

NEC Express5800 series

R120g-2M, R120g-1M, R120g-2E, R120g-1E, E120g-M,

R120f-2M, R120f-1M, R120f-2E, R120f-1E, E120f-M

FC SANboot installation guide

Windows Server 2008 R2

Windows Server 2012

Windows Server 2012 R2

Red Hat EnterpriseLinux 6

Red Hat EnterpriseLinux 7

VMware vSphere 5.1

VMware vSphere 5.5

VMware vSphere 6.0

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1 Overview

1.1 Purpose of this document

This manual describes the process for implementing NEC Express5800 Series rack server operating system in an FC SAN Boot system that is located in storage devices in a Storage Area Network (hereafter referred to as SAN).

Because there are many different reference sources for servers, storage devices, software and other items when building a SAN Boot system, this manual shows the overall flow of implementation by pointing to and indicating the various manuals to be used. By doing so, this manual shows how to build a SAN Boot system.

Because of this, this manual does not guarantee performance, availability and reliability. Before building a system, the user must assure performance, availability and reliability by following the system design requirements.

1.2 What is SAN Boot ?

SAN Boot is a method in which the system is booted through a SAN from an operating system stored in NEC M-series Storage in the SAN.

The advantages of SAN Boot are: (1) effective use of storage resources and improved fault tolerance by assigning the boot area to a highly reliable storage system; and (2) adding flexibility to system changes by allowing switching of storage networks and reducing downtime.

NEC Express5800 Series provides a SAN Boot solution that encompasses the advantages of SAN Boot and provides companies with an optimized and highly available IT system foundation.

1.3 Abbreviations

The following table shows the meanings of the abbreviations used in this manual.

Abbreviation	Description	Remarks
FC	Fibre Channel	
HBA	Host Bus Adapter	
WWPN	World Wide Port Name	
WWNN	World Wide Node Name	
WWN	World Wide Name	
LD	Logical Disk	
RHEL	Red Hat Enterprise Linux	
DDR	DynamicDataReplication	Data replication function
iSM(E)	Storage Manager (Express)	Storage management software
ControlCommand	Storage ControlCommand	Storage software
MV	Master Volume	Working volume
RV	Replication Volume	Backup volume
WG	WG	Logical disk usage format :Windows (GPTdisk)
WN	WN	Logical disk usage format :Windows (MBR disk)
LX	LX	Logical disk usage format :Linux/VMware (VMFS)

As far as there is no mentioning in particular, "optical disk drive" of mentioning means the following drive in this note. CD-R/RW with DVD-ROM drive

- DVD-ROM drive
- DVD Super MULTI drive
- DVD-Combo drive
- DVD-RAM drive

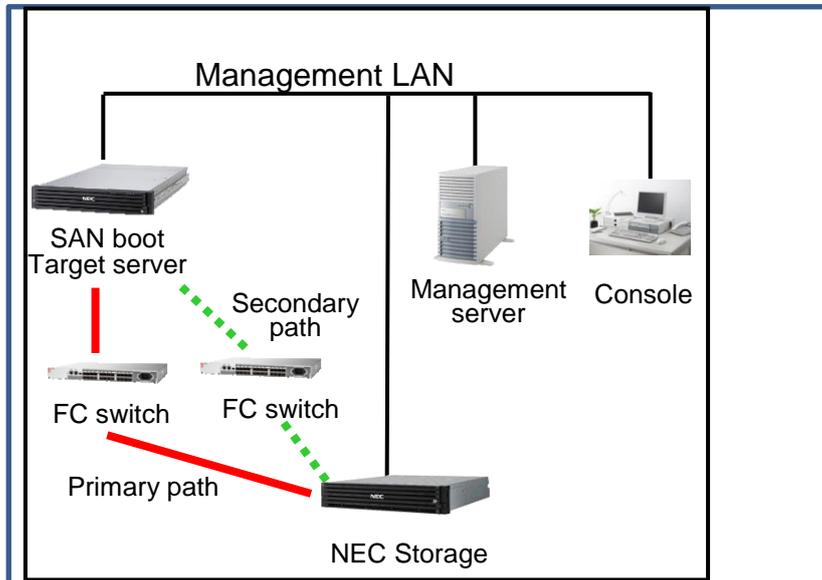
1.4 Notes on Configuring SAN Boot Environment

- Regarding applicable hardware and software for SAN boot configuration, refer to "SAN Boot Compatibility Table" provided separately.
- Confirm also configuration guides of each server, storage, and software or operational requirements of the product reports.
- Make sure to read "8. Precautions and Limitations" before construction of SAN boot environment.

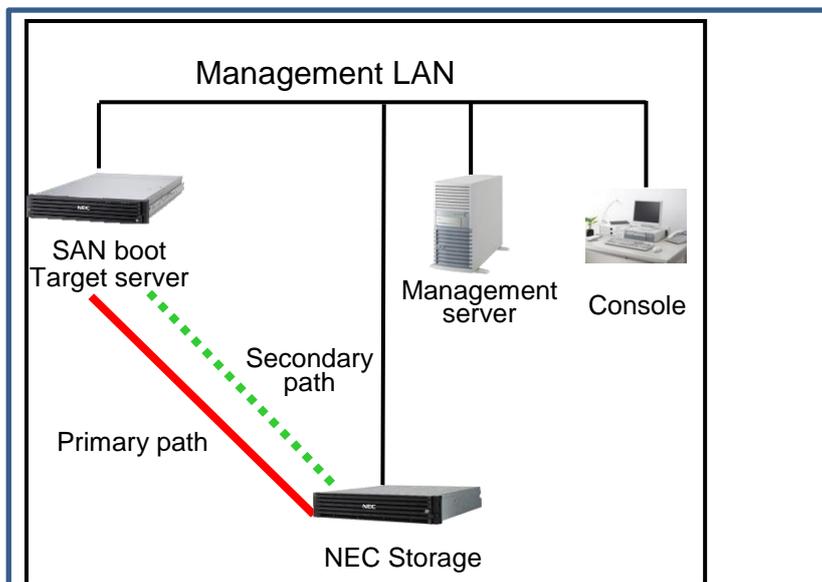
1.5 SAN Boot Environment Hardware Connection Images

The following is the configuration examples of standard hardware connection at SAN Boot configuration.

Configuration example of FC SAN Boot (switch path)



Configuration example of 8G FC SAN boot (directly linked to storage)



The configuration in which HDD/SSD and RAID controller are mounted on SAN boot target server is unsupported. Please be advised when ordering the device.

SAN Boot is not supported for the direct connection to target server with 16G FC HBA (N8190-157A/158A) except for a case of VMware.

To connect target server and storage directly except for a case of VMware, use 8G FC HBA (N8190-159/160).

1.6 Confirmation and Preparation

In some cases of SAN boot environment configuration, the following manuals and system update may be required.

It is recommended to prepare them before starting the construction.

Prerequisite confirmation items and data

Chapter 2	<p>2.6. Confirmation of WWPN</p> <p>Refer to “9.1.1 Confirmation from IEEE address label” in this document to confirm WWPN of each FC controller.</p> <p>2.7 Installation position of FC controller</p> <p>Confirm installation position of FC controller in each device under SAN Boot Environment.</p>
Chapter 3	<p>3.1.5 Association of LD set and FC controller of the server</p> <p>Refer to “2.6 Confirmation of WWPN” for WWPN.</p>
Chapter 5	<p>5.2.1. Installation of Windows Server 2012 R2</p> <p>5.2.1.1. Preparations</p> <ul style="list-style-type: none">Prepare EXPRESSBUILDER DVD attached to each device for driver update. <p>Prepare OS installation media produced by NEC to install OS.</p> <p>5.2.2. Installation of Windows Server 2012</p> <p>5.2.2.1. Preparations</p> <ul style="list-style-type: none">Prepare EXPRESSBUILDER DVD attached to each device for driver update.Prepare OS installation media produced by NEC to install OS. <p>5.2.2.2. OS installation / setup</p> <ul style="list-style-type: none">Prepare driver CD attached to FC controller. <p>5.2.2.3. Application of correction module</p> <ul style="list-style-type: none">Prepare KB2853466, an update program for Windows Server 2012. <p>Obtain from: http://www.microsoft.com/en-us/download/details.aspx?id=36916 http://support.microsoft.com/kb/2853466</p> <p>5.2.3. Installation of Windows Server 2008 R2</p> <p>5.2.3.1. Preparations</p> <ul style="list-style-type: none">Prepare EXPRESSBUILDER DVD attached to each device for driver update.Prepare OS installation media produced by NEC to install OS. <p>5.2.3.2. OS Installation / setup</p> <ul style="list-style-type: none">Prepare driver CD attached to FC controller. <p>5.2.3.3. Application of Service Pack</p> <ul style="list-style-type: none">Prepare Service Pack 1.Obtain from: http://www.58support.nec.co.jp/global/download/w2008r2/sp1.html

Chapter 5	5.3.Initial installation of RHEL 5.3.1.3. RHEL6 <ul style="list-style-type: none">• Prepare installation media of Red Hat Enterprise Linux 6.5 to install OS. 5.3.4 Environment settings of RHEL 5.3.4.1. RHEL6 <ul style="list-style-type: none">• Prepare initial configuration script for driver update and OS settings change. Obtain from:EXPRESSBUILDER DVD attached to each device• Prepare network number fixation script to immobilize the network number. Obtain from: https://www.support.nec.co.jp/View.aspx?id=3140100973 (JP only)• Prepare errata kernel (2.6.32-431.20.3.el6) and update module for application of RHEL6.5 errata kernel. Obtain from: https://www.support.nec.co.jp/View.aspx?id=9010102917 (JP only)
Chapter 6	6.2. Confirmation of FC path redundancy
Chapter 7	7.1.2. Backup of WS2008 R2/WS2012 Hyper-V by DDR function Obtain “iSMpassthrough_enabler” Obtain from: Included in the package of ContorolCommand ver6.2 and later.
Chapter 8	8.1.3. Application of the latest BIOS Prepare BIOS update module to update the system BIOS of the server to the latest. Obtain from: http://support.express.nec.co.jp/pcserver/ (JP only) 8.1.4. FW version of FC controller Prepare the latest FW update module when using N8190-157A/158A as a FC controller. Obtain from: http://support.express.nec.co.jp/pcserver/ (JP only)

1.7 Obtain Manuals

Referential Manual

Chapter 1	1.7 Obtain manuals <ul style="list-style-type: none">• Server (NEC Express5800 series User's Guide)• FC Controller User's Guide Obtain from: http://support.express.nec.co.jp/pcserver/ (JP only)
Chapter 2	2.1.4 Installation of NEC Storage M series control software <ul style="list-style-type: none">• "FC SAN Boot Compatibility Table"• "NEC StorageManager Installation Guide" Obtain from: INSTALL.pdf in NEC StorageManager Suite CD-ROM or DVD-ROM. 2.1.4.2 Activation of AccessControl license <ul style="list-style-type: none">• "NEC Storage Software Configuration Setting Tool User's Manual (GUI) for the M Series" Obtain from: manual¥IS051.pdf in NEC Storage Manager Express Setup and Utility CD-ROM. 2.2.2.1 Zoning of FC switch <ul style="list-style-type: none">• "User's Guide" Obtain from: Attached to FC switch
Chapter 3	3.1.1 Settings of NEC Storage M series – Construction of pool and logical disk (LD) 3.1.2 Settings of NEC Storage M series – Construction of LD set 3.1.3 Settings of NEC Storage M series – LD Assignment to LD set 3.1.4 Settings of NEC Storage M series – Change ports to access mode 3.1.5 Settings of NEC Storage M series – Association of LD set and FC controller of the server <ul style="list-style-type: none">• "NEC Storage Software Configuration Setting Tool User's Manual (GUI) for the M Series" Obtain from: manual¥IS051.pdf in NEC Storage Manager Express Setup and Utility CD-ROM.

**Chapter
5**

5.2.1. Installation of Windows Server 2012 R2

5.2.1.2. OS installation / setup

- Refer to “Installation Guide (Windows)” of each device.

Obtain from: <http://www.58support.nec.co.jp/global/download/index.html>

5.2.1.3 Installation of NEC Storage PathManager for Windows

- “Installation Guide”

Obtain from: Attachment of NEC Storage PathManager product.

5.2.1.4 Installation of Hyper-V (only when used)

- “Windows Server 2012 R2 Hyper-V Installation Procedure”

Obtain from: <http://support.express.nec.co.jp/os/w2012r2/hyper-v.html> (JP only)

5.2.2. Installation of Windows Server 2012

5.2.2.2. OS installation / setup

- Refer to “Installation Guide (Windows)” of each device.

Obtain from: <http://www.58support.nec.co.jp/global/download/index.html>

5.2.2.4 Installation of NEC Storage PathManager for Windows

- “Installation Guide”

Obtain from: Attachment of NEC Storage PathManager product.

5.2.2.5 Installation of Hyper-V (only when used)

- “Windows Server 2012 Hyper-V Installation Procedure”

Obtain from: <http://support.express.nec.co.jp/os/w2012/hyper-v.html> (JP only)

5.2.1. Installation of Windows Server 2008 R2

5.2.1.2. OS installation / setup

- Refer to “Installation Guide (Windows)” of each device.

Obtain from: <http://www.58support.nec.co.jp/global/download/index.html>

5.2.1.4 Installation of NEC Storage PathManager for Windows

- “Installation Guide”

Obtain from: Attachment of NEC Storage PathManager product.

5.2.1.5 Installation of Hyper-V (only when used)

- Windows Server 2008 R2: “Hyper-V 2.0 Installation Procedure”

Obtain from: <http://support.express.nec.co.jp/os/w2008r2/hyper-v-v2.html> (JP only)

**Chapter
5**

5.3.3 Initial installation of RHEL

5.3.3.1. RHEL6

- “Installation Guide (Linux)”
Obtain from:EXPRESSBUILDER DVD attached to each device

5.3.4 Environment configuration of RHEL

5.3.4.1. RHEL6

- “Installation Guide (Linux)”
Obtain from:EXPRESSBUILDER DVD attached to each device

Update of [RHEL6] kernel (2.6.32-431.20.3.el6 (RHEL6.5 errata))
Obtain from:Update of [RHEL6] kernel (2.6.32-431.el6(RHEL6.5) and later)
<https://www.support.nec.co.jp/View.aspx?id=9010102917> (JP only)

**Chapter
6**

6.2. Confirmation of FC path redundancy

Windows OS

Refer to “NEC Storage PathManager for Windows Manual” to confirm detailed information.

Obtain from: <https://www.support.nec.co.jp/View.aspx?NoClear=on&id=3170100142>
(JP only)

VMware ESX/ESXi

Refer to “NEC Storage PathManager for VMware Manual” to confirm detailed information.

Obtain from: <https://www.support.nec.co.jp/View.aspx?NoClear=on&id=3170100142>
(JP only)

**Chapter
7****7.1 DDR (7.1 DDR M series)**

- Installation Guide of NEC Storage ControlCommand
Obtain from:INSTALL.pdf in NEC Storage ControlCommand(Windows) CD-ROM.
Obtain from:INSTALL.pdf in NEC Storage ControlCommand (Linux) CD-ROM.
- “NEC Storage series Configuration Manual (GUI)”
Obtain from: manual¥IS051.pdf in NEC StorageManager Suite CD-ROM or DVD-ROM
- “NEC Storage Software Data Replication User’s Manual(Function Guide)”
Obtain from:manual¥IS015.pdf in NEC Storage ControlCommand(Windows) CD-ROM
Obtain from:manual¥IS015.pdf in NEC Storage ControlCommand(Linux) CD-ROM
- “NEC Storage Software Command Reference of ControlCommand”
Obtain from:manual¥IS041.pdf in NEC Storage ControlCommand(Windows) CD-ROM
manual¥IS041.pdf in NEC Storage ControlCommand(Linux) CD-ROM
- “NEC Storage Software NEC StorageManager Command Reference”
Obtain from: manual¥IS052.pdf in NEC StorageManager Suite CD-ROM or DVD-ROM

7.1.2. Backup of WS2008 R2 Hyper-V by DDR function

- Backup procedure/restore procedure “Data Replication User’s Manual(Installation and Operation Guide for Windows)”

Obtain from:manual¥IS016.pdf in NEC Storage ControlCommand on Windows CD-ROM

7.1.2. Backup of WS2008 R2/WS2012 Hyper-V by DDR function

- Obtain “iSMpassthrough_enabler”
Obtain from: Included in the package of ControlCommand ver6.2 and later.

