Element Manager
Installation Manual

Version 0.9

October, 2017

Revision History

Date	Ver. No.	Editor	Section	Change Description
October, 2017	0.9	–	–	Initial Version Registered

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1. Introduction

1.1. Objective

This document is the installation manual for the EM Module included in the Element Manager (hereafter referred to as "EM"). Please read this manual carefully before using the software.

1.2. Scope of Application

The scope of this document is for the operation of the components of EM Module.

The subjects other than that are not covered in this document.

1.3. Expressional Conventions

There are certain expressions and text styles conventionally used in this document. Please make yourself clear about the items below before going on through the document.

[XX XX] - bold letters surrounded by square brackets

This means the command to be entered in Linux.

X [Enter] - bold letter and "[Enter]"

In this case, you need to enter the letters within brackets and press the Enter key in the console screen.

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1.5. Configuration of the Included Accessories

The "Table-11 Included Accessories" below illustrates the required items to follow the installation instructions in this document.

For the items described as "in-advance DL", you must download and prepare them prior to implementing the installation in this document.

Table 1-1 Included Accessories

#	Folder Structure	File Name	Description	Remarks
1.	em	-	-	-
2.	bin	em	Resource Agent	-
3.		em_ctl.sh	EM Start-up Script	-
4.		EmMonitor.pyc	Alive Monitor Client	-
5.	lib	MsfEmMain.pyc	Main Module	-
6.		GlobalModule.pyc	Global Module	-
7.		EmCommonLog.pyc	EM Common Log Module	-
8.		__init__.pyc	Initialization Module	-
9.	CommonDriver	EmCommonDriver.pyc	Driver Common Part Module	-
10.		__init__.pyc	Initialization Module	-
11.	Config	EmConfigManagement.pyc	Configuration Management Module	-
12.		__init__.pyc	Initialization Module	-
13.	DB	EmDBControl.pyc	DB Control Module	-
14.		__init__.pyc	Initialization Module	-
15.	DriverUtility	EmDriverCommonUtilityDB.pyc	Driver Common Utility (DB) Module	-
16.		EmDriverCommonUtilityLog.pyc	Driver Common Utility (Log) Module	-
17.		__init__.pyc	Initialization Module	-
18.	NetconfServer	EmNetconfServer.pyc	EM Netconf Server モジュール	-
19.		__init__.pyc	Initialization Module	-
20.	OrderflowControl	EmOrderflowControl.pyc	Order Flow Control Module	-
21.		__init__.pyc	Initialization Module	-
22.	Protocol	EmNetconfProtocol.pyc	For-device Protocol Process Module	-
23.		__init__.pyc	Initialization Module	-
24.	Scenario	EmCeLagDelete.pyc	LAG Deletion Scenario for CE	-
25.		EmCeLagMerge.pyc	LAG Addition Scenario for CE	-
26.		EmInternalLagDelete.pyc	LAG Deletion Scenario for Internal Link	-
27.		EmInternalLagMerge.pyc	LAG Addition Scenario for Internal Link	-
28.		EmL2SliceDelete.pyc	L2 Slice Deletion Scenario	-
29.		EmL2SliceGet.pyc	L2 Slice Information Adjustment Scenario	-
30.		EmL2SliceMerge.pyc	L2 Slice Addition Scenario	-
31.		EmL3SliceDelete.pyc	L3 Slice Deletion Scenario	-
32.		EmL3SliceGet.pyc	L3 Slice Information Adjustment Scenario	-
33.		EmL3SliceMerge.pyc	L2 Slice Addition Scenario	-
34.		EmLeafDelete.pyc	Leaf Deletion Scenario	-
35.		EmLeafMerge.pyc	Leaf Addition Scenario	-
36.		EmSpineDelete.pyc	Spine Deletion Scenario	-

#	Folder Structure	File Name	Description	Remarks
37.		EmSpineMerge.pyc	Spine Addition Scenario	-
38.		EmSeparateScenario.pyc	Individual Scenario Module	-
39.		__init__.pyc	Initialization Module	-
40.	SeparateDriver	CiscoDriver.pyc	Cisco Driver Module	-
41.		JuniperDriver5100.pyc	Juniper 5100 Driver Module	-
42.		JuniperDriver5200.pyc	Juniper 5200 Driver Module	-
43.		EmSeparateDriver.pyc	Driver Individual Module	-
44.		__init__.pyc	Initialization Module	-
45.	SystemUtility	EmSysCommonUtilityDB.pyc	System Common (DB) Utility Module	-
46.		__init__.pyc	Initialization Module	-
47.	conf	conf_driver.conf	Driver Individual Part Operational Configuration File	-
48.		conf_if_process.conf	I/F Process Part Operational Configuration File	-
49.		conf_scenario.conf	Scenario Individual Part Operational Configuration File	-
50.		conf_sys_common.conf	EM Common Configuration File	-
51.	installer	-	-	-
52.		whl_package.tar	In-use Python Library Package	In-Advance DL
53.		pip-8.1.2.tar.gz	PIP Command for Python Library Install	In-Advance DL
54.		setuptools-28.6.0.tar	pip Dependent Package	In-Advance DL
55.	dhcp.v4.2.5	dhcp-4.2.5-42.el7.centos.x86_64.rpm	DHCP Installation Package	In-Advance DL
56.	ntp.v4.2	autogen-libopts-5.18-5.el7.x86_64.rpm	NTP Installation Package	In-Advance DL
57.		ntpdate-4.2.6p5-22.el7.centos.x86_64.rpm	NTP Installation Package	In-Advance DL
58.		ntp-4.2.6p5-22.el7.centos.x86_64.rpm	NTP Installation Package	In-Advance DL
59.	postgresql.v9.3.13	postgresql93-9.3.13-1PGDG.rhel7.x86_64.rpm	PostgreSQL Installation Package	In-Advance DL
60.		postgresql93-contrib-9.3.13-1PGDG.rhel7.x86_64.rpm	PostgreSQL Installation Package	In-Advance DL
61.		postgresql93-devel-9.3.13-1PGDG.rhel7.x86_64.rpm	PostgreSQL Installation Package	In-Advance DL
62.		postgresql93-libs-9.3.13-1PGDG.rhel7.x86_64.rpm	PostgreSQL Installation Package	In-Advance DL
63.		postgresql93-server-9.3.13-1PGDG.rhel7.x86_64.rpm	PostgreSQL Installation Package	In-Advance DL
64.		uuid-1.6.2-26.el7.x86_64.rpm	PostgreSQL Dependent Package	In-Advance DL
65.		libxslt-1.1.28-5.el7.x86_64.rpm	PostgreSQL Dependent Package	In-Advance DL
66.	pacemaker.v1.1.14-1.1	pacemaker-1.1.14-1.el7.x86_64.rpm	Pacemaker Installation Package	In-Advance DL
67.		corosync-2.3.5-1.el7.x86_64.rpm	Corosync Installation Package	In-Advance DL
68.		crmsh-2.1.5-1.el7.x86_64.rpm	crm Command Installation Package	In-Advance DL
69.		pcs-0.9.143-15.el7.x86_64.rpm	pcs Command Installation Package	Although the latest package is 0.9.149-1, the package one version earlier is used since the latest one is a trial version.

