC	40
DA2	DAA	96

Note:
DA (Diagnostics Agent) is the instance installed when installing a AAS instance.

5.8. Update of SAPHOSTAGENT

Perform this work on Node#1 and Node#2.

SAPHOSTAGENT with a patch level of 100 or higher is required to combine SAP NW and EXPRESSCLUSTER.

Note:
Be sure to update SAPHOSTAGENT after completing the installation described in 5.2 through 5.7.

For how to update SAPHOSTAGENT, refer to the following document:

SAP Note
#1553301： 7.20 EXT Kernel – Usage
#1031096： Installing Package SAPHOSTAGENT

Note:
"7.20 EXT Kernel - Usage" describes how to apply the 720EXT kernel. Read this section for reference.

5.9. Activation of Connector for SAP

Perform this work on Node#1 and Node#2.

Perform the following setup to use the Connector for SAP.

5.9.1. Setting up the SAP profile

Add the following specification to the common profile for SAP instances (`/sapmnt/<SID>/profile/DEFAULT.PFL`) to activate the SAP HA Connector and combine it with EXPRESSCLUSTER.

```
service/halib = /usr/sap/hostctrl/exe/saphascriptco.so
service/halib_cluster_connector=/opt/nec/clusterpro/bin/clp_shi_connector
_wrapper
```

5.9.2. Assigning the sudo privilege to the SAP NW user

Assign the `sudo` privilege to the SAP NW user so that the SAP HA Connector can be executed. Set up the privilege by using the `visudo` command as the root user. Add the following specification:

```
Defaults:%sapsys       !requiretty

%sapsys ALL=(ALL)      NOPASSWD: ALL
```

Note:
Set up the groups automatically created during installation of SAP NW so that `sudo` can be executed to normally combine SAP NW and EXPRESSCLUSTER. If the SAP NW user cannot execute `sudo`, starting and stopping of SAP NW instances cannot be normally controlled.

5.10. Registration of SAP License

For how to register the SAP license, refer to the following document:

"SAP Systems Based on SAP NetWeaver 7.3 Application Server ABAP on Linux: SAP MaxDB"

- "Installing the SAP license"

5.11. Disabling the automatic startup of SAP

Perform this work on Node#1 and Node#2.

Enter the following command for disabling the automatic startup of SAP, because each SAP process is run by EXPRESSCLUSTER.

```
# chkconfig sapinit off
```

After entering the above command, check that the automatic startup of SAP is disabled.

```
# chkconfig --list sapinit
sapinit        0:off   1:off   2:off   3:off   4:off   5:off   6:off
```

Chapter 6 Setup of EXPRESSCLUSTER

6.1. Setup of Resources

Add the exec resource to the failover groups created in 4.4.

Set up the exec resource to control starting and stopping of each instance.

A script to control starting and stopping of various SAP instances is available.
To control starting and stopping of each SAP instance using this script, set up the exec resource.
The script to control starting and stopping uses resource names as keys for control, so it is necessary to specify resource names appropriate to the control target.

Include the following string in the resource name:

```
instance_<SID>_<INO>
```

The words in <> indicate the following items:
`SID`: SAP System ID
`INO`: Instance number

Note:
Modify the SAP user (`SAPUSER`), SAP System ID (`SID`), SAP profile path (`PROFILE`), and the instance number (`INO`) in the supplied script according to your environment.

For how to add the exec resource, refer to the following document:
"Reference Guide"
- "Understanding EXEC resources"

6.1.1. Setting up the ASCS resource

Add the following two exec resources to the group for which the floating IP for ASCS is specified.
- Add the exec resource for controlling SAP services.
- Add the exec resource for starting SAP instances.
  * Include the SID (SAP System ID) and INO (instance number) specified in 5.2 in the resource name.
  Example in this manual
  `exec-ascs-SAP-instance_NEC_10`

6.1.2. Setting up the ERS1 (Node#1) resource

Add the following two exec resources for the group for ERS1.
- Add the exec resource for controlling SAP services.
- Add the exec resource for starting SAP instances.
  * Include the SID (SAP System ID) and INO (instance number) specified in 5.2 in the resource name.
  Example in this manual
  `exec-ERS1-SAP-instance_NEC_20`

6.1.3. Setting up the ERS2 (Node#2) resource

Add the following two exec resources for the group for ERS2.
- Add the exec resource for controlling SAP services.
- Add the exec resource for starting SAP instances.
  * Include the SID (SAP System ID) and INO (instance number) specified in 5.6 in the resource name.
  Example in this manual
  `exec-ERS2-SAP-instance_NEC_21`

6.1.4. Setting up the PAS resource

Add the following two exec resources for the group for ERS2.