**Chapter
8****8.1.3. Application of the latest BIOS**

- Regarding the update procedure, refer to the introduction sentences of BIOS download page of each device and “Readme.txt” included in downloaded data.
Obtain from: <http://support.express.nec.co.jp/pcserver/> (JP only)

8.1.4. FW version of FC controller

- Regarding the update procedure, refer to the introduction sentences of download
-

page and "Readme.txt" included in downloaded data.

Obtain from: <http://support.express.nec.co.jp/pcserver/> (JP only)

2 Preparation

2.1 Obtain Manuals

This document explains installation procedure with cross-references between relevant pages in each device's manual. The manuals are attached to each server, and the latest version is published online. It is recommended to download the latest ones from the website before construction.

NEC Express5800 series User's Guide

<http://support.express.nec.co.jp/pcserver/> (JP only)

Select from category > Product manual (User's Guide)

- R120f-2M / R120f-1M / R120f-2E / R120f-1E:
Documents & Software > Rack
- E120f-M:
Documents & Software > Other

Select target model name

Click product manual (User's Guide) and select User's Guide of the target model from search result.

FibreChannel controller/switch User's Guide

<http://support.express.nec.co.jp/pcserver/> (JP only)

(1) Search from model number / name.

(2) Enter product's model number (N8190-157A/-158A/-159/-160) and click "Search from model number".

(3) Select target model number from search result.

(4) Select target model number from search result.-> User's guide.

SigmaSystemCenter 3.4 document

<http://www.nec.co.jp/WebSAM/SigmaSystemCenter/> (JP only)

Download

- SigmaSystemCenter 3.4 First Step Guide
- SigmaSystemCenter 3.4 Installation Guide
- SigmaSystemCenter 3.4 Configuration Guide
- SigmaSystemCenter 3.4 Reference Guide

DeploymentManager Ver6.4 document

<http://www.nec.co.jp/WebSAM/SigmaSystemCenter/> (JP only)

Download

- DeploymentManager Ver6.3 First Step Guide
- DeploymentManager Ver6.3 Installation Guide
- DeploymentManager Ver6.3 Operation Guide
- DeploymentManager Ver6.3 Reference Guide

NEC Storage Control Software, Installation Guide

Please contact your dealer or the NEC sales department.

2.2 Specifications of Hardware/Software

Please contact NEC sales or Contact Center for inquiries about constructible SAN boot system configuration using each product.

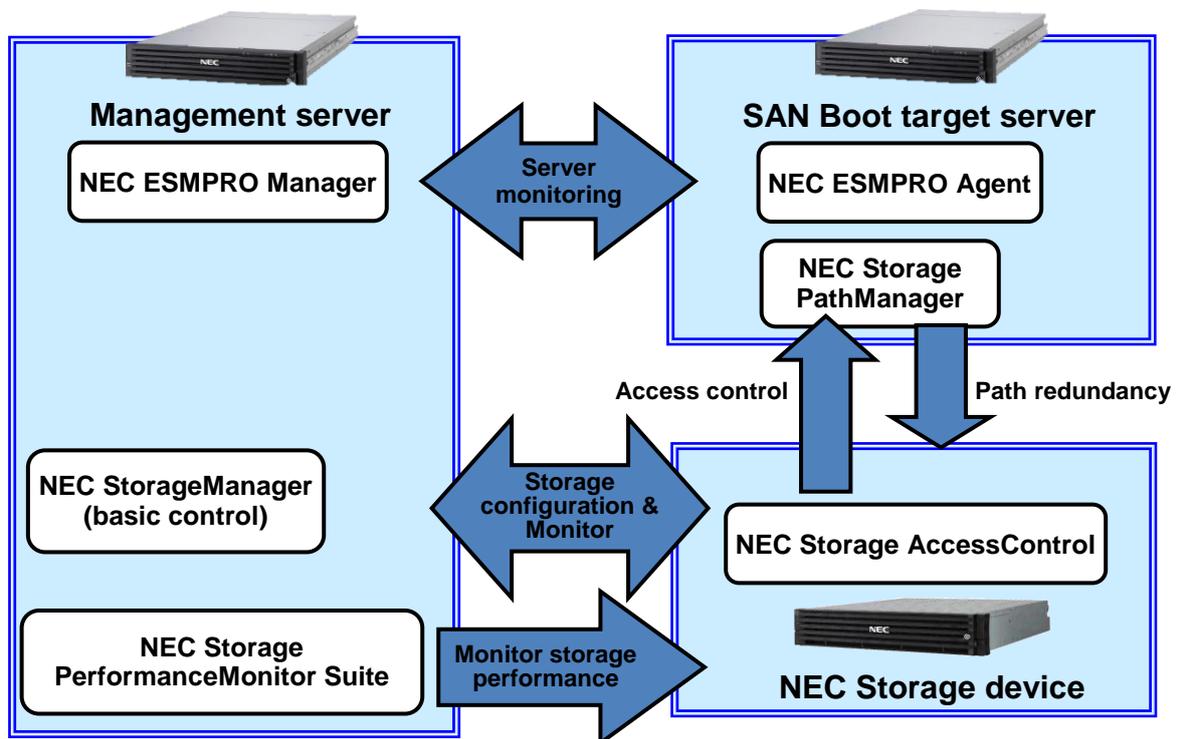
2.3 Management Server Preparation

2.3.1 Management Software and Linkage Image

The followings are the major roles (installed software) of management server used in SAN Boot environment.

- Management of SAN Boot target servers (NEC ESMPRO Manager)
- Storage configuration setting/monitoring (NEC Storage Manager)

The linkage between software installed at SAN booting is as follows:



2.3.2 Software Installation in the Management Server

This section describes the NEC M-series Storage management settings and EM/FC switch console function settings prerequisite to the SAN Boot environment (i.e. OS installation).

Refer to "7. Additional Application Settings" regarding data replication functions (DDR) that must be setup after OS installation.

2.3.3 Management LAN Settings

Connect via management LAN*1 and configure network settings, to operate NEC StorageManager which configures/manages NEC Storage disk array (mandatory).

For smooth construction/management of SAN boot target server, it is strongly recommended to connect and configure management LAN.

***1 Management LAN and operation LAN can co-exist in the same segment. However, it is recommended to configure dedicated management LAN network so that it is possible to prevent inaccessibility due to network congestion at the time of high network load.**

2.3.4 Installation of control software for NEC Storage-M series

2.3.4.1. Installation of NEC StorageManager

To control NEC Storage for SAN boot, use NEC StorageManager. If NEC StorageManager is not installed or the installed version cannot be used for SAN boot, install it according to **“4. Implementation of server (Windows)”** and **“5. Implementation of Client”** in **“NEC StorageManager Installation Guide”**.

For **“Installation Guide”**, please refer to INSTALL.PDF in NEC StorageManager Suite CD-ROM or DVD-ROM.

2.3.4.2. Installation of AccessControl License

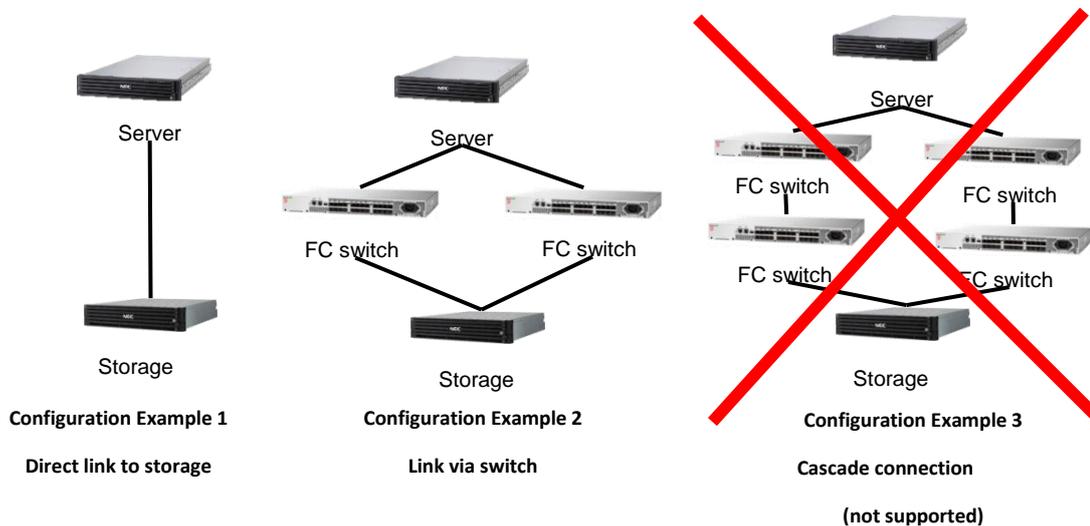
A system disk cannot be shared by multiple servers in SAN boot system. Therefore, access control between each server by AccessControl is required.

For M10 series and M100 series, AccessControl license is activated before shipped. Therefore, users do not need to perform license activation.

2.4 Preparation of Fibre Channel switch

2.4.1 Configuration

In SAN boot environment, a server for SAN boot is connected to storage via FC switch or directly connected to storage. Note that the arrangement of FC switches in cascade form is not supported in SAN boot environment.



2.4.1.1. FC switch configuration

FC switch configuration is available in NEC Storage WB series (WB305A/310A/330A/340A).



2.4.2 Configuration of FC Zoning

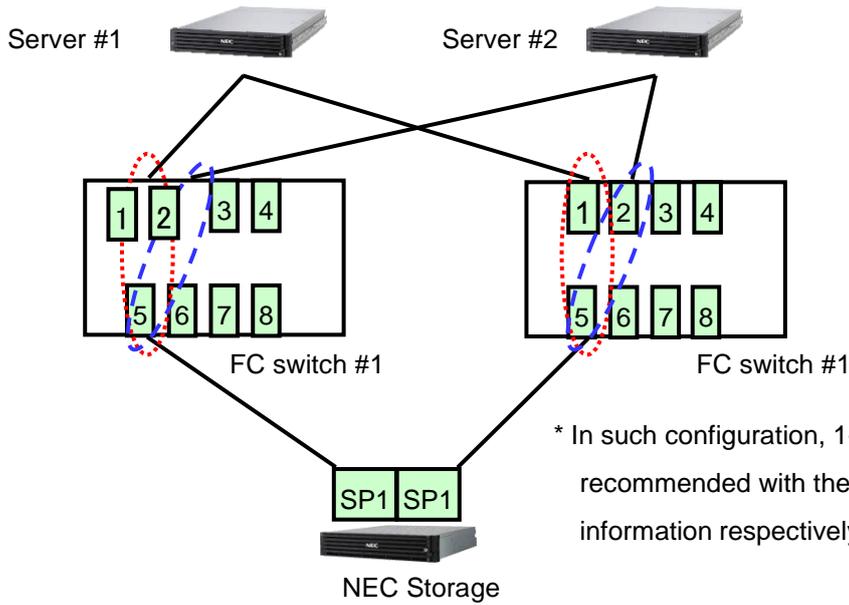
The purpose of FC switch zoning is to improve security by logically separating devices which does not require mutual data access and by disabling access from connected devices outside the zone.

When booting from FC SAN, interruptions (logon from other servers) may occur at the time of server up, in case of without zoning settings to distribute FC controllers (to connect servers to FC switches) to different zone in port bases. Therefore, this zoning settings are necessary.

If multiple devices are included in the same zone, interruptions from other devices may occur. Therefore, 1-to-1 zoning (port level zoning) is strongly recommended also for device side. For details of how to configure zoning of FC switches, please refer to "User's Guide" attached to FC switch.

Configuration example of FC switch zoning

The following is an example of port zoning in which FC is configured with two servers linked by dual redundant path.



* In such configuration, 1-to-1 zoning setting is recommended with the following zone information respectively for FC switch #1 and #2.

Server #1 Zone information: [Port1] ⇔ [Port5]

Server #2 Zone information: [Port2] ⇔ [Port5]

Precautions:

- For details of how to configure, please refer to “Appendix: Zoning Setting” in “User’s Guide” of FC switch.
- The example here shows configuration with two servers. The zoning setting of port3 and later for future extension is also possible.

2.5 Boot mode

- R120f-2M / R120f-1M / E120f-M / R120f-2E / R120f-1E support both legacy BIOS mode and UEFI mode as OS boot modes.
- The supported boot mode and X2SPIC setting by NEC are as shown below. The boot mode and X2APIC need to be setup according to the selected OS. For the setup procedures, please refer to “4.2 BIOS setting of server”.

OS type	Supported boot mode	X2APIC setting
Windows Server 2012 R2	UEFI mode	Enabled
Windows Server 2012	UEFI mode	Enabled
Windows Server 2008 R2	Legacy BIOS mode	Disabled
Red Hat Enterprise Linux 6 x86_64	UEFI mode	Enabled
VMware ESXi 5.5 Update2	Legacy BIOS mode	Disabled

2.6 Confirmation of WWPN

- Before implementation, confirm FC controller WWPN (World Wide Port Name) used in each server for FC SAN boot.
- In FC SAN boot environment, FC controller of the server and LD set on NEC Storage need to be associated by using AccessControl on NEC Storage.
- Before setting the association between WWPN and LD set, confirmation of WWPN is required. Each port of FC controller has individual WWPN, therefore, two WWPN shall be confirmed per FC controller in [N8190-158A/160].
- FC controllers for FC SAN boot need to be installed to the specified option card slots. The option card slot position differs in each server model.

2.6.1 Procedure to confirm WWPN

- Refer to “9.1.1. Confirmation from IEEE address” to confirm FC controller WWPN and take a note of each number.

2.7 Position to install FC controller

Install FC controller to the server to use for FC SAN boot.

Installation position of FC controller differs in each server model.



To associate LD set and FC controller, WWPN is required. Take note of that a FC controller with which WWPN is installed to which slot.



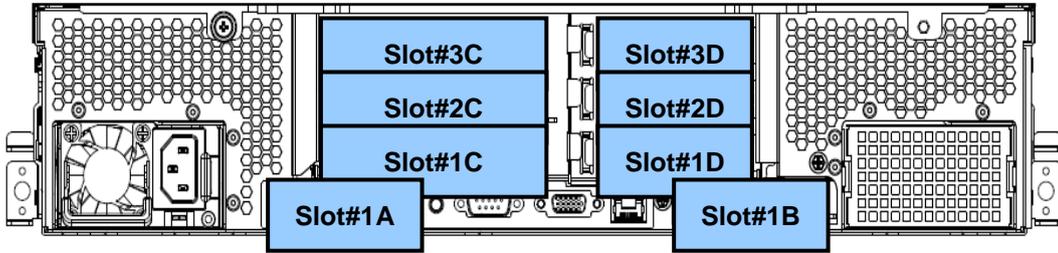
When using two N8190-158A/160 on R120g-2M / R120g-1M / R120g-2E / R120g-1E / E120g-M / R120f-2M / R120f-1M / R120f-2E / R120f-1E / E120f-M, port 1 is used for FC SAN boot preferentially in legacy BIOS mode, and port 0 in UEFI.

2.7.1 R120g-2M / R120f-2M

To execute FC SAN Boot from a FC controller, install a FC controller to Slot #1C,

To execute from two FC controllers, install them to Slot #1C and Slot #1D.

When executing FC SAN Boot from two of N8190-158A/160, take a note of which number is for Port0/Port1 as one of them will be used for FC SAN Boot.