#	Folder Structure	File Name	Description	Remarks
70.		cluster-glue-1.0.12-2.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
71.		cluster-glue-libs-1.0.12-2.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
72.		corosynclib-2.3.5-1.el7.x86_64.rpm	Corosync Dependent Package	In-Advance DL
73.		ipmitool-1.8.13-9.el7_2.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
74.		libqb-1.0-1.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
75.		libtool-ltdl-2.4.2-21.el7_2.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
76.		libxslt-1.1.28-5.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
77.		libyaml-0.1.4-11.el7_0.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
78.		lm_sensors-libs-3.3.4-11.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
79.		nano-2.3.1-10.el7.x86_64.rpm	crm Dependent Package	In-Advance DL
80.		net-snmp-agent-libs-5.7.2-24.el7_2.1.x86_64.rpm	Corosync Dependent Package	In-Advance DL
81.		net-snmp-libs-5.7.2-24.el7_2.1.x86_64.rpm	Corosync Dependent Package	In-Advance DL
82.		openhpi-libs-3.4.0-2.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
83.		OpenIPMI-libs-2.0.19-11.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
84.		OpenIPMI-modalias-2.0.19-11.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
85.		pacemaker-cli-1.1.14-1.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
86.		pacemaker-cluster-libs-1.1.14-1.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
87.		pacemaker-libs-1.1.14-1.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
88.		pacemaker-all-1.1.14-1.1.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
89.		perl-5.16.3-286.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
90.		perl-Carp-1.26-244.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
91.		perl-constant-1.27-2.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
92.		perl-Encode-2.51-7.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
93.		perl-Exporter-5.68-3.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
94.		perl-File-Path-2.09-2.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
95.		perl-File-Temp-0.23.01-3.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
96.		perl-Filter-1.49-3.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
97.		perl-Getopt-Long-2.40-2.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
98.		perl-HTTP-Tiny-0.033-3.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
99.		perl-libs-5.16.3-286.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
100.		perl-macros-5.16.3-286.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
101.		perl-parent-0.225-244.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
102.		perl-PathTools-3.40-5.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL

#	Folder Structure	File Name	Description	Remarks
103.		perl-Pod-Escapes-1.04-286.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
104.		perl-podlators-2.5.1-3.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
105.		perl-Pod-Perldoc-3.20-4.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
106.		perl-Pod-Simple-3.28-4.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
107.		perl-Pod-Usage-1.63-3.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
108.		perl-Scalar-List-Utils-1.27-248.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
109.		perl-Socket-2.010-3.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
110.		perl-Storable-2.45-3.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
111.		perl-Text-ParseWords-3.29-4.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
112.		perl-threads-1.87-4.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
113.		perl-threads-shared-1.43-6.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
114.		perl-TimeDate-2.30-2.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
115.		perl-Time-HiRes-1.9725-3.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
116.		perl-Time-Local-1.2300-2.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
117.		pm_crmgen-2.1-1.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
118.		pm_diskd-2.2-1.el7.x86_64.rpm	Diskd RA Package	In-Advance DL
119.		pm_extras-2.2-1.el7.x86_64.rpm	VIPCheck RA Package	In-Advance DL
120.		pm_logconv-cs-2.2-1.el7.noarch.rpm	Pacemaker Dependent Package	In-Advance DL
121.		psmisc-22.20-9.el7.x86_64.rpm	Pacemaker Dependent Package	In-Advance DL
122.		pssh-2.3.1-5.el7.noarch.rpm	crm Dependent Package	In-Advance DL
123.		python-clufter-0.50.4-1.el7.x86_64.rpm	pcs Dependent Package	In-Advance DL
124.		python-dateutil-1.5-7.el7.noarch.rpm	pcs Dependent Package	In-Advance DL
125.		python-lxml-3.2.1-4.el7.x86_64.rpm	pcs Dependent Package	In-Advance DL
126.		resource-agents-3.9.7-1.2.6f56.el7.x86_64.rpm	Standard RA Package Incl. Virtual IPRA	In-Advance DL
127.		ruby-2.0.0.598-25.el7_1.x86_64.rpm	pcs Dependent Package	In-Advance DL
128.		rubygem-bigdecimal-1.2.0-25.el7_1.x86_64.rpm	pcs Dependent Package	In-Advance DL
129.		rubygem-io-console-0.4.2-25.el7_1.x86_64.rpm	pcs Dependent Package	In-Advance DL
130.		rubygem-json-1.7.7-25.el7_1.x86_64.rpm	pcs Dependent Package	In-Advance DL
131.		rubygem-psych-2.0.0-25.el7_1.x86_64.rpm	pcs Dependent Package	In-Advance DL
132.		rubygem-rdoc-4.0.0-25.el7_1.noarch.rpm	pcs Dependent Package	In-Advance DL
133.		rubygems-2.0.14-25.el7_1.noarch.rpm	pcs Dependent Package	In-Advance DL
134.		ruby-irb-2.0.0.598-25.el7_1.noarch.rpm	pcs Dependent Package	In-Advance DL
135.		ruby-libs-2.0.0.598-25.el7_1.x86_64.rpm	pcs Dependent Package	In-Advance DL
136.		pacemaker_install.sh	Package Installer	In-Advance DL