- Add the exec resource for controlling SAP services.
- Add the exec resource for starting SAP instances.
  * Include the SID (SAP System ID) and INO (instance number) specified in 5.4 in the resource name.
  Example in this manual

```
exec-PAS-SAP-instance_NEC_30
```

6.1.5. Setting up the AAS resource

Add the following two exec resources for the group for AAS.

- Add the exec resource for controlling SAP services.
- Add the exec resource for starting SAP instances.
  * Include the SID (SAP System ID) and INO (instance number) specified in 5.7 in the resource name.
  Example in this manual

```
exec-AAS-SAP-instance_NEC_40
```

6.1.6. Setting up the MAXDB resource

Add the following exec resource for the group for MAXDB.
Add the following exec resource to the group for which the floating IP for MaxDB is specified.

- Add the exec resource for controlling MAXDB.

6.1.7. Setting up the DA1 (Node#1) resource

- Add the exec resource for controlling SAP services.
- Add the exec resource for starting SAP instances.
  * Include the SID (SAP System ID) and INO (instance number) specified in 5.4 in the resource name.
  Example in this manual

```
exec-DA1-instance_DAA_97
```

6.1.8. Setting up the DA2 (Node#2) resource

- Add the exec resource for controlling SAP services.
- Add the exec resource for starting SAP instances.
  * Include the SID (SAP System ID) and INO (instance number) specified in 5.7 in the resource name.
  Example in this manual

```
exec-DA2-instance_DAA_96
```

6.1.9. Setting up the hostexec1 (Node#1) resource

Add the following exec resource for the group for hostexec1.

- Add the exec resource for controlling saphostexec.

6.1.10. Setting up the hostexec2 (Node#2) resource

Add the following exec resource for the group for hostexec2.

- Add the exec resource for controlling saphostexec.

For examples of setting up in this manual, refer to “2.1 An example of setting EXPRESSCLUSTER” and “3.1 A exec resource” in the supplied “Configuration Example” document.

Note:
Specify a resource name that conforms to the naming conventions for the exec resource that controls starting and stopping of SAP NW instances. If the resource name does not conform to the naming conventions, starting and stopping of SAP NW instances cannot be normally controlled.

6.2. Setup of Monitor Resources

Add the custom monitor resource and NIC Link Up/Down monitor resource to the group resources created in the previous section.

The detail may refer following documents.

"Reference Guide"
- "Understanding NIC link up/down monitor resources"
- "Understanding custom monitor resources"

For examples of setting in this manual, refer to "2.1 An example of setting EXPRESSCLUSTER" and "3.2 A Custom monitor" in the supplied "Configuration Example" document.

The script specified for the custom monitor resource is included in the installation media of this product.

Note:
Modify the SAP user (SAPUSER) and the instance number (INO) in the supplied script according to your environment.

6.2.1. Add the NIC Link Up/Down monitor resource

For how to add the NIC Link Up/Down monitor resource, refer to the following document:

"Reference Guide"
- "Understanding NIC link up/down monitor resources"

6.2.2. Setting up the SAP NW instance monitor resource

The custom monitor resource is used to monitor SAP NW instances.

Specify the script included in this product for the custom monitor resource to monitor the following instances:
- ASCS
- ERS1
- ERS2
- PAS
- AAS
- MaxDB
- DA1
- DA2

The package required to monitor SAP NW instances is described below.

Note:
The package required to monitor SAP NW instances varies depending on the distribution.

The procedure for RedHat and Oracle is described below.

Install the following `rpm` files in `Packages` in the OS installation media on each node (Node#1 and Node#2).
- `cluster-glue-libs`
- `resource-agents`

Example of the package installation

```
# rpm -i cluster-glue-libs-1.0.5-2.el6.x86_64.rpm
# rpm -i resource-agents-3.9.2-7.el6.x86_64.rpm
```

The procedure for SUSE is described below.