PCI slot configuration of R120g-2M / R120f-2M

2.7.2 R120g-1M / R120f-1M

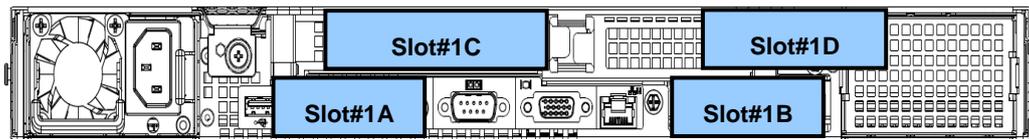
To execute FC SAN Boot from a FC controller, install a FC controller to Slot #1C,

To execute from two FC controllers, install them to Slot #1C and Slot #1D.



When executing FC SAN Boot from two of N8190-158A/160, take a note of which number is for Port0/Port1

as one of them will be used for FC SAN Boot.



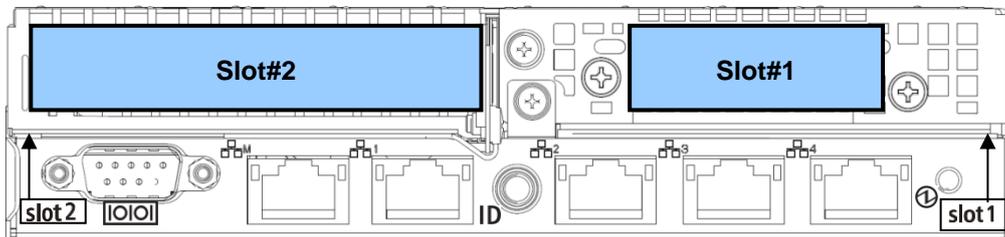
PCI slot configuration of R120g-1M / R120f-1M

2.7.3 E120g-M / E120f-M

Install N8190-158A/160 to Slot#2.



Booting from FC SAN on E120g-M / E120f-M requires one of N8190-158A/160.



PCI slot configuration of E120g-M / E120f-M

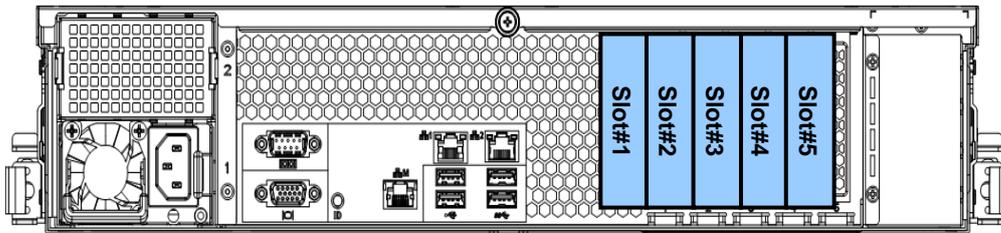
2.7.4 R120g-2E / R120f-2E

To execute FC SAN Boot from a FC controller, install a FC controller to Slot #3,

To execute from two FC controllers, install them to Slot #3 and Slot #2.



When executing FC SAN Boot from two of N8190-158A/160, take a note of which number is for Port0/Port1 as one of them will be used for FC SAN Boot.



PCI slot configuration of R120g-2E / R120f-2E

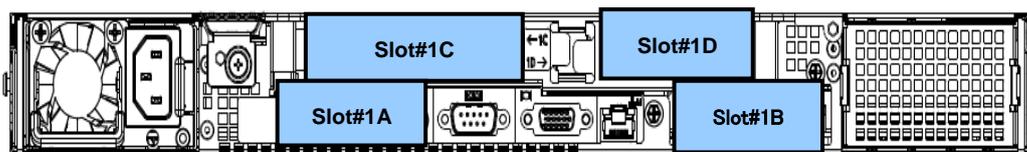
2.7.5 R120g-1E / R120f-1E

To execute FC SAN Boot from a FC controller, install a FC controller to Slot #1C,

To execute from two FC controllers, install them to Slot #1C and Slot #1D.



When executing FC SAN Boot from two of N8190-158A/160, take a note of which number is for Port0/Port1 as one of them will be used for FC SAN Boot.

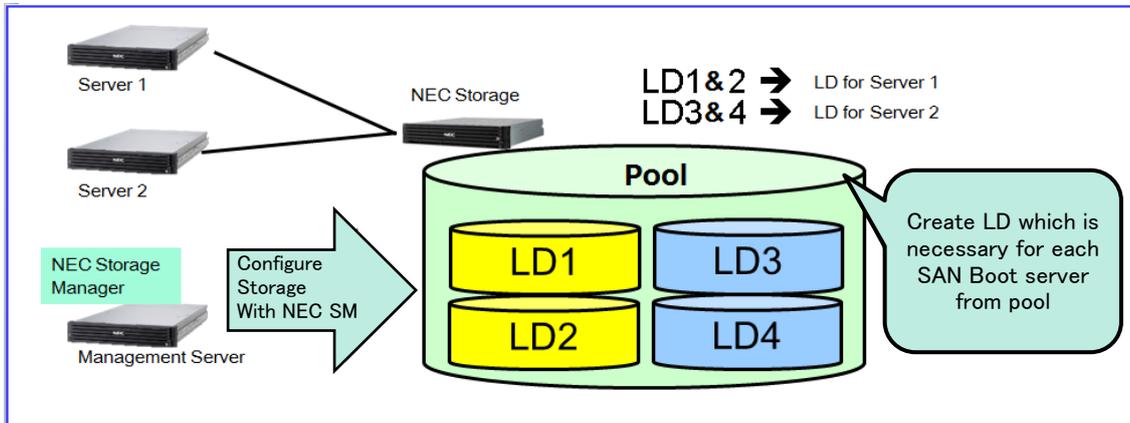


PCI slot configuration of R120f-1E

3 Setting of storage

3.1 Setting of NEC Storage M series

3.1.1 Configuration of pool and Logical Disk (LD)



Configure pool and Logical Disk (LD) with NEC StorageManager. Refer to “7.1 Pool configuration” and “9.1 Logical disk configuration” in “NEC Storage Series Configuration Guide (GUI) – M Series”.

* Proceed to configuration of logical disk if pool was already made at system local procurement.

* It may take time for formatting depending on capacity or number of LD to be created.



When performing back up OS images of Windows using data replication function of NEC Storage, the logical disk format of the logical disk in which OS is saved must be set as “WG”.

Refer to “7.1.4 Notes on Backup/restore Windows server OS image by DDR function” in this document.

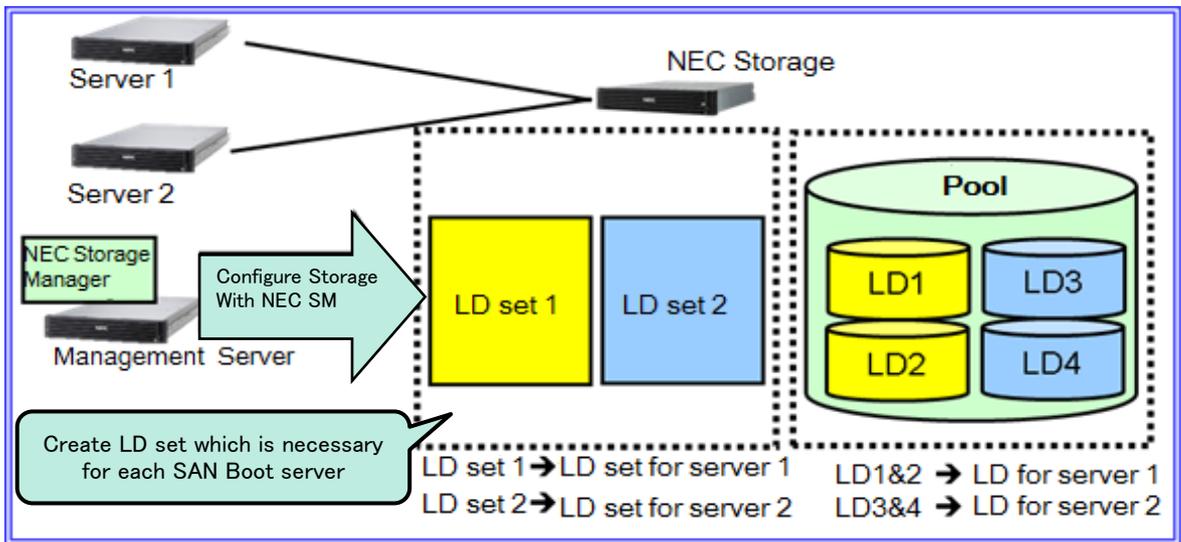


Specify “512byte” for block size of logical disk at LD configuration.

3.1.2 Configuration of LD set

Configure LD set with NEC StorageManager.

For more details, refer to “10.3.3.1 New creation/configuration change of LD set (FC)” in “NEC Storage Series Configuration Guide (GUI) – M Series”..



:



Configure business server platform for LD set platform. When business server is VMware ESX Server, configure “LX” for the platform.

LD set is virtual concept which indicates a gathering of logical disks. Access to LD from business server is enabled by allocating path information (WWN (World Wide Name) of business server) and LD to LD set.

For more details, refer to “2.3 LD set” in “NEC Storage Software Configuration Guide (GUI) – M Series”.

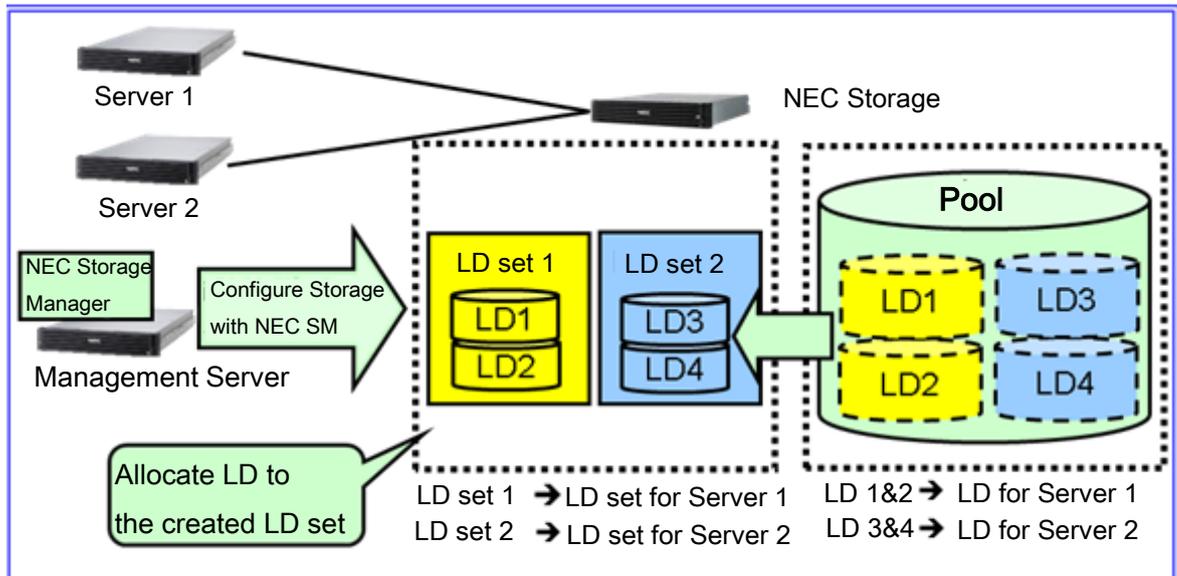
3.1.3 Allocation of LD to LD set

Allocate LD to LD set by using NEC StorageManager.

Allocate LUN0 to LD for OS installation.

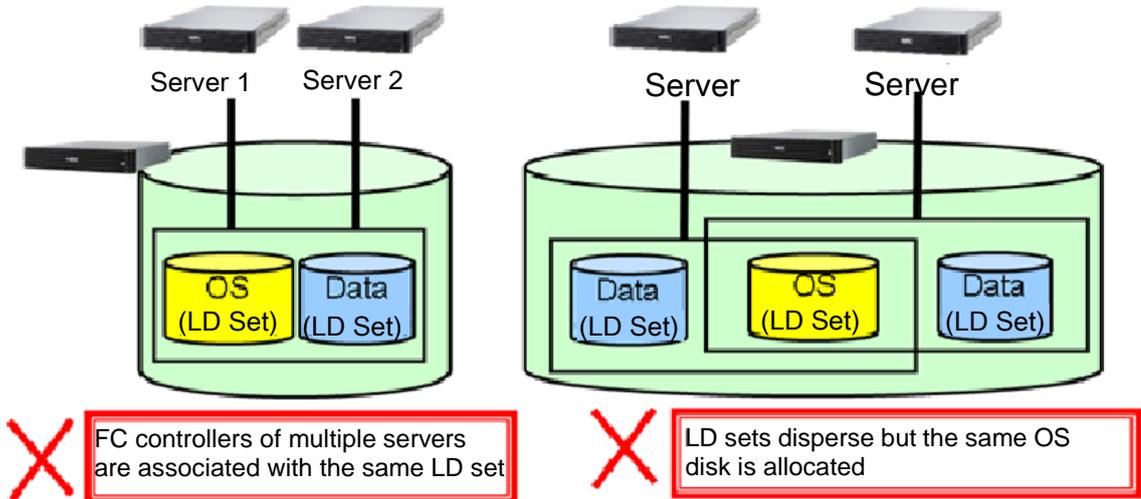
For more details, refer to “10.1 Allocation of logical disk” in “NEC Storage Software Configuration Guide (GUI)”- M Series.

Perform this procedure after completed LD formatting according to “3.1.1 Configuration of pool and logical disk (LD)”.

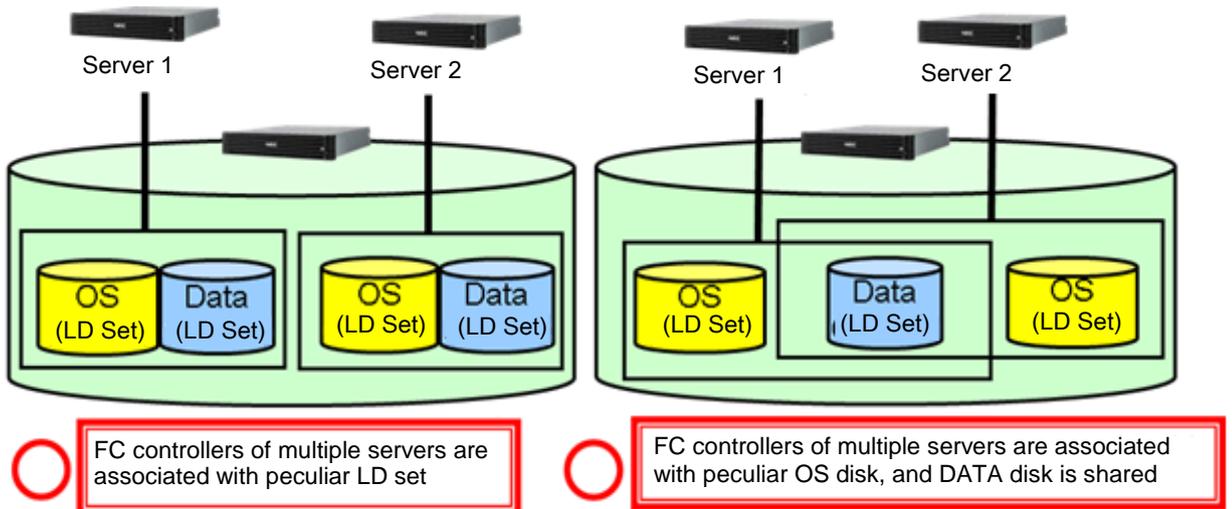


Notes on allocation of LD

- Following configuration is not supported.



- Configure to disable to access to same LD set from multiple servers.
- Regarding data disk sharing, exclusive access control is required with using cluster dedicated LD set.