#	Folder Structure	File Name	Description	Remarks
137.	script	-	-	-
138.		ra_config.xlsx	Resource Agent Configuration File	-
139.		create_table.sql	Table Creation Script	-

2. Operational Environment

2.1. EM Module Start-up Server of Controller

It is recommended to operate the software on the following Linux computer environment.

Table 2-1 Recommended Hardware Configuration

No.	Computer	Minimum Configuration
1.	OS	CentOS7.2 x86_64
2.	CPU	Intel® Xeon® CPU E5-2420 v2 @ 2.20 GHz 12 Core
3.	Memory	32G or larger
4.	HD Free Space	500G or larger
5.	NIC	More than 1 port

3. Preparation for installing the Controller Server

3.1. OS Installation

Please refer to " Fabric_Controller_Installation_Manual" for the way of Installing OS.

4. Installation of Controller Server

4.1. Environmental Installation

<Execution Host: ACT/SBY>

Create a working folder where files are located during the installation.

(It will be deleted when the environmental Installation is completed.)

[mkdir ~/setup] [Enter]

Then locate the em folder in the included accessory in the working folder.

4.1.1. Firewall Configuration

4.1.1.1. Firewall Confirmation

<Execution Host: DB/ACT/SBY>

Check if the firewall has been already configured.

[firewall-cmd --state] [Enter]

If the firewall has already been configured, the following message will be displayed in the screen.

running

In this case, keep following the instructions from 4.1.1.2 to 4.1.1.6.

If the firewall is not installed or is not started, the following message will be displayed in the screen.

(In case the firewall is not started) not running

(In case the firewall is not installed) bash: firewall-cmd: command not found

In these cases, the instructions from 4.1.1.2 to 4.1.1.6 can be ignored.

4.1.1.2. Permit the Connection of Netconf Request (EC, Start-up Notification)

<Execution Host: ACT/SBY>

Execute the following command to permit the connection from the port used in Netconf Request.

(The specified port numbers in this document are default values. You can change the numbers in accordance with your configuration.)

[firewall-cmd --permanent --add-port=830/tcp] [Enter]

4.1.1.3. Permit the Connection of PostgreSQL

<Execution Host: DB>

Execute the following command to permit the connection from the port used in PostgreSQL.

[firewall-cmd --permanent --add-port=5432/tcp] [Enter]

4.1.1.4. Permit the Connection of PNTP

<Execution Host: ACT/SBY>

Execute the following command to permit the connection from the port used in NTP.

[firewall-cmd --permanent --add-service=ntp] [Enter]

4.1.1.5. Permit the Connection of Pacemaker/Corosync

<Execution Host: ACT/SBY>

Execute the following command to permit the connection from the port used in Pacemaker/Corosync.

[firewall-cmd --permanent --add-service=high-availability] [Enter]

4.1.1.6. Final Configuration of the Firewall

<Execution Host: ACT/SBY>

Once having completed the 4.1.1 Firewall Configuration above, execute the following command to reflect the configuration.

[firewall-cmd --reload] [Enter]

[systemctl restart firewalld] [Enter]

Confirm the current configuration by executing the following command (especially for the highlighted section).

[firewall-cmd --list-all] [Enter]

```
public (default, active)
  interfaces: eth0 eth1
  sources:
  services: dhcpv6-client ntp ssh high-availability
  ports: 830/tcp
  masquerade: no
  forward-ports:
  icmp-blocks:
  rich rules:
```

<Execution Host: DB>

Also at the DB side, execute the following command to reflect the configuration.

[firewall-cmd --reload] [Enter]

[systemctl restart firewalld] [Enter]

Confirm the current configuration by executing the following command (especially for the highlighted section).

[firewall-cmd --list-all] [Enter]

```
public (default, active)
  interfaces:
  sources:
  services: ssh
  ports: 5432/tcp
  masquerade: no
  forward-ports:
```

icmp-blocks:
rich rules:

4.1.2. Installation and Configuration of Pacemaker

4.1.2.1. Installation of pacemaker

<Execution Host: ACT/SBY>

Execute the following command to launch the installer and install.

[cd ~/setup/em/installer/pacemaker.v1.1.14-1.1] [Enter]

[sh pacemaker_install.sh] [Enter]

Note: Although you will be warned that there is no key with the message "Warning: pssh-2.3.1-5.el7.noarch.rpm: header V3 RSA/SHA256 Signature, Key ID 352c64e5: NOKEY" displayed in the screen during the installation, the installation process keeps going on and you can ignore it.

4.1.2.2. Confirmation of Installation of Pacemaker

<Execution Host: ACT/SBY>

Execute the following command to confirm the version of Corosync.

[corosync -version] [Enter]

If the installation has been completed successfully, the following message will be displayed.

Corosync Cluster Engine, version '2.3.5'

Copyright (c) 2006-2009 Red Hat, Inc.

Execute the following command to confirm the version of pcs.

[pcs --version] [Enter]

If the installation has been completed successfully, the following message will be displayed.