Download the following add-on from the SUSE official web site and install it on each node (Node#1 and Node#2I).

```
“SUSE Linux Enterprise High Availability Extension”
```

6.2.3. Setting up the SAP NW instance service monitor resource

Specify the script included in this product for the custom monitor resource to monitor the following instance services:

- ASCS
- ERS1
- ERS2
- PAS
- AAS
- MaxDB
- DA1
- DA2
- hostexec1
- hostexec2

Chapter 7 Connector for SAP

7.1. Setup of Logs

This section describes the logs output from the Connector for SAP.

For information about the logs in EXPRESSCLUSTER, refer to the following document:

“Reference Guide”
- “Section III Maintenance information”

7.1.1. Setting up `logrotate`

Use `logrotate` in Linux OS to specify the log storage location and version control.

The following setup file is created when this product is installed:

```
/etc/logrotate.d/clp_shi_connector
```

The default setup is as shown below.

```
/opt/nec/clusterpro/log/clp_shi_connector.log
{
        rotate 1
        size 1M
}
```

The Connector for SAP log is output to the following location:

```
/opt/nec/clusterpro/log/clp_shi_connector.log
```

7.1.2. Setting up log level

For setting up the log level of the Connecter for SAP log, change the parameter of following file.

```
/ opt/nec/clusterpro/etc/clp_shi_connector.conf
```

Parameter	Level	Description
LOGLEVEL	0, 1, 2, 4, 8 (The default is 4)	Specify the output log level. * In spite of setting LOGLEVEL, logs of the ERROR level are output to standard error output and syslog. 0: Do not output any log. 1: (ERROR): Output logs of the ERROR level. 2: (WARNING): Output logs of the WARNING level and the ERROR level. 4: (INFORMATION): Output logs of the INFORMSTION level, the WARNING level and the ERROR level. 8: (TRACE): Output logs of the internal trace, the INFORMSTION level, the WARNING level and the ERROR level.

The setting method is as follows. LOGLEVEL is set as 4 in the following example.

```
LOGLEVEL=4
```

7.1.3. Format of log

An example of a Connector for SAP output log is shown below.

Log format

```
LEVEL YY/MM/DD HH:MM:SS[PID] message
```

Example of output log

```
I 12/08/22 18:54:50[32412] ********** main: clp_shi_connector start **********
E 12/08/22 18:54:50[32412] Invalid options. (aaa bbb)
I 12/08/22 18:54:50[32412] main: retval: 2
I 12/08/22 18:54:50[32412] ********** main: clp_shi_connector end **********
```

7.1.4. Refusing setting of operation by SAP interface

Modify the parameter of the following file to refuse the starting and stopping request from SAP interface and to control SAP only via EXPRESSCLUSTER.

```
/opt/nec/clusterpro/etc/clp_shi_connector.conf
```

Parameter name	Setting value	Description
REFUSE_START_GROUP_RESOURCE	Group resource name of EXPRESSCLUSTER	For the setting value (group resource name of EXPRESSCLUSTER), set the EXEC resource name controlling the SAP instance which want to refuse the starting request from the SAP interface. Multi group resource names can be set. Set the index of parameter to 0, 1, 2, … as follows: REFUSE_START_GROUP_RESOURCE[0] REFUSE_START_GROUP_RESOURCE[1] REFUSE_START_GROUP_RESOURCE[2] …
REFUSE_STOP_GROUP_RESOURCE	Group resource name of EXPRESSCLUSTER	For the setting value (group resource name of EXPRESSCLUSTER), set the EXEC resource name controlling the SAP instance which want to refuse the stopping request from the SAP interface. Multi group resource names can be set. Set the index of parameter to 0, 1, 2, … as follows: REFUSE_STOP_GROUP_RESOURCE[0] REFUSE_STOP_GROUP_RESOURCE[1] REFUSE_STOP_GROUP_RESOURCE[2] …

The example of the setting to refuse the starting and stopping request from ASCS instance is described below.

```
REFUSE_START_GROUP_RESOURCE[0]=" exec-ascs-SAP-instance_NEC_10"

REFUSE_STOP_GROUP_RESOURCE[0]=" exec-ascs-SAP-instance_NEC_10"
```

NOTE:
Set the index of parameter [i] (i=0, 1, 2, …) to begin with 0. If the sequence of index is not correct, starting and stopping request from SAP interface cannot be denied normally.