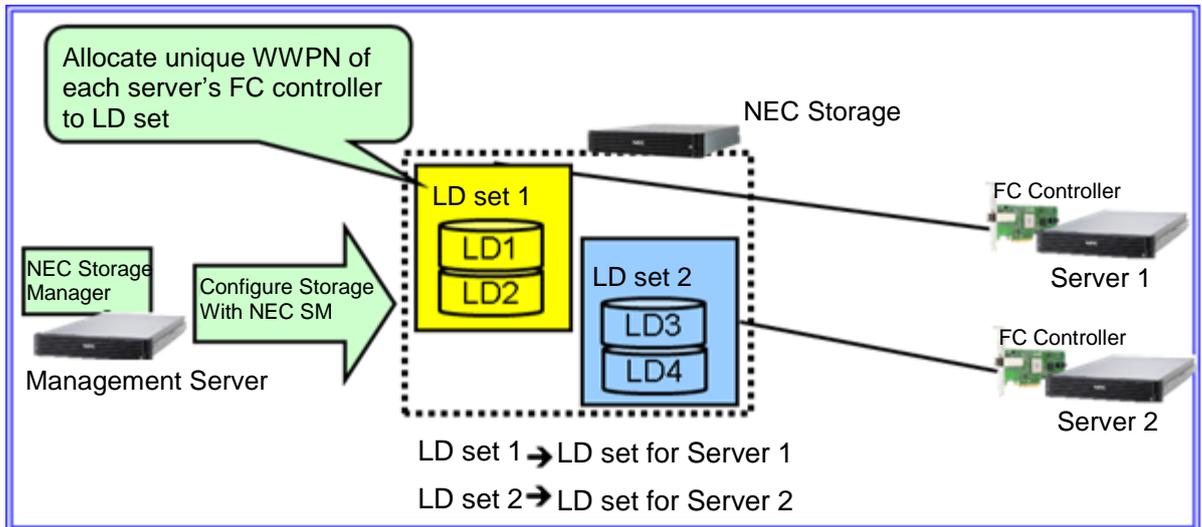
3.1.4 Change of access mode

Setup access mode of NEC Storage port to WWN mode is required for SAN boot (Default is WWN mode).

Setup access mode of the port to WWN mode by using NEC StorageManager.

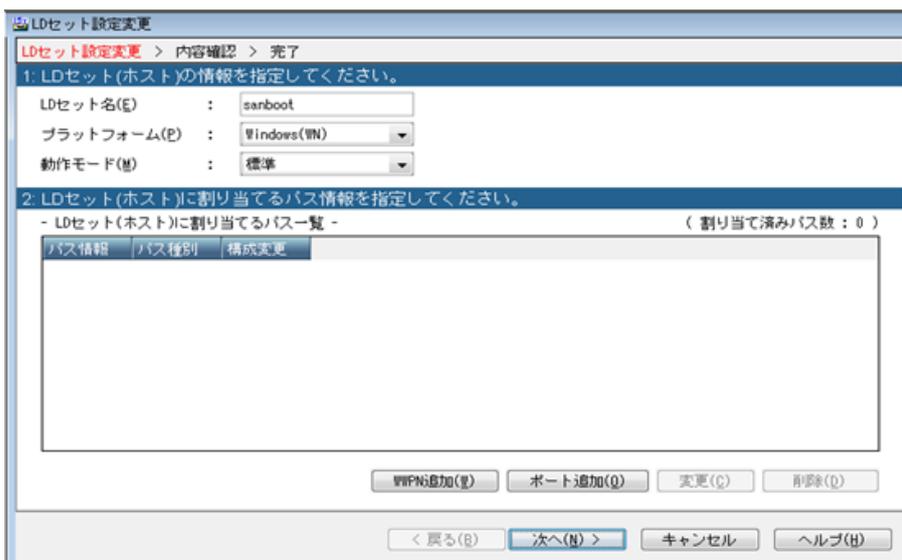
For more details, refer to “11.2.7 Change of port mode Change” in “NEC Storage Software Configuration Guide (GUI) – M Series”.

3.1.5 Association WWN to LD set server



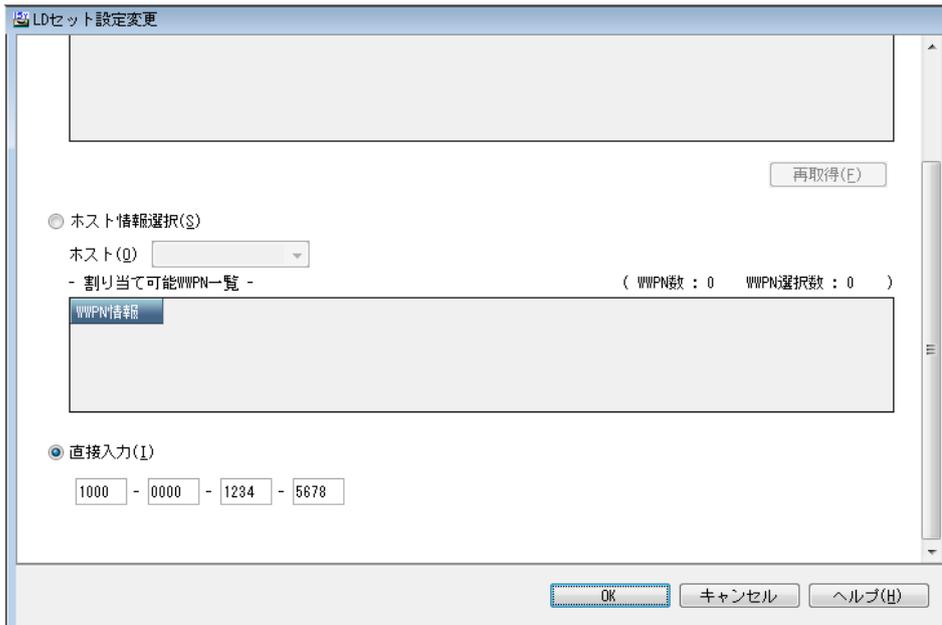
Associate LD set created by using NEC StorageManager in [3.1.2 LD set Configuration] with WWN (WWPN) of FibreChannel controller which is installed in the server to perform SAN boot.

For more details, refer to “10.3.3.1 New creation/setting change of LD set” in “Instruction for NEC Storage Series Configuration Guide (GUI) – M Series”.



Associate all the ports from a FibreChannel controller to the same LD set for redundant configuration.

Confirmation of WWPN is available from WWPN label attached to FC controller or BIOS of FC controller.



Refer to **“9.1 Confirmation Method for WWPN/WWNN of FC controller”** in this document for WWPN confirmation method of FC controller.

4 Server settings

4.1 Connection of FC cable

Before setting up FC controller, connect ports of FC controller for booting from FC SAN and FC switch/storage with FC cable. The position of FC controller slot for booting from FC SAN and FC ports depend on the server model and configured boot mode.



Connect 2 paths of FC cables only for FC SAN Boot.

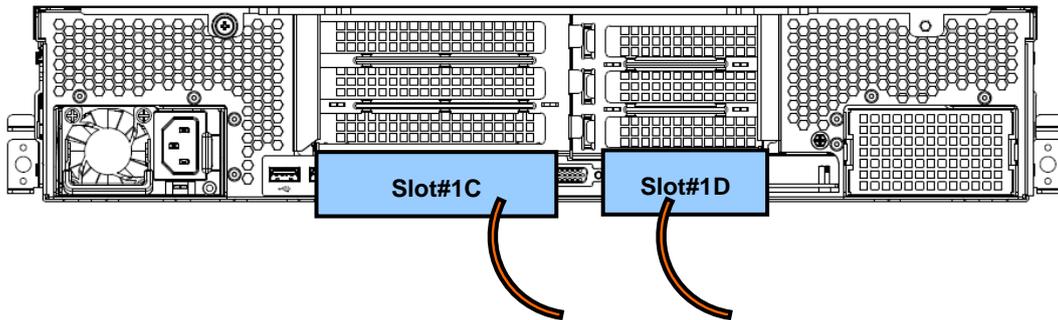


When using two of N8190-158A / 160 on R120g-2M / R120g-1M / R120g-2E / R120g-1E / E120g-M / R120f-2M / R120f-1M / R120f-2E / R120f-1E / E120f-M, Port1 is used preferentially in legacy BIOS mode, and Port0 is used preferentially in UEFI mode.

4.1.1 R120g-2M / R120f-2M

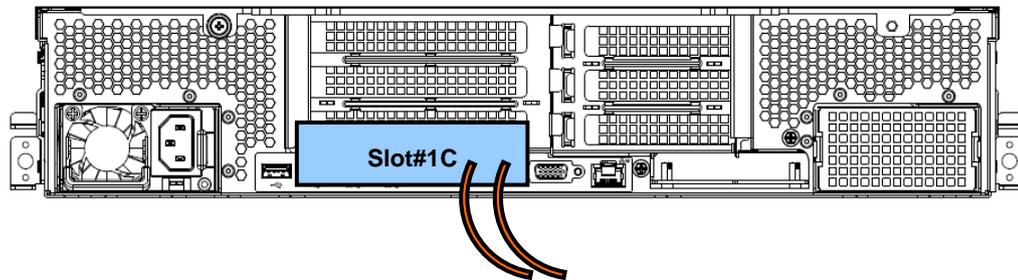
Booting from FC SAN with two of N8190-157A/159:

Connect FC controllers installed in Slot# 1C and Slot# 1D to FC switch/storage with FC cables.



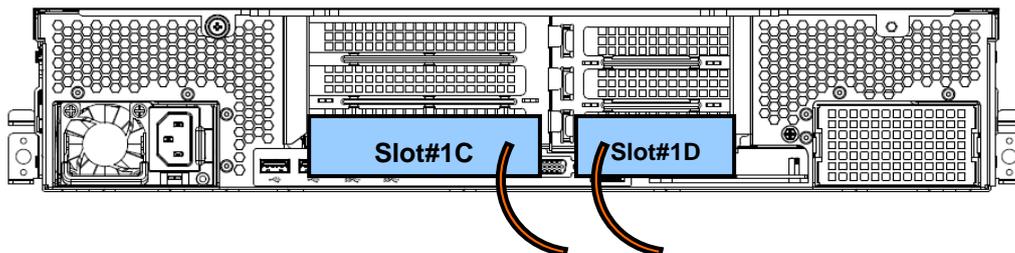
Booting from FC SAN with a N8190-158A/160:

Connect FC controllers installed in Slot# 1C to FC switch/storage with a FC cable.



Booting from FC SAN with two of N8190-158A/160:

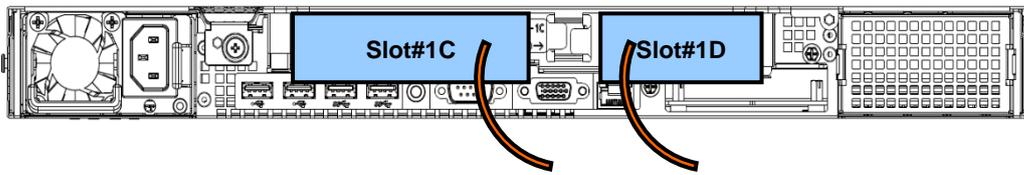
Connect FC controllers installed in Slot# 1C and Slot# 1D to FC switch/storage with FC cables. In legacy BIOS mode, Port1 side is used; in UEFI mode, Port0 is used.



4.1.2 R120g-1M / R120f-1M

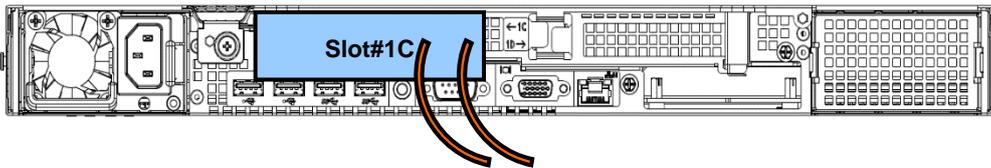
Booting from FC SAN with two of N8190-157A / 159 :

Connect both of the FC controllers to FC switch/storage with FC cables.



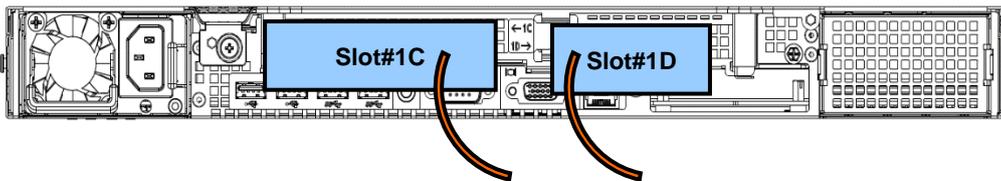
Booting from FC SAN with a N8190-158A / 160 :

Connect FC controllers installed in Slot# 1C to FC switch/storage with a FC cable.



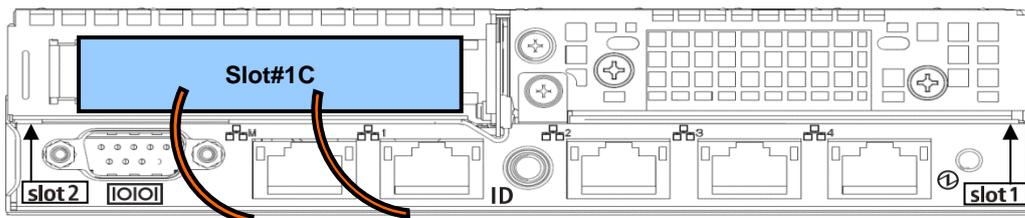
Booting from FC SAN with two of N8190-158A / 160 :

Connect both of the FC controllers to FC switch/storage with FC cables. In legacy BIOS mode, Port1 side is used; in UEFI mode, Port0 is used.



4.1.3 E120g-M / E120f-M

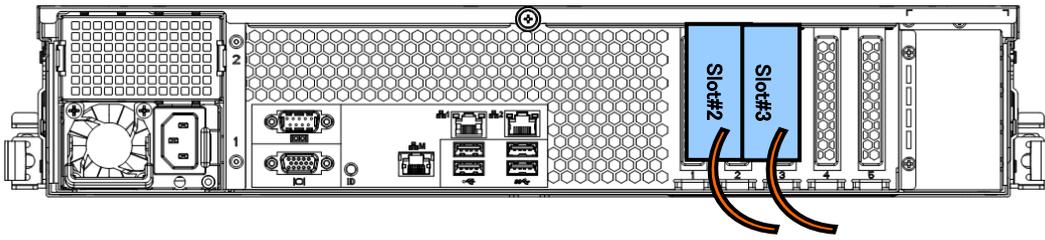
Connect both ports of N8190-158A / 160 to FC switch/storage with FC cables.



4.1.4 R120g-2E / R120f-2E

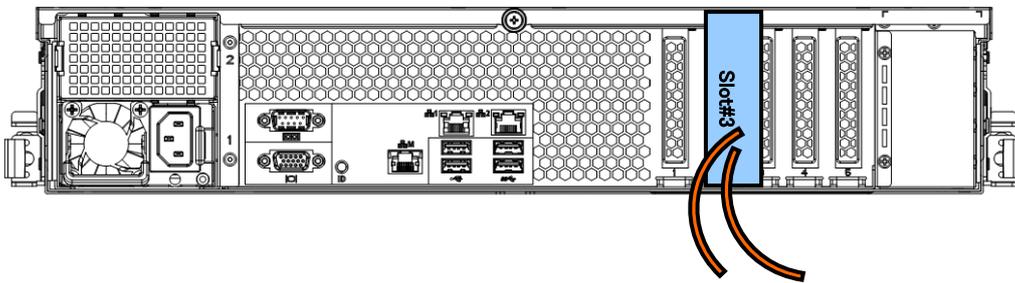
Booting from FC SAN with two of N8190-157A / 159 :

Connect FC controllers installed in Slot# 3 and Slot# 2 to FC switch/storage with FC cables.