0.9.143

Execute the following command to confirm the version of Pacemaker.

[crmadmin --version] [Enter]

If the installation has been completed successfully, the following message will be displayed.

Pacemaker 1.1.14-1.el7

Written by Andrew Beekhof

Execute the following command to confirm the version of crm.

[crm --version] [Enter]

If the installation has been completed successfully, the following message will be displayed.

2.1.5-1.el7 (Build unknown)

Execute the following command to confirm the resource agent which is going to be used is actually installed.

[ls /lib/ocf/resource.d/pacemaker/] [Enter]

If the installation has been completed successfully, the following message will be displayed.

diskd

Execute the following command to confirm the resource agent which is going to be used is actually installed.

[ls /lib/ocf/resource.d/heartbeat/] [Enter]

If the installation has been completed successfully, the following message will be displayed.

VIPcheck、IPAddr2

4.1.2.3. Configuration of the Host

<Execution Host: ACT/SBY>

Register the node's hosts used in the active system and the stand-by system.

Perform this task both at the active node and the stand-by node.

Execute the following command to open the hosts file.

[vi /etc/hosts] [Enter]

In the edit mode, add the following lines to the end of the file.

(IP Address for the Stand-by Interconnection) (Stand-by Host Name)

(IP Address for the Active Interconnecction) (Active Host Name)

Then restart in order to enable the configuration of the Hosts.

[reboot] [Enter]

4.1.2.4. Configuration of the password

<Execution Host: ACT/SBY>

After rebooting the system, set the password for the "hacluster" user who will be used in the certification of inter-server communication via corosync. All you have to do is just change the password since the user must have been automatically created at the time of the package installation. The passwords should be identical within all the servers which compose a same cluster.

This task should be performed both at the active and the stand-by nodes.

Execute the following command to change the password.

[passwd hacluster] [Enter]

When the following prompt is displayed after the command, enter the new password.

Changing password for user hacluster.

New password:

[(New Password] [Enter]

After pressing the [Enter] key, you will be prompted to enter the same password again for the confirmation.

Retype new password:

Enter the same password.

[(New Password)] [Enter]

If the entered password is exactly the same as the one entered before, the following message will be displayed and the password change is successfully completed.

passwd: all authentication tokens updated successfully.

4.1.2.5. Configuration of pcsd Service

<Execution Host: ACT/SBY>

Launch and enable the pcsd service. Being independent of pacemaker or corosync, pcsd is a service required to be running in order to use the pcs commands which is used to configure clusters.

This task must be performed both at the active and the stand-by nodes.

Execute the following command to enable the pscd service.

[systemctl start pcsd] [Enter]

[systemctl enable pcsd] [Enter]

The following message will be displayed after the enablement.

Created symlink from /etc/systemd/system/multi-user.target.wants/pcsd.service to /usr/lib/systemd/system/pcsd.service.

4.1.2.6. Confirmation of the pscd Service

<Execution Host: ACT/SBY>

Execute the following command to confirm the status of pcsd service.

This task must be performed both at the active and the stand-by nodes.

[systemctl status pcsd] [Enter]

If the service has been successfully started, the following message will be displayed in the screen.

```
Loaded: loaded (/usr/lib/systemd/system/pcsd.service; disabled; vendor preset: disabled)
Active: active (running) since *** 2016-**-** **:**:** UTC; **s ago
Main PID: **** (pcsd)
CGroup: /system.slice/pcsd.service
        ├**** /bin/sh /usr/lib/pcsd/pcsd start
        ├**** /bin/bash -c ulimit -S -c 0 >/dev/null 2>&1 ; /usr/bin/ruby -I/usr/lib/...
        └**** /usr/bin/ruby -I/usr/lib/pcsd /usr/lib/pcsd/ssl.rb
```

4.1.2.7. Node Certification

<Execution Host: ACT/SBY>

Execute the following command to certificate the nodes between each other by use of "pcs cluster auth" command.

By doing this, the inter-server communication via corosync will be enabled.

This task must be performed both at the active and the stand-by nodes.

[pcs cluster auth (Active Node Name) (Stand-by Node Name) -u hacluster -p (password for hacluster) --force] [Enter]

If it is certificated successfully, the following message will be displayed in the screen.

(Stand-by Host Name or Active Host Name): Authorized

(Stand-by Host Name or Active Host Name): Authorized

4.1.2.8. Making of Initial Cluster

<Execution Host: ACT>

Execute the following command to make the initial cluster by use of "pcs cluster setup" command.

This task must be performed on the Active nodes only.

[pcs cluster setup --name (Cluster Name to be set) (Active Node Name) (Stand-by Node Name)]

If the cluster is created successfully, the following message will be displayed in the screen.

Shutting down pacemaker/corosync services...

Redirecting to /bin/systemctl stop pacemaker.service

Redirecting to /bin/systemctl stop corosync.service

Killing any remaining services...

Removing all cluster configuration files...

(Active Node Name): Succeeded

(Stand-by Node Name): Succeeded

Synchronizing pcsd certificates on nodes em-it1-ha-00.novalocal, em-it1-ha-01.novalocal...

(Active Node Name): Succeeded

(Stand-by Node Name): Succeeded

Restarting pcsd on the nodes in order to reload the certificates...

(Active Node Name): Succeeded

(Stand-by Node Name): Succeeded

4.1.2.9. Synchronization between Nodes

<Execution Host: ACT>

Execute the following command to start synchronization between nodes and establish as a cluster.

This task must be performed on the Active nodes only.

[pcs cluster start --all] [Enter]

If the cluster is started successfully, the following message will be displayed in the screen.

(Active Node Name): Starting Cluster...
(Stand-by Node Name): Starting Cluster...

4.1.2.10. Confirmation of the Inter-node Communication Status

<Execution Host: ACT/SBY>

Execute the following command to confirm the status of inter-node communication via corosync.