7.1.5. List of error messages

Error messages that the Connector for SAP outputs to syslog

Message	Description	Solution
`clp_shi_connector invoked. (options: args)`	clp_shi_connector started (specified option: `args`).	—
`Invalid options. (args)`	The option is incorrectly specified (specified option: `args`).	Correctly specify the option referring to the usage.
`failed to get cluster resource name. (SID: ${sid}, INO: ${ino})`	The name of the resource that controls the SAP instance of which `SID` is `${sid}` and `INO` is `${ino}` could not be acquired.	• Correctly specify the name of the resource that controls the SAP instance of which `SID` is `${sid}` and `INO` is `${ino}` according to the naming conventions. • Correctly set up `sudo`. • Start the cluster. • Check the status of the system.
`failed to get cluster group name.`	The cluster group name could not be acquired.	• Correctly set up `sudo`. • Start the cluster. • Check the status of the system.
`failed to get cluster node name.`	The cluster node name could not be acquired.	• Correctly set up `sudo`. • Start the cluster. • Check the status of the system.
`failed to get current node name. (ret=${ret})`	The name of the node on which the group is currently operating could not be acquired.	• Correctly set up `sudo`. • Start the cluster. • Check the status of the system.
`resource "${res_name}" is not ONLINE.`	The resource with the resource name `${res_name}` is not active.	• Correctly set up `sudo`. • Start the cluster. • Start the resource `${res_name}`. • Check the status of the system.
`clpfunctions is missing.`	There is no `clpfunctions` file.	• Install EXPRESSCLUSTER again. • Check the status of the system.
`clpstat failed. (ret=${ret})`	Executing `clpstat` command has failed (return value: `${ret}`).	• Correctly set up `sudo`. • Start the cluster. • Check the status of the system.
`Can't find cluster resource. (SID: $1, INO: $2)`	The cluster resource controlling SID: `$1` and INO: `$2` could not be found.	• Following the naming conventions, correct

		the name of the resource which control SAP instance whose SID and INO are ${sid} and ${ino} respectively. • Correctly set up sudo. • Start the cluster. • Check the status of the system.
Failed to analyze resource line.	The resource line could not be analyzed.	• Check the status of the system.
Can't find cluster group. (resource: $1)	The cluster group related to resource: $1 could not be found.	• Correctly set up sudo. • Start the cluster. • Check the status of the system.
failed to control group resource (${res_name}) because group is stopped.	The group resource (${res_name}) could not be controlled because the group stopped.	• Correctly set up sudo. • Start the group to which the resource belongs. • Check the status of the system.
failed to start group resource (${res_name}) because group resource is not OFFLINE. (ret=${ret})	The group resource could not be active because the group resource (${res_name}) did not stop (return value: ${set}).	• Correctly set up sudo. • Stop the resource. • Check the status of the system.
failed to stop group resource (${res_name}) because group resource is not ONLINE. (ret=${ret})	The group could not stop because the group resource (${res_name}) was not active (return value: ${set}).	• Correctly set up sudo. • Start the resource. • Check the status of the system.
Start action to group resource (${res_name}) was canceled because this group resource is specified in REFUSE_START_GROUP_RESOURCE.	The starting action to group resource (${res_name}) was canceled because this group resource is specified in REFUSE_START_GROUP_RESOURCE.	• Check the setting of REFUSE_START_GROUP_ RESOURCE.
Stop action to group resource (${res_name}) was canceled because this group resource is specified in REFUSE_STOP_GROUP_RESOURCE.	The stopping action to group resource (${res_name}) was canceled because this group resource is specified in REFUSE_STOP_GROUP_RESOURCE.	• Check the setting of REFUSE_STOP_GROUP_ RESOURCE.

Chapter 8 Notes and Restrictions

- Notes on starting/stopping groups
  Refer to the following sections in the “Reference Guide”:
  “Chapter X Group resource details”
  → “Attributes common to group resource”
  → “Group start dependence and group stop dependence”
  → “Notes”
- Naming conventions for exec resources
  Specify a resource name that conforms to the naming conventions for the exec resource that controls starting and stopping of SAP NW instances. If the resource name does not conform to the naming conventions, starting and stopping of SAP NW instances cannot be normally controlled.
- SAP NW instance number
  The SAP NW instance number must be unique across the cluster nodes. If some SAP NW instances have duplicate numbers, starting and stopping of SAP NW instances cannot be normally controlled.
- Privilege setup
  Set up the groups automatically created during installation of SAP NW so that `sudo` can be executed to normally combine SAP NW and EXPRESSCLUSTER. If the SAP NW user cannot execute `sudo`, starting and stopping of SAP NW instances cannot be normally controlled.