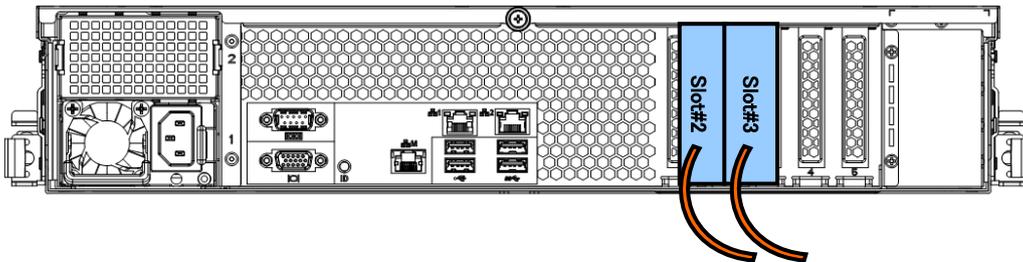
Booting from FC SAN with a N8190-158A / 160 :

Connect FC controller installed in Slot# 3 to FC switch/storage with FC cables.



Booting from FC SAN with two of N8190-158A / 160 :

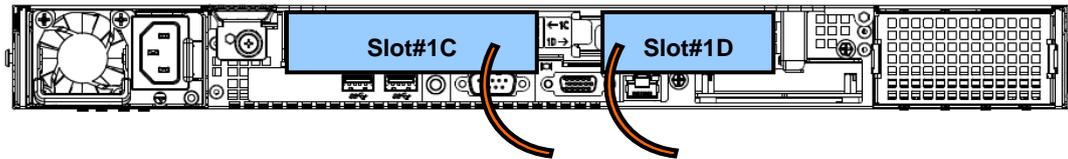
Connect FC controllers installed in Slot# 3 and Slot# 2 to FC switch/storage with FC cables. In legacy BIOS mode, Port1 side is used; in UEFI mode, Port0 is used.



4.1.5 R120g-1E / R120f-1E

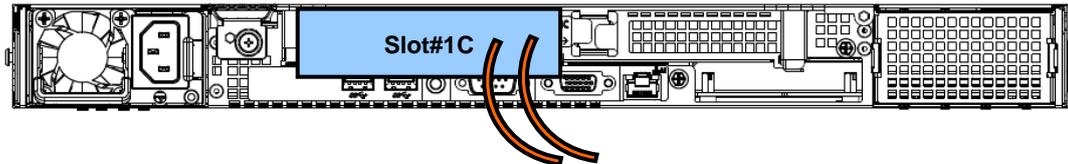
Booting from FC SAN with two of N8190-157A / 159 :

Connect both of the FC controllers to FC switch/storage with FC cables.



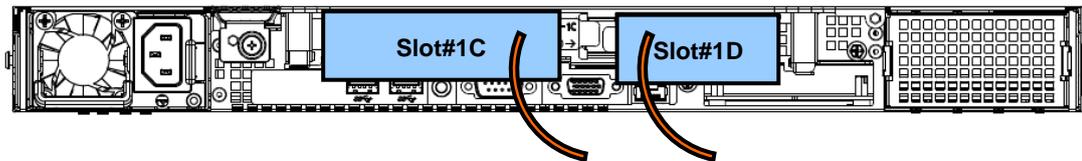
Booting from FC SAN with a N8190-158A / 160 :

Connect FC controllers installed in Slot# 1C to FC switch/storage with a FC cable.



Booting from FC SAN with two of N8190-158A / 160 :

Connect both of the FC controllers to FC switch/storage with FC cables. In legacy BIOS mode, Port1 side is used; in UEFI mode, Port0 is used.



4.2 BIOS Setting of server

R120g-2M / R120g-1M / R120g-2E / R120g-1E / E120g-M

R120f-2M / R120f-1M / R120f-2E / R120f-1E / E120f-M :

To boot from FC SAN, boot mode (UEFI/legacy BIOS) and x2APIC need to be setup according to the OS and FC controller BIOS needs to be enabled.

To setup BIOS setting of the server, press <F2> key at server booting and display System Setup screen.

Press <F2> to enter SETUP or Press <F12> to Network

For setup procedures of System BIOS, please refer to "System BIOS" in Maintenance Guide and User's Guide of each device.

4.2.1 Enable PCI slot option ROM

Change settings of "PCI Configuration".

Enable the PCI slot in which the FC controller is installed in "2.7. Installation position of FC controller".

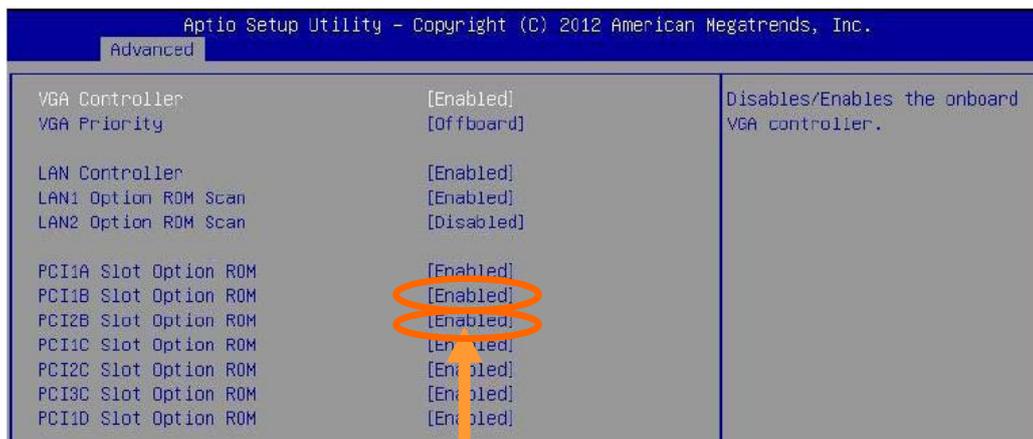
[BIOS Setup screen]

-> [Advanced]

-> [PCI Configuration]

PCI Slot 1 Option ROM: [Enabled]

* Disable all the other option ROM other than the ones used for FC SAN boot.



Change the setting of the slot for FC controller from [Disable] to [Enable] (the image above is of R120f-2M).

4.2.2 Setting of boot mode

[BIOS setting screen]

- > [Boot]
 - > [Boot Mode]
- > [Advanced]
 - > [CPU Configuration]
 - > [x2APIC]

Setup boot mode to [UEFI] or [Legacy] according to the table below. Depending on this setting, the setting procedure of FC controller and path used at OS installation differ in each mode.

Boot mode	X2APIC	OS
UEFI (UEFI mode)	Enabled	Windows Server 2012 Windows Server 2012R2 Red Hat Enterprise Linux 7 x86_64 Red Hat Enterprise Linux 6 x86_64
Legacy (Legacy BIOS mode)	Disabled	Windows Server 2008R2 VMware ESXi 6 VMware ESXi 5

After completing the settings, save the change and turn the power off.

[BIOS setting screen]

- > [Save & Exit]
 - > [Save & Exit Options]
 - > [Save Changes and Power OFF]

4.3 Settings of FC controller (legacy BIOS mode)

In legacy BIOS mode environment, setup FC controller from the local console of the server to boot from FC SAN according to the following procedure.

4.3.1 Boot BIOS configuration utility

Boot the server after completing “4.2 BIOS setting of server”.

When the following message is displayed, press <Alt> and <E> or <Ctrl> and <E> simultaneously to boot BIOS configuration utility of FC controller.

```
Emulex LightPulse FC BIOS, Version 2.12a15
Copyright (c) 1997-2014 Emulex. All rights reserved.

Press <Alt E> or <Ctrl E> to enter Emulex BIOS configuration
utility. Press <s> to skip Emulex BIOS
```

The following message appears when key depressions are recognized, then the menu will be displayed. If the procedure has proceeded without the menu to be displayed, reboot the server and retry.

```
Emulex FC BIOS configuration utility selected
Bringing the Link up, Please wait...
```

```
Emulex LightPulse FC BIOS Utility. UB2.12a15

This utility displays and saves changes when selected.
You will be prompted to reboot for all changes to take effect.

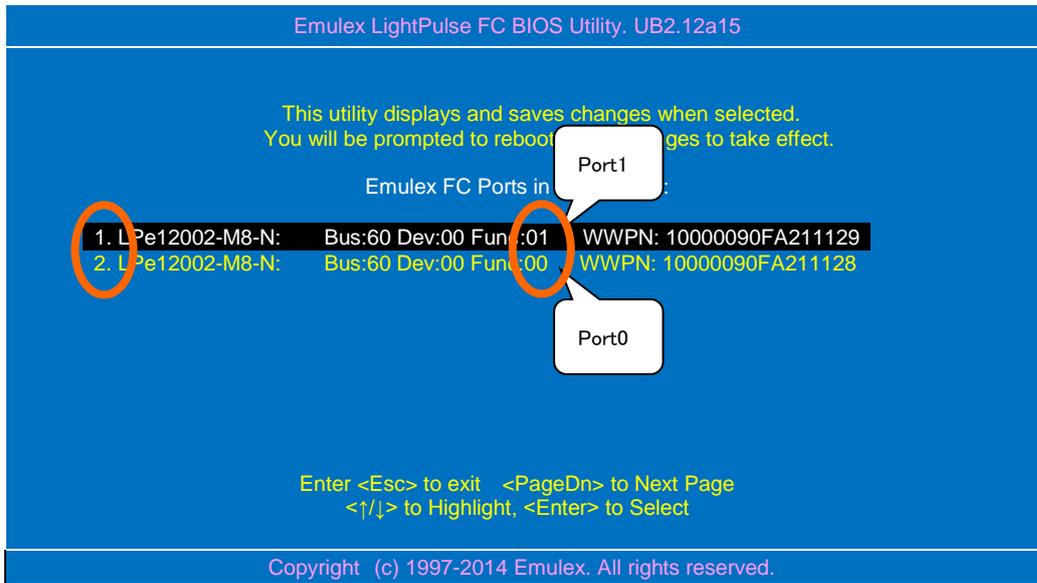
Emulex FC Ports in the System:
1. LPe12002-M8-N: Bus:60 Dev:00 Func:01 WWPN: 10000090FA211129
2. LPe12002-M8-N: Bus:60 Dev:00 Func:00 WWPN: 10000090FA211128

Enter <Esc> to exit <PageDn> to Next Page
<t/j> to Highlight, <Enter> to Select

Copyright (c) 1997-2014 Emulex. All rights reserved.
```

4.3.2 Selection of FC port to setup

When the menu is displayed, select a port linked to the storage in which OS is installed, then press <Enter> to display information screen of the corresponding port.



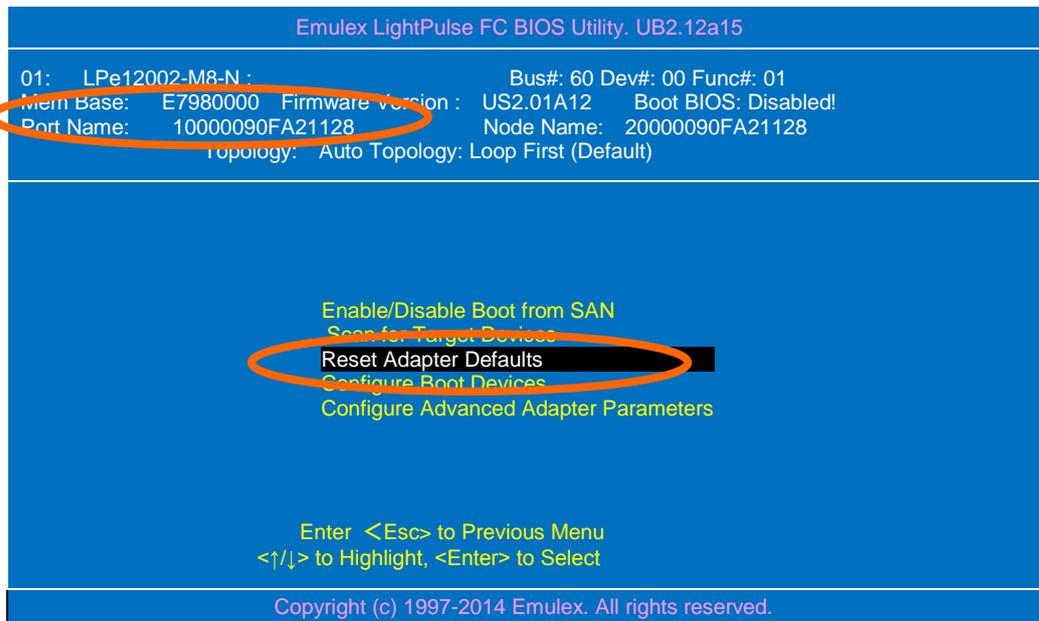
On N8190-158A/160, ports with same Bus and Dev number, and also Func [00] and [01] are displayed. Func [00] corresponds to Port0 of FC controller, and Func [01] to Port1. The displaying order of Port0 and Port1 depends on server.

4.3.3 Initialization of port settings

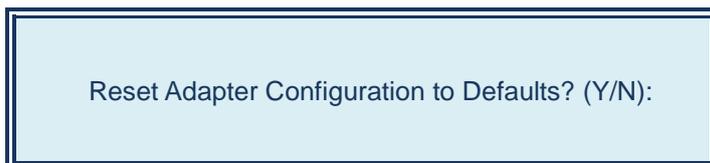


Confirm that the port name of the selected port agrees with WWPN of the port used for booting from FC SAN. If not, press <Esc> key to redo the selection of port from "4.3.2. Selection of FC port to setup".

In the following screen, select [Reset Adapter Defaults] and press <Enter>.

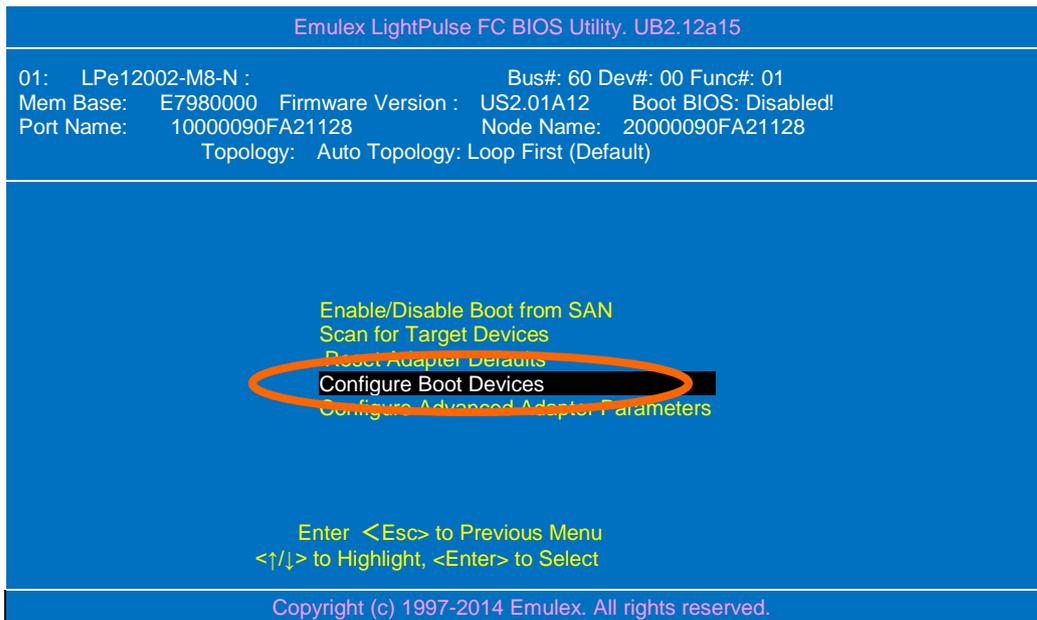


When the following confirmation message is displayed, press <Y> to initialize the port settings.