This task must be performed both at the active and the stand-by nodes.

[corosync-cfgtool -s] [Enter]

If the cluster is started successfully, the following message will be displayed in the screen.
When the "status" is "active" and "no faults", the communication is working properly.
Printing ring status.
Local node ID (1 or 0)
RING ID 0
id = (IP address of the Active or Stand-by system)
status = ring 0 active with no faults

4.1.2.11. Confirmation of Cluster Status

<Execution Host: ACT or SBY>

Execute the following command to confirm the status of the cluster.

This task can be performed at either the Active or the Stand-by system.

[pcs status] [Enter]

After entering the command, the cluster status will be displayed in the screen. A warning message about STONITH, which looks like below will be also displayed on top of the screen.

Cluster name: (Cluster Name having been set)
WARNING: no stonith devices and stonith-enabled is not false
Last updated: Thu Oct 13 02:06:57 2016 Last change: Thu Oct 13 02:06:49 2016

Since STONITH is not available in the environment this time, set “false” for the enablement of STONITH.

[pcs property set stonith-enabled=false] [Enter]

Confirm the cluster status for one last time.

[pcs status] [Enter]

After entering the command, the cluster status will be displayed in the screen. If it is

configured properly, the screen message will be looked like below.

Cluster name: emcluster

Last updated: WDW MMM DD HH:MM:DD YYYY Last change: WDW MMM DD HH:MM:DD YYYY by root via cibadmin on (Active Node Name)

Stack: corosync

Current DC: (Stand-by Node Name) (version 1.1.14-1.el7-70404b0) - partition with quorum

2 nodes and 0 resources configured

Online: [(Active Node Name) (Stand-by Node Name)]

Full list of resources:

PCSD Status:

(Active Node Name): Online

(Stand-by Node Name): Online

Daemon Status:

corosync: active/disabled

pacemaker: active/disabled

pcsd: active/enabled

4.1.2.12. Enablement of pacemaker/corosync Services

<Execution Host: ACT/SBY>

Execute the following command to enable corosync and pacemaker services for enabling the auto start of both services after the reboot.

This task must be performed both at the active and the stand-by nodes.

[systemctl enable pacemaker] [Enter]

[systemctl enable corosync] [Enter]

4.1.3. Installation and Configuration of Python Library

4.1.3.1. Installation of setup-tools

<Execution Host: ACT/SBY>

Execute the following command to install setup-tools.

[cd ~/setup/em/installer/] [Enter]

[tar zxvf setuptools-28.6.0.tar.gz] [Enter]

[cd setuptools-28.6.0] [Enter]

[python setup.py install] [Enter]

4.1.3.2. Installation of PIP

<Execution Host: ACT/SBY>

Execute the following command to install PIP.

[cd ~/setup/em/installer/] [Enter]

[tar zxvf pip-8.1.2.tar.gz] [Enter]

[cd pip-8.1.2] [Enter]

[python setup.py install] [Enter]

4.1.3.3. Confirmation of PIP Installation

<Execution Host: ACT/SBY>

Execute the following command to confirm the version.

[pip --version] [Enter]

If the installation has been completed successfully, the following message will be displayed.

pip 8.1.2 from /usr/lib/python2.7/site-packages/pip-8.1.2-py2.7.egg (python 2.7)

4.1.3.4. Installation of Python Library

<Execution Host: ACT/SBY>

Execute the following command to extend the package.

[cd ~/setup/em/installer/] [Enter]

[tar xvf whl_package.tar] [Enter]

Execute the following command to navigate to the folder of the extended package.

[cd whl_package] [Enter]

Execute the following command to install the library.

[pip install --use-wheel --no-index --find-links=. netconf-0.4.1-py2-none-any.whl] [Enter]

[pip install --use-wheel --no-index --find-links=. ncclient-0.5.2-py2-none-any.whl] [Enter]

[pip install --use-wheel --no-index --find-links=. oslo.db-4.13.3-py2.py3-none-any.whl] [Enter]

[pip install --use-wheel --no-index --find-links=. xmltodict-0.10.2-py2-none-any.whl] [Enter]

[pip install --use-wheel --no-index --find-links=. psycopg2-2.6.2-cp27-cp27mu-linux_x86_64.whl] [Enter]

4.1.3.5. Confirmation of Python Library Installation

<Execution Host: ACT/SBY>

Execute the following command to view the list of installed libraries and the version of each library.

[pip list] [Enter]

If the installation of each library has been completed successfully, the following information will be displayed in the list.

alembic (0.8.8)
Babel (2.3.4)
cffi (1.8.3)
cryptography (1.5.2)
debtcollector (1.8.0)
decorator (3.4.0)
enum34 (1.1.6)
funcsigs (1.0.2)
idna (2.1)
ipaddress (1.0.17)
iso8601 (0.1.11)
lxml (3.6.4)
Mako (1.0.4)
MarkupSafe (0.23)
monotonic (1.2)
ncclient (0.5.2)
netaddr (0.7.18)
netconf (0.4.1)
netifaces (0.10.5)
oslo.config (3.17.0)
oslo.context (2.9.0)
oslo.db (4.13.3)
oslo.i18n (3.9.0)
oslo.utils (3.16.0)
paramiko (2.0.2)
pbr (1.10.0)
positional (1.1.1)
psycopg2 (2.6.2)
pyasn1 (0.1.9)
pycparser (2.14)
pyparsing (2.1.9)
python-editor (1.0.1)

pytz (2016.7)
rfc3986 (0.4.1)
setuptools (28.6.0)
six (1.9.0)
SQLAlchemy (1.0.15)
sqlalchemy-migrate (0.10.0)
sqlparse (0.2.1)
sshutil (0.9.7)
stevedore (1.17.1)
Tempita (0.5.2)
wrapt (1.10.8)
xmltodict (0.10.2)

4.1.4. Installation and Configuration of NTP

4.1.4.1. Installation

<Execution Host: ACT/SBY>

Execute the following command to install ntp.

[cd ~/setup/em/installer/ntp.v4.2/] [Enter]

[rpm -ivh autogen-libopts-5.18-5.el7.x86_64.rpm] [Enter]

[rpm -ivh ntpdate-4.2.6p5-22.el7.centos.x86_64.rpm] [Enter]

[rpm -ivh ntp-4.2.6p5-22.el7.centos.x86_64.rpm] [Enter]

4.1.4.2. Making of drift File

<Execution Host: ACT/SBY>

Execute the following command to make a blank drift file.

[touch /var/lib/ntp/drift] [Enter]

4.1.4.3. Change of the NTP Configuration File

<Execution Host: ACT/SBY>

Add the following lines (the highlighted section) to the NTP configuration file (/etc/ntp.conf) as the root user.

[vi /etc/ntp.conf] [Enter]

```
…
 restrict default nomodify notrap nopeer noquery

 restrict default ignore

…
#restrict 192.168.1.0 mask 255.255.255.0 nomodify notrap

 restrict xxx.xxx.xxx.xxx noquery nomodify
 server xxx.xxx.xxx.xxx iburst

…
```

4.1.4.4. Synchronization with NTP Server

<Execution Host: ACT/SBY>

Execute the following command to confirm that NTP is not running.

[systemctl status ntpd.service] [Enter]

<Output in case NTP is not running>

```
…
Active: inactive (dead)
…
```

<Output in case NTP is running>

```
…
```

Active: active (running)
…

In case NTP is running, execute the following command to stop the NTP.

[systemctl stop ntpd.service] [Enter]

Synchronize the time with NTP server (IP address: xxx.xxx.xxx.xxx).

[ntpdate xxx.xxx.xxx.xxx] [Enter]

4.1.4.5. Restart of the NTP

<Execution Host: ACT/SBY>

Execute the following command to restart NTP.

[systemctl restart ntpd.service] [Enter]

[systemctl enable ntpd.service] [Enter]

Execute the following command to confirm the synchronization with NTP server.

[ntpq -p] [Enter]

<output example when the synchronization established successfully >

```
     remote           refid      st t when poll reach   delay   offset  jitter
==============================================================================
*xxx.xxx.xxx.xxx LOCAL(0)        11 u   55   64  377    0.130   -0.017   0.017
```

4.1.5. Installation and Configuration of PostgreSQL

4.1.5.1. Installation

<Execution Host: DB/ACT/SBY>

Execute the following command to install postgresql.

[cd ~/setup/em/installer/postgresql.v9.3.13] [Enter]

[rpm -ivh libxslt-1.1.28-5.el7.x86_64.rpm] [Enter]

[rpm -ivh uuid-1.6.2-26.el7.x86_64.rpm] [Enter]

[rpm -ivh postgresql93-libs-9.3.13-1PGDG.rhel7.x86_64.rpm] [Enter]

[rpm -ivh postgresql93-9.3.13-1PGDG.rhel7.x86_64.rpm] [Enter]

[rpm -ivh postgresql93-server-9.3.13-1PGDG.rhel7.x86_64.rpm] [Enter]

[rpm -ivh postgresql93-devel-9.3.13-1PGDG.rhel7.x86_64.rpm] [Enter]

[rpm -ivh postgresql93-contrib-9.3.13-1PGDG.rhel7.x86_64.rpm] [Enter]

4.1.5.2. Change the PostgreSQL Configuration

<Execution Host: DB>

Change the configuration as follows.

[vi /var/lib/pgsql/.bash_profile] [Enter] (Modify or add the highlighted section)

PGDATA=/usr/local/pgsql/9.3/data

export PGDATA

export PATH=$PATH:/usr/pgsql-9.3/bin

[source /var/lib/pgsql/.bash_profile] [Enter]

4.1.5.3. Making of Data Base and Granting Permissions

<Execution Host: DB>

Execute the following command to make the installation folder of the Data Base.

[cd /usr/local/] [Enter]

[mkdir -pm 777 /usr/local/pgsql/9.3] [Enter]

[chown -R postgres:postgres pgsql] [Enter]

Execute the following command as a postgres user to make the Data Base.

- Making of Data Base Folder

  [su - postgres] [Enter]

  [cd /usr/local/pgsql/9.3/] [Enter]

  [mkdir -m 700 data] [Enter]

- Initialization of the Data Base

  [initdb --encoding=UTF8 --no-locale --pgdata=/usr/local/pgsql/9.3/data --auth=ident] [Enter]

After the command execution, confirm the output looked like below.

The files belonging to this database system will be owned by user "postgres".

This user must also own the server process.

The database cluster will be initialized with locale "C".
The default text search configuration will be set to "english".

Data page checksums are disabled.

fixing permissions on existing directory /usr/local/pgsql/9.3/data ... ok
creating subdirectories ... ok
selecting default max_connections ... 100
selecting default shared_buffers ... 128MB
creating configuration files ... ok
creating template1 database in /usr/local/pgsql/9.3/data/base/1 ... ok
initializing pg_authid ... ok
initializing dependencies ... ok
creating system views ... ok
loading system objects' descriptions ... ok
creating collations ... ok
creating conversions ... ok
creating dictionaries ... ok
setting privileges on built-in objects ... ok
creating information schema ... ok
loading PL/pgSQL server-side language ... ok
vacuuming database template1 ... ok
copying template1 to template0 ... ok
copying template1 to postgres ... ok
syncing data to disk ... ok

Success. You can now start the database server using:

    postgres -D /usr/local/pgsql/9.3/data
or
    pg_ctl -D /usr/local/pgsql/9.3/data -l logfile start

- Making of the Data Base

[pg_ctl -D /usr/local/pgsql/9.3/data -l logfile start] [Enter]

After the execution, ”server starting” will be displayed in the screen.