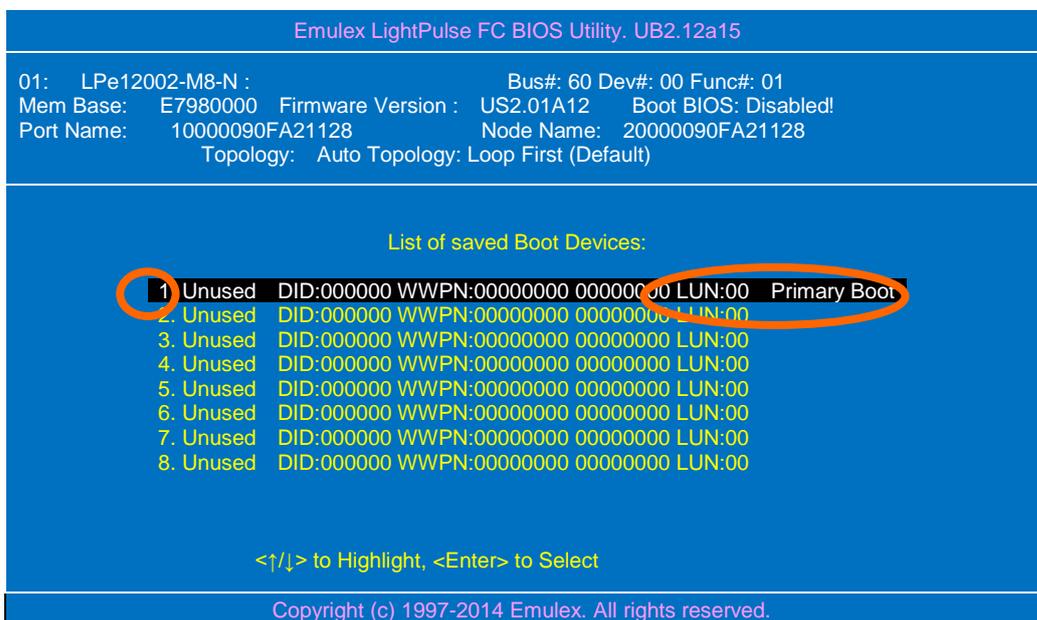


4.3.4 Register boot devices

In the following screen, select [Configure Boot Devices] and press <Enter> to display the list of boot devices.



When the list of boot devices is displayed, select [1] and press <Enter> to display setting screen of primary boot entry.

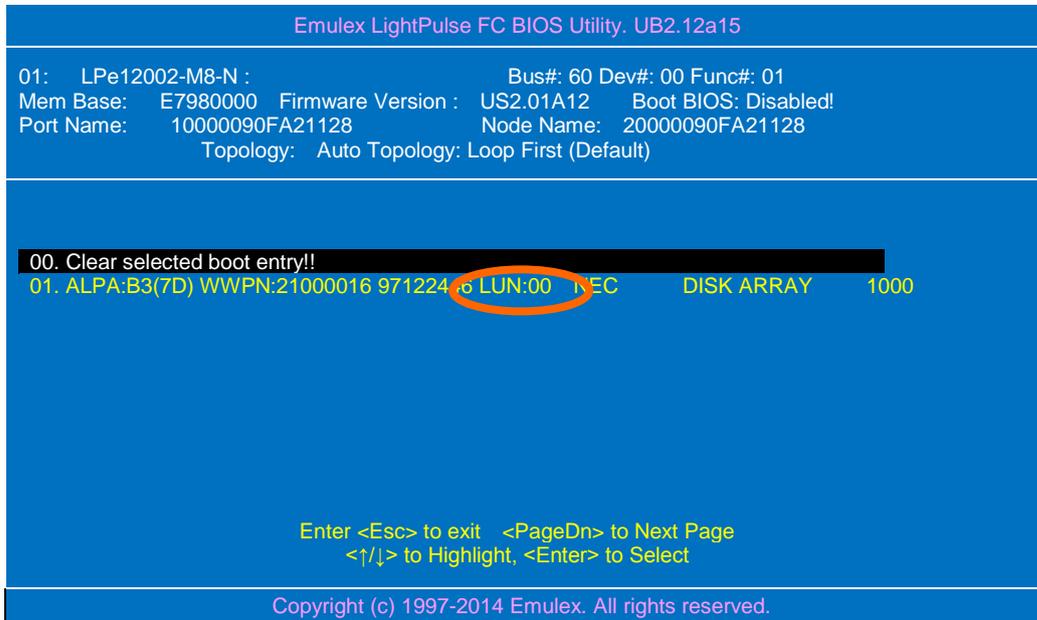


If the boot device could not be recognized from the selected port, a message "This Adapter is not ready, try again!" appears instead of the list of boot devices. Please confirm the selected port is correct. If the selected port is correct, confirm the settings of storage and FC switch, then reboot the server, and redo the procedure from the beginning.

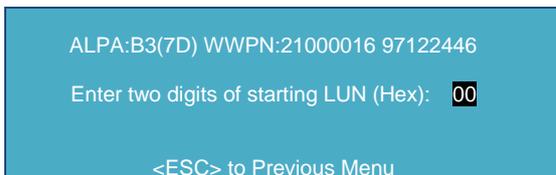
Select the boot device to be registered and press <Enter>.



The number of boot devices must contain LUN0. If devices with the number LUN0 are not displayed, refer to "3.1.3. Allocation of LD to LD set" to reconfirm LD allocation.



When the screen to enter LUN start number of the device appears, enter 00 (means LUN0).



When the screen to select LUN of the device, select 01 (LUN:00) and press <Enter>.

Emulex LightPulse FC BIOS Utility. UB2.12a15

01: LPe12002-M8-N : Bus#: 60 Dev#: 00 Func#: 01
Mem Base: E7980000 Firmware Version : US2.01A12 Boot BIOS: Disabled!
Port Name: 10000090FA21128 Node Name: 20000090FA21128
Topology: Auto Topology: Loop First (Default)

ALPA:B3 SelectedID:7D WWPN: 21000016 97122446

01.	LUN:00	NEC	DISK ARRAY	1000
02.	LUN:01	NEC	DISK ARRAY	1000

Enter <Esc> to exit <PageDn> to Next Page
<↑/↓> to Highlight, <Enter> to Select

Copyright (c) 1997-2014 Emulex. All rights reserved.

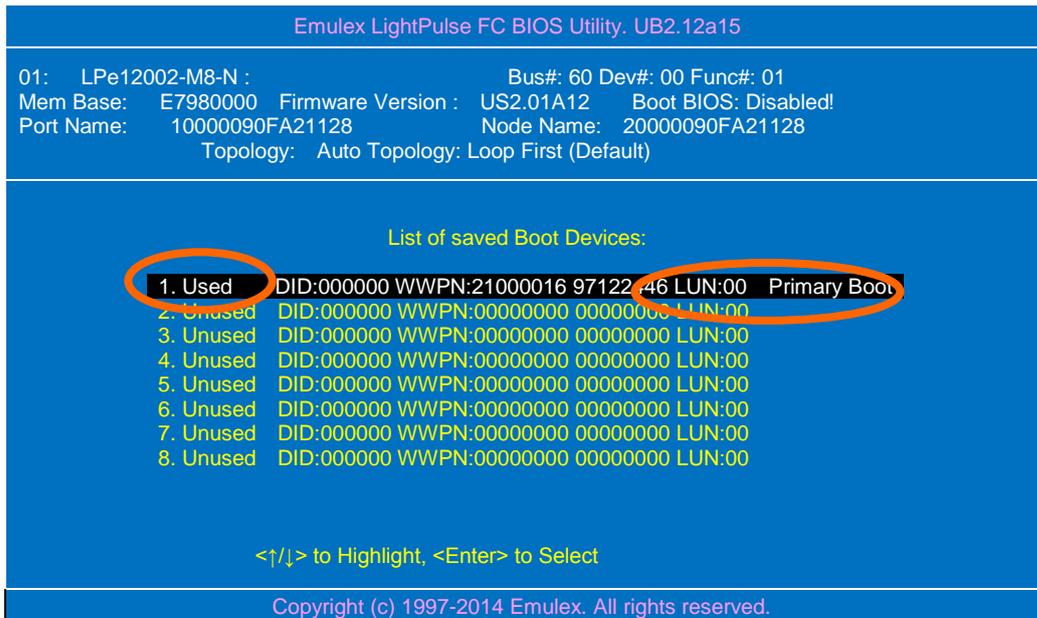
When the screen to select methods to specify devices, select [Boot this device via WWPN] (specify a WWPN) and press <Enter>.

DID:0000B3 WWPN:21000016 97122446 LUN:00

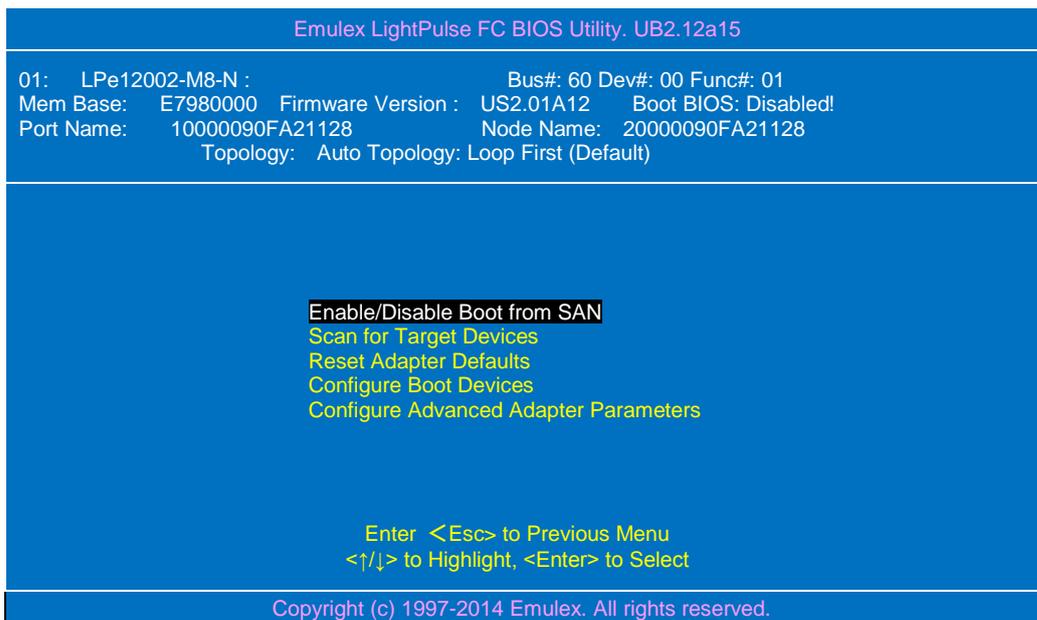
Boot this device via WWPN
Boot this device via DID

<ESC> to Previous Menu
<↑/↓> to Highlight, <Enter> to Select

When the list of boot devices is displayed again, confirm that “Primary Boot” entry (on top) is set as [Used].



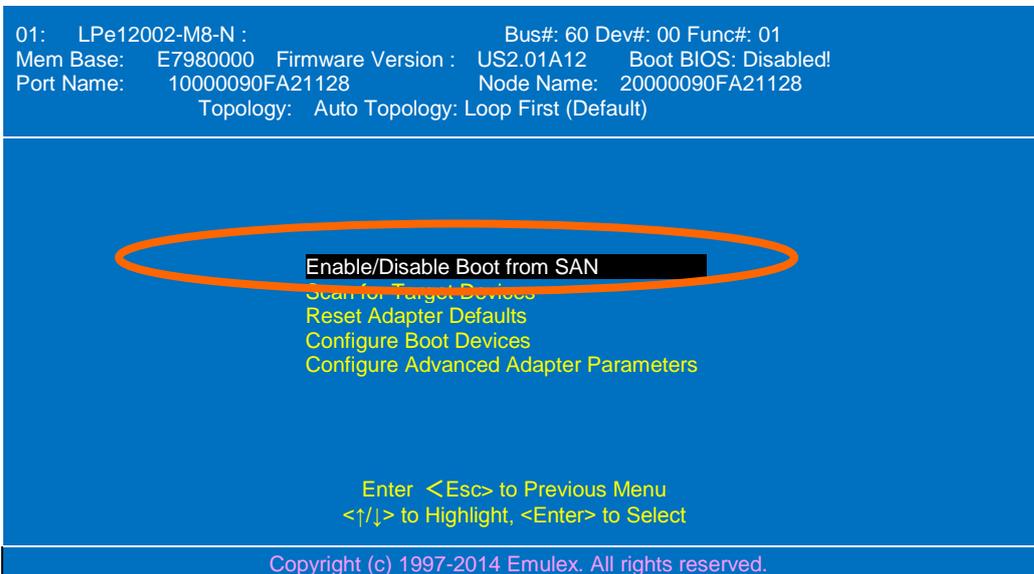
Then press <ESC> to return to the menu screen below.



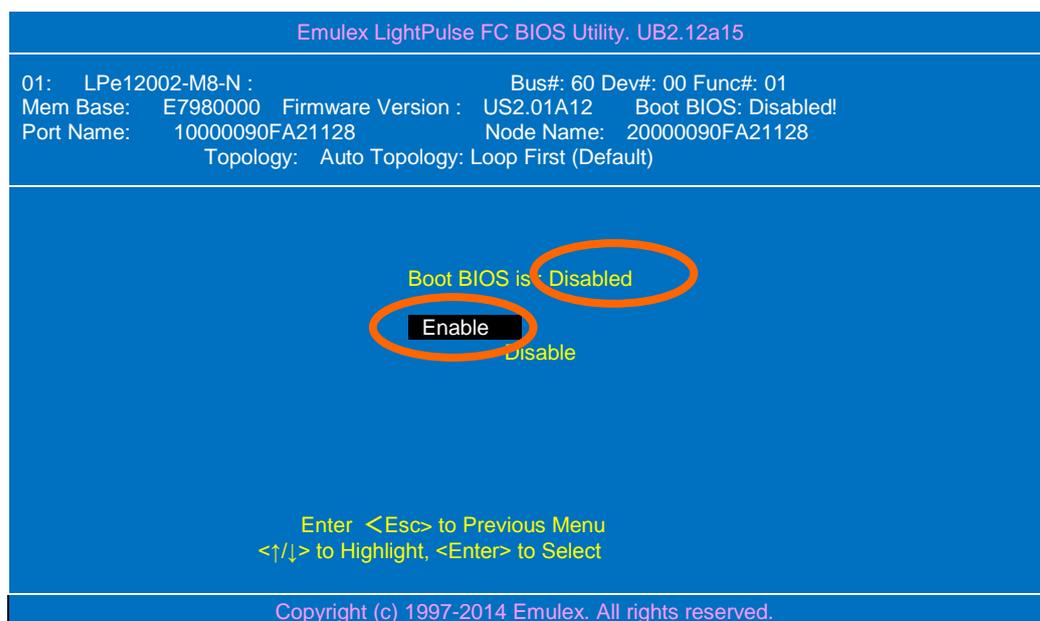
4.3.5 Setting to enable SAN Boot

Select [Enable/Disable Boot from SAN] and press <Enter>.