[psql -c "alter user postgres with password ""] [Enter]

After the execution, ”ALTER ROLE” will be displayed in the screen.

[psql] [Enter]

[create role root login createdb password ";] [Enter]

After the execution, ”CREATE ROLE” will be displayed in the screen.

[¥q] [Enter]

[pg_ctl -D /usr/local/pgsql/9.3/data -l logfile stop] [Enter]

After the execution, the following message will be displayed in the screen.

waiting for server to shut down.... done

server stopped

[exit] [Enter]

Execute the following command as the root user.

[chkconfig postgresql-9.3 on] [Enter]

[systemctl daemon-reload] [Enter]

4.1.5.4. Change of the Data Base Configuration

<Execution Host: DB>

Change the configuration as follows.

[vi /usr/local/pgsql/9.3/data/postgresql.conf] [Enter]

Before Change

--

#listen_addresses = 'localhost'

#port = 5432

--

After Change

--

listen_addresses = '*'

port = 5432

--

Change the configuration as follows. (Replace the highlighted section with the server segment to permit.)

[vi /usr/local/pgsql/9.3/data/pg_hba.conf] [Enter]

Before Change

--

TYPE DATABASE USER ADDRESS METHOD

"local" is for Unix domain socket connections only

local all all peer

IPv4 local connections:

```
host    all             all             127.0.0.1/32            ident
# IPv6 local connections:
host    all             all             ::1/128                 ident
# Allow replication connections from localhost, by a user with the
# replication privilege.
#local   replication     postgres                                peer
#host    replication     postgres        127.0.0.1/32            ident
#host    replication     postgres        ::1/128                 ident
```

After Change

```
--
# TYPE  DATABASE        USER            ADDRESS                 METHOD

# "local" is for Unix domain socket connections only
#local   all             all                                     peer
# IPv4 local connections:
#host    all             all             127.0.0.1/32            ident
# IPv6 local connections:
#host    all             all             ::1/128                 ident
# Allow replication connections from localhost, by a user with the
# replication privilege.
#local   replication     postgres                                peer
#host    replication     postgres        127.0.0.1/32            ident
#host    replication     postgres        ::1/128                 ident

local   all             postgres                                peer
local   all             all                                     trust
host    all             all             192.168.53.0/24         trust
host    all             all             127.0.0.1/32            trust
```

Change the configuration as follows. (Modify the highlighted section.)

[vi /usr/lib/systemd/system/postgresql-9.3.service] [Enter]

```
--
# Location of database directory
Environment=PGDATA=/usr/local/pgsql/9.3/data/
--
```

4.1.5.5. Restart the Data Base

<Execution Host: DB>

Execute the following command as a postgres user.

[systemctl daemon-reload] [Enter]

[systemctl start postgresql-9.3] [Enter]

Execute the following command to confirm the running of postgres.

[systemctl status postgresql-9.3] [Enter]

The following message will be displayed after the command. Check the highlighted (red letters) comments below.

Active: active (running) **< Make sure it is "running".**

CGroup: /system.slice/postgresql-9.3.service

tq***** /usr/pgsql-9.3/bin/postgres -D /usr/local/pgsql/9.3/data **< Make sure that the folder just created is specified.**

4.2. Installation of EM Module

Hereafter, the written expression "$EM_HOME" represents any location path specified by the user.

4.2.1. Locating the Library

<Execution Host: ACT/SBY>

Execute the following command to locate the library file which is in the included accessories.

[mkdir -p $EM_HOME/lib] [Enter]

[cp -r ~/setup/em/EmModule/lib/* $EM_HOME/lib/] [Enter]

Grant executional privilege to the located file in accordance with the following steps.

[cd $EM_HOME/lib] [Enter]

[chmod 777 MsfEmMain.pyc] [Enter]

4.2.2. Locating the Configuration File

<Execution Host: ACT/SBY>

Execute the following command to locate the configuration file which is in the included accessories.

[mkdir -p $EM_HOME/conf] [Enter]

[cp -r ~/setup/em/EmModule/conf/* $EM_HOME/conf/] [Enter]

Change the EM Module configuration file by use of the following command.

[vi $EM_HOME/conf/[File Name]] [Enter]

For the “File Name” above, the followings will be inserted.

・conf_sys_common.conf

・conf_scenario.conf

・conf_if_process.conf

・conf_driver.conf

*Please modify configuration values based on your installed server.

Please refer to “EM_Configuration Specifications.xlsx” for the details of the change.

4.2.3. Locating the Startup Shell

<Execution Host: ACT/SBY>

Execute the following command to locate the startup shell file which is in the included accessories.

[mkdir -p $EM_HOME/bin] [Enter]

[cp -r ~/setup/em/EmModule/bin/* $EM_HOME/bin/] [Enter]

Grant executional privilege to the located file in accordance with the following steps.

[cd $EM_HOME/bin] [Enter]

[chmod 777 em_ctl.sh] [Enter]

4.2.4. Making of Log Folder

<Execution Host: ACT/SBY>

Make the folder for logging by use of the following command.

[mkdir -p $EM_HOME/logs/em/log] [Enter]

4.2.5. Making of Schema

<Execution Host: DB>

Make the schema by use of the following command.

[createdb "Schema Name"] [Enter]

Make a table in the schema by use of the following command.

[cd ~/setup/em/script/] [Enter]

[psql "Schema Name" < create_table.sql] [Enter]

4.2.6. Configuration of Monitoring Account for Resource Agent

<Execution Host: ACT/SBY>

Set the IP address, connecting user name and password for EM monitoring to the startup script.

Modify the configuration definition of startup script by use of the following command.

[cd $EM_HOME/bin] [Enter]

[vi em_ctl.sh] [Enter]

Edit the following lines. (Modify the highlighted section.)