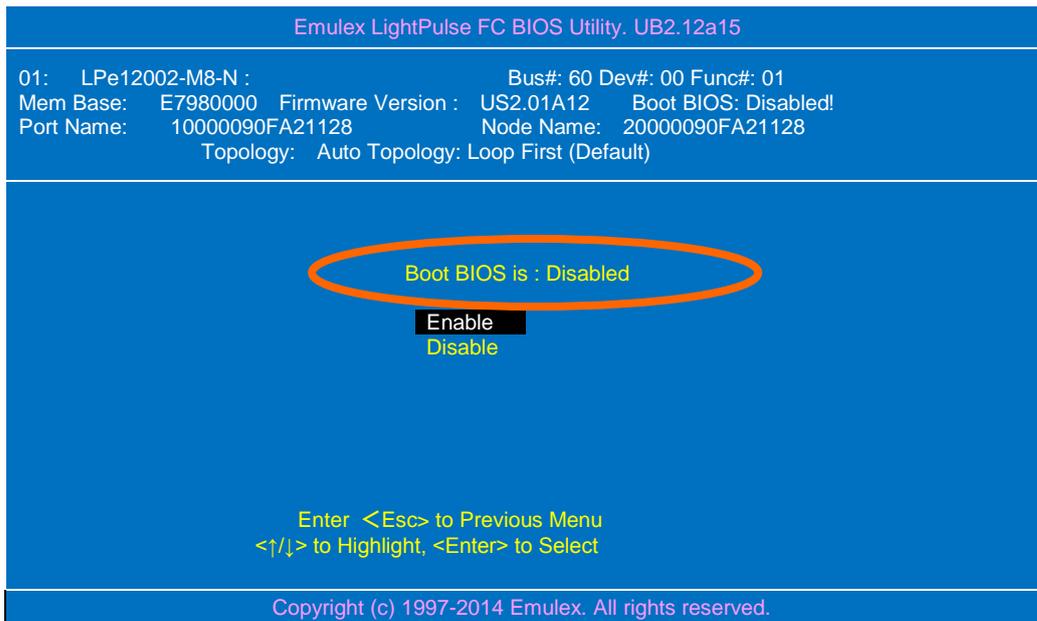




The screen to switch enable/disable SAN Boot is displayed. It is disabled in the default setting, change it to [Enable] and press <Enter>.



Confirm the setting of SAN Boot is enable with the message "Boot BIOS is Enabled", then press <ESC> to return to the port selection menu.



For the rest of the ports connected to the storages on which OS will be installed, initialize the port settings, register boot devices, and enable SAN Boot according to "4.3.2. Selection of FC port for settings" and later".

The setting of FC controller (legacy BIOS mode) is completed once this procedure is done.



Confirm that the port name of the selected port agrees with WWPN of the port used for booting from FC SAN. If not, press <Esc> key to redo the selection of port from "4.3.2. Selection of FC port to setup".

4.4 Settings of FC controller (UEFI mode)

In UEFI mode environment, setup FC controller from the local console of the server to boot from FC SAN according to the following procedure.

4.4.1 Booting BIOS setup utility

Boot the server after completing “4.2 BIOS setting of server”.

Press <F2> key at server booting and display the System Setup screen.

4.4.2 Selection of FC port to setup

After BIOS setup utility is opened, select [UEFI Driver Configuration] in the following location.

[BIOS setting screen]

> [Advanced]

> [UEFI Driver Configuration]

UEFI drivers which can be recognized by server will be loaded for the devices, and the devices will be listed in UEFI Driver Configuration. Select FC port to setup. The correspondence table of model number and display name is shown below.

Model number	Display name
N8190-157A	LPe16000B
N8190-158A	LPe16002B
N8190-159	LPe1250
N8190-160	LPe12002

4.4.3 Initialization of port settings

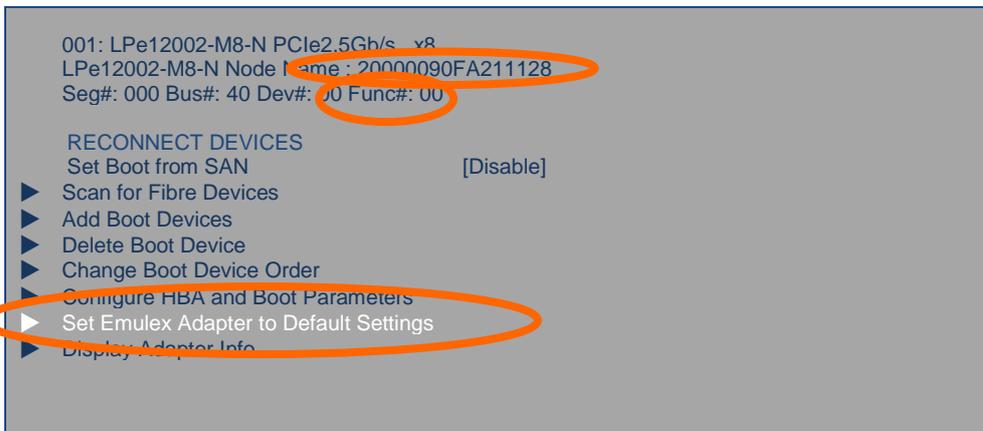


WWNN of the selected port is displayed on the right side of the node name. Confirm that the last 12 digits of WWNN agrees with the last 12 digits of port WWPN used for booting from FC SAN (the first four digit of WWNN (=2000) corresponds to the first four digit of WWPN (=1000)).

If the selected port is not the one used for SAN booting, press <Esc> key to retry from "4.4.2.

Selection of FC port to setup". On N8190-158A / 160, Func# [00] corresponds to Port0, and [01] to Port1.

Select [Set Emulex Adapter to Default Settings] in the following screen and press <Enter>.



When the following menu is displayed, select [Set Adapter Defaults], and press <Enter> to return the port settings to default. Then, press <ESC> to return to the previous menu.

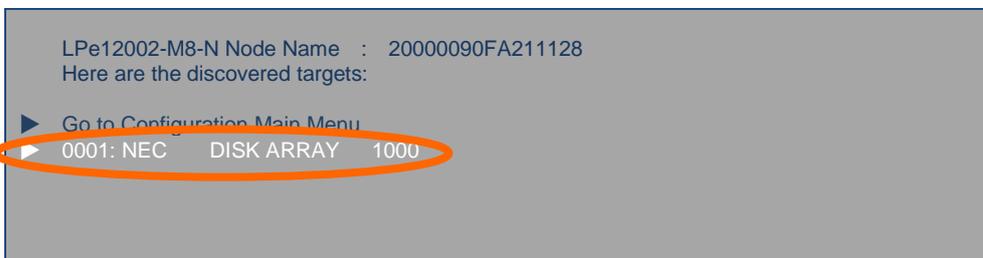


4.4.4 Register boot devices

Select [Add Boot Device] and press <Enter> to display the setting menu of the Boot device. It may take several tens of seconds until the menu is displayed.

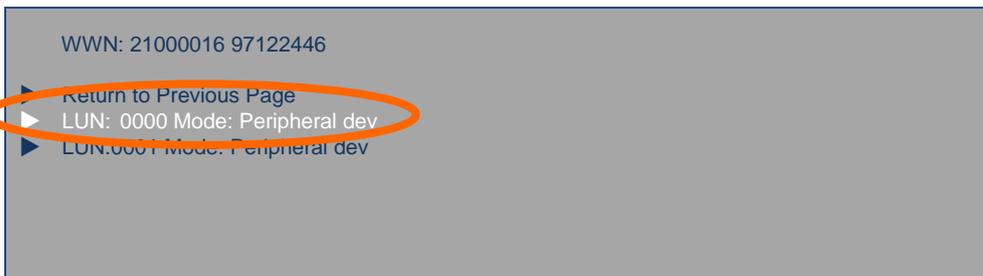


Select device to install OS (boot device) and press <Enter>.

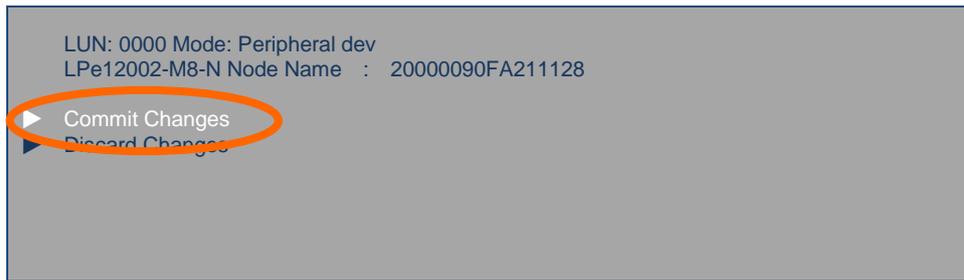


If the boot device from the selected port cannot be recognized, confirm whether or not the selected port is correct. If it is correct, confirm the settings of storage and FC switch, reboot the server, and redo the procedure from the beginning.

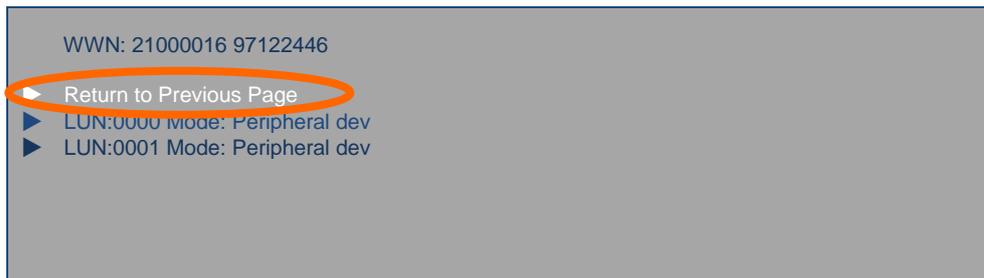
When LUN selection screen is displayed, select [LUN: 0000] and press <Enter>.



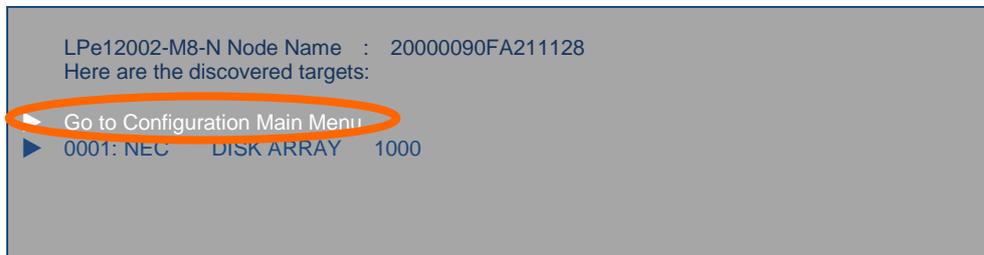
When the confirmation menu is displayed, select [Commit Changes] and press <Enter>.



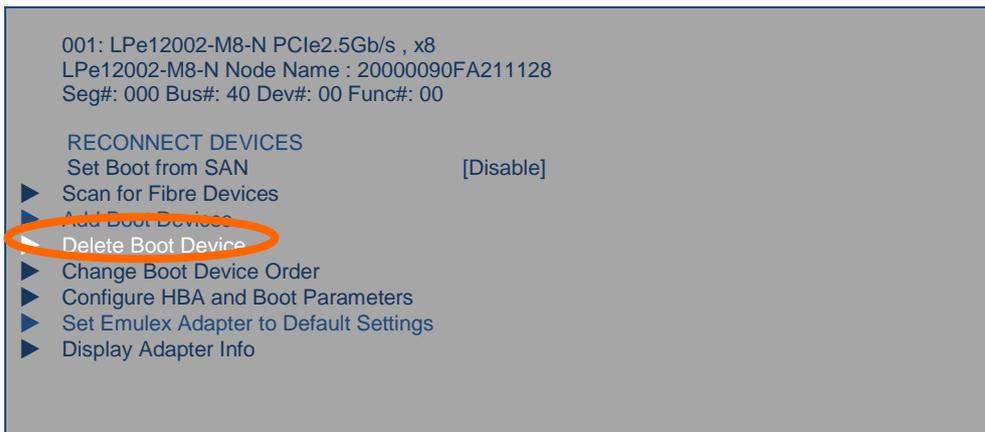
Select [Return to Previous Page] and press <Enter> to return to device selection screen.



Select [Go to Configuration Main Menu] and press <Enter> to return to the main menu.

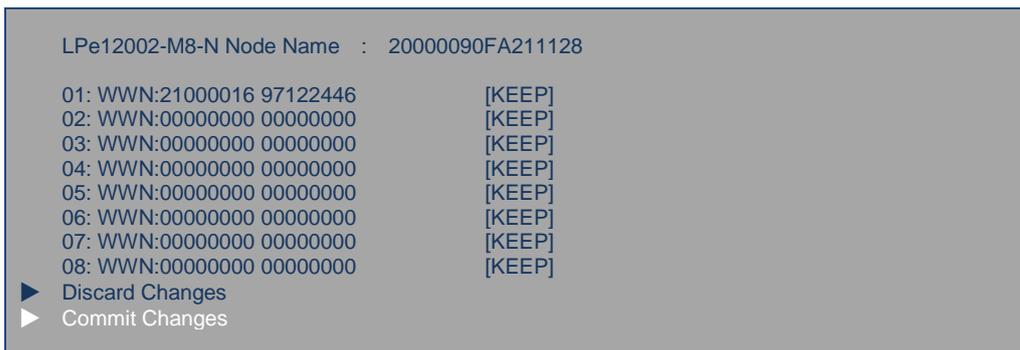


Select [Delete Boot Device] and press <Enter> to display the list of the registered boot devices.



If no issues detected in the listed boot devices, press <Esc> to return to the menu.

If any wrong boot devices are displayed or the same device is displayed duplicate, select the boot device to be deleted and press <Enter>.The indication sign changes from [KEEP] to [DELETE], then select [Commit Changes] and press <Enter> to delete the registration of the boot device.

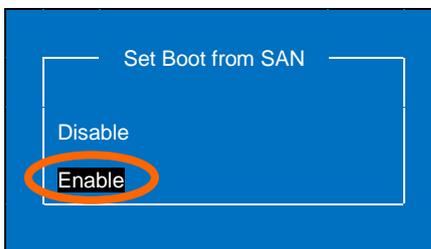


4.4.5 Setting to enable SAN Boot

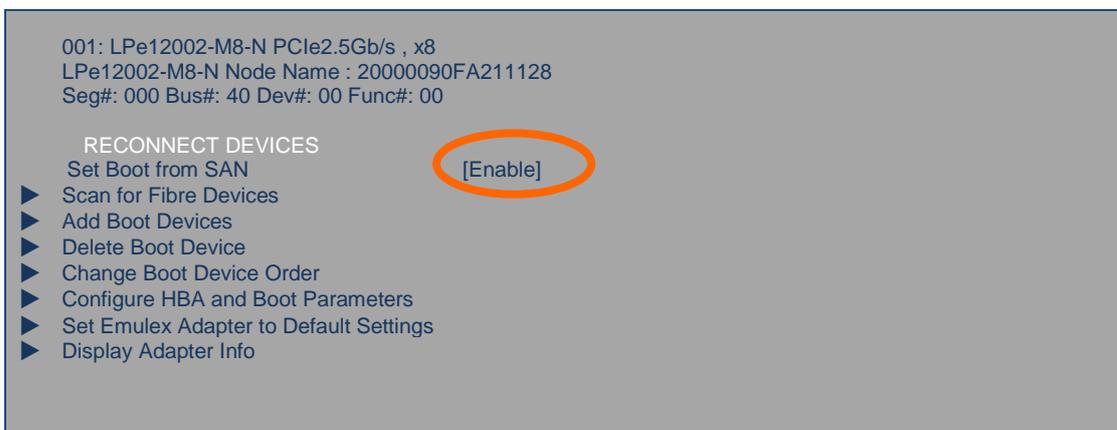
Select [Set Boot from SAN] from the following menu and press <Enter>.



When the selection menu is displayed, select [Enable] and press <Enter>.



Confirm that [Set Boot from SAN] is enabled.



Press <Esc> to return to the list of UEFI devices.

For the rest of FC ports connected to the storages on which OS will be installed, initialize the port settings, register boot devices, and enable SAN Boot according to "4.4.2. Selection of FC port to setup" and later.



Do not register boot devices nor enable SAN Boot for FC ports connected to storage in which OS is not installed.

The setting of FC controller (UEFI mode) is completed once this procedure is done.

Press <Esc> to return to the list of UEFI devices, and select [Save & Exit] > [Save Changes and Power Off] in BIOS Setup Utility to power off.

4.5 FC connection with single path

When installing OS such as Windows and RHEL, the path to storage must be changed to single path in advance. The remained path depends on the server model and the setup boot mode.

* In VMware, OS installation is available while connecting with redundant path.