<Before Change>

```
# Environmental Definition
# Set information to access EM from the monitoring module
# Login User Name for EM
USERNAME="root"
# Loging Password for EM
PASSWORD=""
# Waiting IP Address for EM
IPV4="127.0.0.1"
# Waiting Port for EM
PORT=830
```

<After Change>

```
# Environmental Definition
# Set information to access EM from the monitoring module
# Login User Name for EM
USERNAME = "(User Name that has been set to the Account at conf_if_process.conf of EM)"
# Login Password for EM
PASSWORD = "(Password that has been set to the Password at conf_if_process.conf of EM)"
```

Waiting IP Address for EM

IPV4 = ”(IP Address that has been set to the Netconf_server_address at conf_if_process.conf of EM)”

PORT = “(Port Number that has been set to the Port_number at conf_if_process.conf of EM)”

Save it when you have completed the edit.

4.2.7. Configuration of Environment Variables

<Execution Host: ACT/SBY>

Open the file to register environment variables by use of the following command.

[vi /root/.bash_profile] [Enter]

Add the following lines in the end of the file.

```
EMTOPPATH="(Change this according to the using environment. Write out the whole EM path from the top.) "
EMLIBTOPPATH="$EMTOPPATH/lib"
PYTHONPATH="$EMLIBTOPPATH:$EMLIBTOPPATH/CommonDriver"
PYTHONPATH="$PYTHONPATH:$EMLIBTOPPATH/Config"
PYTHONPATH="$PYTHONPATH:$EMLIBTOPPATH/DB"
PYTHONPATH="$PYTHONPATH:$EMLIBTOPPATH/DriverUtility"
PYTHONPATH="$PYTHONPATH:$EMLIBTOPPATH/NetconfServer"
PYTHONPATH="$PYTHONPATH:$EMLIBTOPPATH/OrderflowControl"
PYTHONPATH="$PYTHONPATH:$EMLIBTOPPATH/Protocol"
PYTHONPATH="$PYTHONPATH:$EMLIBTOPPATH/Scenario"
PYTHONPATH="$PYTHONPATH:$EMLIBTOPPATH/SeparateDriver"
PYTHONPATH="$PYTHONPATH:$EMLIBTOPPATH/SystemUtility"
PYTHONPATH="$PYTHONPATH:/lib/ocf/resource.d/heartbeat"
export PYTHONPATH
EM_LIB_PATH="$EMTOPPATH/lib/"
export EM_LIB_PATH
EM_CONF_PATH="$EMTOPPATH/conf/"
export EM_CONF_PATH
```

Change the PATH environment variable as follows.

<Before Change>

PATH=$PATH:$HOME/bin

<After Change> (Add the highlighted section.)

PATH=$PATH:$HOME/bin:$EMTOPPATH/bin:/usr/bin/python

Save and close the file when you have completed the addition.

4.3. Registration and Configuration of the Resource Agent

4.3.1. Locating the Resource Agent

<Execution Host: ACT/SBY>

Copy the EM resource agent from the startup shell folder of EM installation folder to the default resource agent folder.

[cp $EM_HOME/bin/em /lib/ocf/resource.d/heartbeat/] [Enter]

Then grant execution privilege to the copied EM resource agent.

[cd /lib/ocf/resource.d/heartbeat/] [Enter]

[chmod 775 em] [Enter]

4.3.2. Making of crm File

<Execution Host: ACT>

Create a working folder to locate files. (It will be deleted when the configuration is completed.)

[mkdir ~/setup] [Enter]

Edit the ra_config.xlsx file, which has the configuration of resource agent in the included accessories, for updating the necessary information, then convert it to a csv file and locate in the working folder.

Execute the following command at the folder where you locate the csv file to convert it into a crm file that is used for registering it to the resource agent.

[pm_crmgen -o crm_conf.crm (located csv file name).csv] [Enter]

If the conversion completes successfully, nothing will be displayed in the screen but in case anything went wrong with the csv file, the location to be amended would be displayed.

4.3.3. Injection of crm File

<Execution Host: ACT>

With the following commend, register the resource agent.

[crm configure load update crm_conf.crm] [Enter]

If the injection completes successfully, nothing will be displayed in the screen. So you need to check the result by following the next instruction. (*Although a message which says the configured number of seconds for VIPcheck is shorter than the default, you can ignore it and keep on going.)

If there is any critical error in the configuration, a warning with the location of the error will be displayed and you will be prompted to answer with Y/N whether you want to keep the injection going or not. When this warning is displayed, there must be errors in the configuration, and you should answer it by entering [N] [Enter].

4.3.4. Confirmation of the Result of Injection

<Execution Host: ACT or SBY>

Confirm the operational status of resource agent with the following command.

[pcs status] [Enter]

If it injected successfully, a message will be displayed as follows.

Cluster name: emcluster
Last updated: WDW MMM DD HH:MM:SS YYYY Last change: WDW MMM DD HH:MM:SS YYYY by root via cibadmin on (Active Node Name or Stand-by Node Name)
Stack: corosync
Current DC: (Active Node Name or Stand-by Node Name) (version 1.1.14-1.el7-70404b0) - partition with quorum
2 nodes and 5 resources configured

Online: [(Active Node Name) (Stand-by Node Name)]

Full list of resources:

Resource Group: grpEM
vipCheck (ocf::heartbeat:VIPcheck): Started (Active Node Name)
prmIP (ocf::heartbeat:IPaddr2): Started (Active Node Name)
prmEM (ocf::heartbeat:em): Started (Active Node Name)

Clone Set: clnDiskd [prmDiskd]
Started: [(Active Node Name) (Stand-by Node Name)]

PCSD Status:
(Active Node Name): Online
(Stand-by Node Name): Online

Daemon Status:
corosync: active/enabled
pacemaker: active/enabled
pcsd: active/enabled