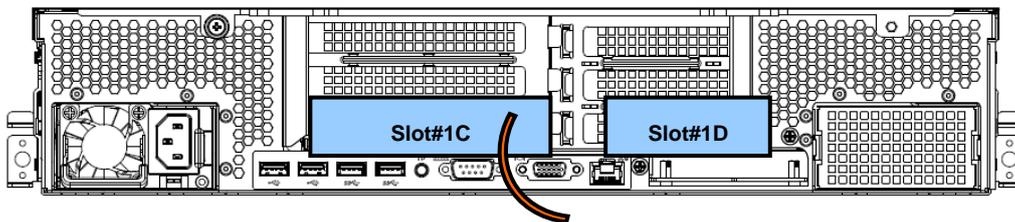
Confirm that the last 12 digits of WWNN agree with the last 12 digits of port WWPN used for FC SAN boot. If not, press <Esc> key to return to "4.4.2. Selection of FC port to setup" and select port anew.



Do not register boot devices nor enable SAN Boot for FC ports connected to storage in which OS is not installed.

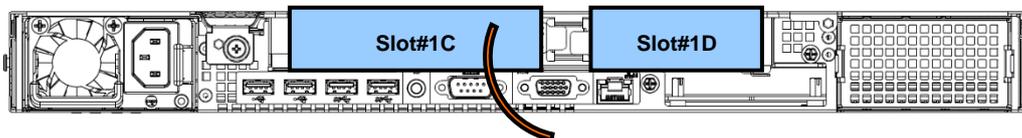
4.5.1 R120g-2M / R120f-2M

Remove FC cable from FC controller installed in Slot#1D. When FC controller installed in Slot#1C is N8190-158A/160, remove FC cable connected to Port1 side in UEFI mode and Port0 side in legacy BIOS mode.



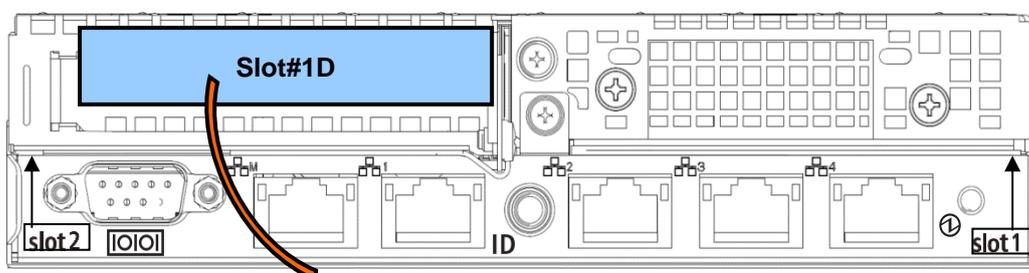
4.5.2 R120g-1M / R120f-1M

Remove FC cable from FC controller installed in Slot#1D. When FC controller installed in Slot#1C is N8190-158A/160, remove FC cable connected to Port1 side in UEFI mode and Port0 side in legacy BIOS mode.



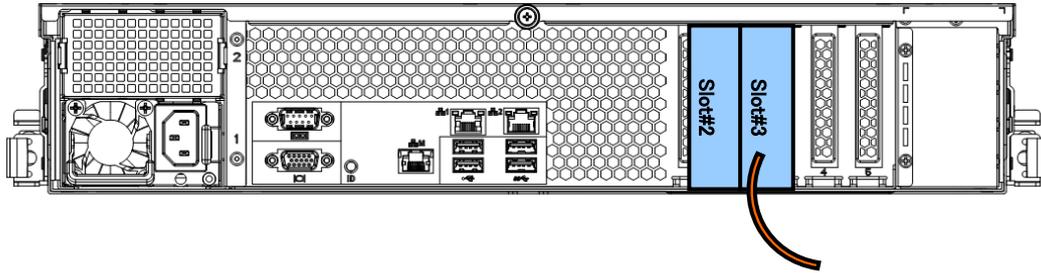
4.5.3 E120g-M / E120f-M

Remove FC cable connected to Port1 side in UEFI mode and Port0 side in legacy BIOS mode



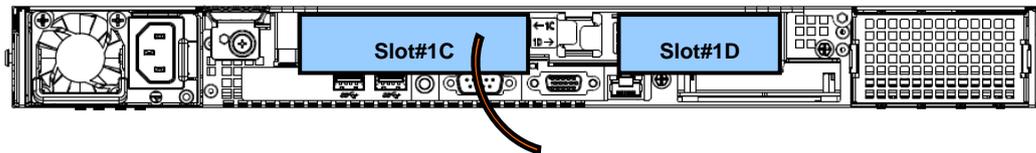
4.5.4 R120g-2E / R120f-2E

Remove FC cable from FC controller installed in Slot#2. When FC controller installed in Slot#3 is N8190-158A/160, remove FC cable connected to Port1 side in UEFI mode and Port0 side in legacy BIOS mode.



4.5.5 R120g-1E / R120f-1E

Remove FC cable from FC controller installed in Slot#1D. When FC controller installed in Slot#1C is N8190-158A/160, remove FC cable connected to Port1 side in UEFI mode and Port0 side in legacy BIOS mode.



5 OS Installation

5.1 Summary

Once all the procedures by chapter 4 are completed and OS installation space (LD) is recognized by FC BIOS, start OS installation.

The installation processes differ depending on each OS. For the installation, refer to procedures/notes in each chapter.

- Windows Server Refer to chapter 5.2. Supporting NEC Storage M series
- Linux (Red Hat) Refer to chapter 5.3. Supporting FC model of NEC Storage M series
- VMware Refer to chapter 5.4. Supporting NEC Storage M series

When using in VMware system, please use storage authenticated by VMware. The list of authenticated storages is shown in the website below:

<http://www.nec.co.jp/vmware/vs5/ver.html#iS> (JP only)

5.2 Windows

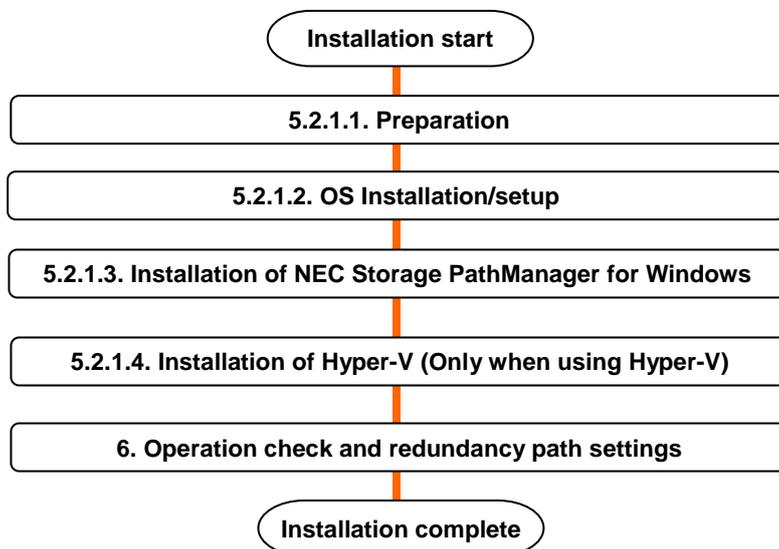
5.2.1 Installation of Windows Server 2012 R2

This chapter explains how to install Windows Server 2012 R2 into Express5800 series. Supported hardware devices are as follows.

<Express5800 series>

Product name
R120g-2M
R120g-1M
E120g-M
R120g-2E
R120g-1E
R120f-2M
R120f-1M
E120f-M
R120f-2E
R120f-1E

Install Windows OS according to the following flow.



5.2.1.1. Preparations



Do not configure path redundancy between server and NEC Storage if NEC Storage PathManager is not installed.
It may cause phenomena such as OS installation failure.

Prerequisites for installation

- R120g-1M / R120g-2M / E120g-M / R120g-2E / R120g-1E
R120f-1M / R120f-2M / E120f-M / R120f-2E / R120f-1E
 - ◆ EXPRESSBUILDER DVD
 - R120g-1M / R120g-2M: Ver. 7.10-012.02 or later
 - E120g-M: Ver. 7.10-013.01 or later
 - R120g-2E: Ver. 7.10-015.01 or later
 - R120g-1E: Ver. 7.10-014.01 or later
 - R120f-1M / R120f-2M: Ver. 7.10-007.01 or later
 - E120f-M: Ver. 7.10-008.02 or later
 - R120f-1E: Ver. 7.10-009.01 or later
 - R120f-2E: Ver. 7.10-010.01 or later
 - ◆ Installation Guide (Windows) (included in EXPRESSBUILDER DVD)
 - ◆ Either of the following OS installation disc
 - NEC operating system installation disc
 - Microsoft operating system installation disc

How to obtain necessary documents

- R120g-1M / R120g-2M / E120g-M / R120g-2E / R120g-1E
R120f-1M / R120f-2M / E120f-M / R120f-2E / R120f-1E

The Installation Guide (Windows) can be downloaded from the following website.

Downloads - Express5800 Server Series

<http://www.58support.nec.co.jp/global/download/index.html>

- ◆ Select Documents & Software.
- ◆ Select Rack.
- ◆ Select model.
- ◆ Select Installation guide (Windows) and display the latest one.

5.2.1.2. OS installation/setup

R120g-1M / R120g-2M / E120g-M / R120g-2E / R120g-1E
R120f-1M / R120f-2M / E120f-M / R120f-2E / R120f-1E

Install and setup OS by using OS standard installer according to the Installation Guide (Windows).

5.2.1.3. Installation of NEC Storage PathManager for Windows

Install NEC Storage PathManager to duplicate path to the storage. Do not duplicate the path between server and NEC Storage until the installation completes.

When using NEC Storage PathManager products, install it according to [Installation] in [Installation Guide] attached to the products.

When using NEC Storage PathManager attached to NEC Storage M100 series, install it according to [Installation of NEC Storage PathManager] in [User's Guide of disk array device] attached to the device.

5.2.1.4. Installation of Hyper V (only when used)

When using Hyper-V under Windows Server 2012 R2 environment, install it according to [Windows Server 2012 R2 Hyper-V Installation Procedure] described on the following website.

If not using Hyper-V, this procedure is not necessary.

Supports for Windows Server 2012 Hyper-V

<http://support.express.nec.co.jp/os/w2012r2/hyper-v.html> (JP only)

- ➔ Installation Procedure
- ➔ Installation Procedure of Hyper-V
- ➔ Windows Server 2012 R2 Hyper-V Installation procedure
[WS2012R2_Hyper-V_install.pdf]

Please confirm precautions and limitations described on the following website.

Support Information for Windows Server 2012 R2 Hyper-V on Express5800 Series Servers

<http://www.58support.nec.co.jp/global/download/w2012r2/hyper-v/hyper-v-ws2012r2.html>

- ➔ Considerations and Restrictions

After completed the above mentioned procedure, proceed to [6. Operation check and redundant path settings].

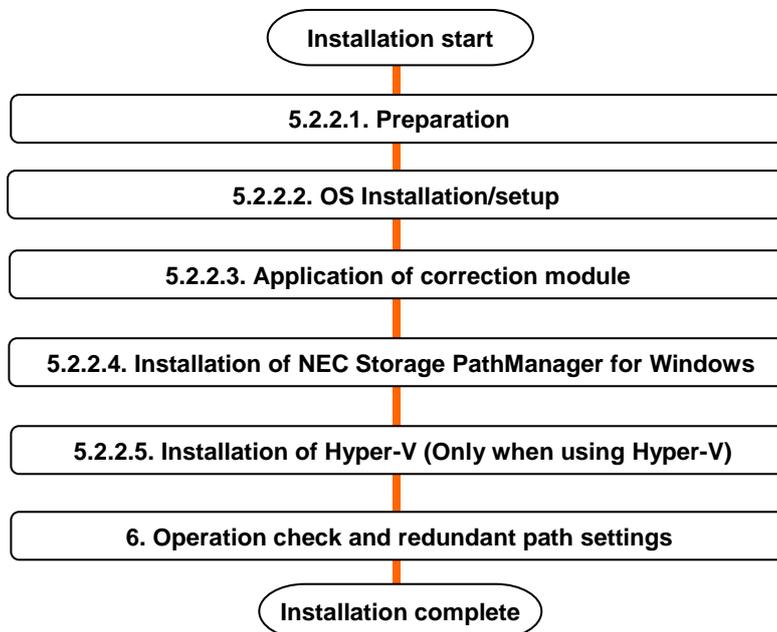
5.2.2 Installation of Windows Server 2012

This chapter explains how to install Windows Server 2012 into Express5800 series. Supported hardware devices are as follows.

<Express5800 series>

Product name
R120g-2M
R120g-1M
E120g-M
R120g-2E
R120g-1E
R120f-2M
R120f-1M
E120f-M
R120f-2E
R120f-1E

Install Windows OS according to the following flow.



5.2.2.1. Preparations



**Do not configure path redundancy between server and NEC Storage if NEC Storage PathManager is not installed.
It may cause phenomena such as OS installation failure.**

Prerequisites for installation

- R120g-1M / R120g-2M / E120g-M / R120g-2E / R120g-1E
R120f-1M / R120f-2M / E120f-M / R120f-2E / R120f-1E
 - ◆ EXPRESSBUILDER DVD
 - R120g-1M / R120f-2M: Ver. 7.10-012-02 or later
 - E120g-M: Ver. 7.10-013.01 or later
 - R120g-2E: Ver. 7.10-015.01 or later
 - R120g-1E: Ver. 7.10-014.01 or later
 - R120f-1M / R120f-2M: Ver. 7.10-007.01 or later
 - E120f-M: Ver. 7.10-008.02 or later
 - R120f-1E: Ver. 7.10-009.01 or later
 - R120f-2E: Ver. 7.10-010.01 or later
 - ◆ Installation Guide (Windows) (included in PL EXPRESSBUILDER DVD)
 - ◆ Either of the following OS installation disc
 - NEC operating system installation disc
 - Microsoft operating system installation disc

How to obtain necessary documents

- R120g-1M / R120g-2M / E120g-M / R120g-2E / R120g-1E
R120f-1M / R120f-2M / E120f-M / R120f-2E / R120f-1E

The Installation Guide (Windows) can be downloaded from the following website.

Downloads - Express5800 Server Series

<http://www.58support.nec.co.jp/global/download/index.html>

- ◆ Select Documents & Software.
- ◆ Select Rack.
- ◆ Select model
- ◆ Select Installation guide (Windows) and display the latest one.

5.2.2.2. OS installation/setup

**R120g-1M / R120g-2M / E120g-M / R120g-2E / R120g-1E
R120f-1M / R120f-2M / E120f-M / R120f-2E / R120f-1E**

Install and setup OS by using OS standard installer according to the Installation Guide (Windows).

When using 16G FC controller (N8190-157A/158A), read the following driver from the driver CD attached to FC controller in the procedure of selecting installation location.

Emulex Light Pulse HBA – Storport Miniport Driver

<¥win¥drv¥WS2012x64>

Execute [Update to the latest version] after swapping OS Installation disc to prevent the case an error message "Windows cannot be installed to this disk" to popup after applying the driver.

5.2.2.3. Application of correction module

After completed OS installation/setup, apply the following correction module.

- Windows Server 2012 update program

<http://www.microsoft.com/en-us/download/details.aspx?id=36916>

- KB2800088
- KB2811660
- KB2812829
- KB2851769
- KB2823233

KB2823233 needs to be applied only when [Media Foundation], a function of OS, is enabled. This [Media Foundation] function is disabled at default setting.

- KB2853466

<http://support.microsoft.com/kb/2853466>

Install this correction module after application of KB2811660.

5.2.2.4. Installation of NEC Storage PathManager for Windows

Install NEC Storage PathManager to duplicate path to the storage. Do not duplicate the path between server and NEC Storage until the installation completes.

When using NEC Storage PathManager products, install it according to [Installation] in [Installation Guide] attached to the products.

When using NEC Storage PathManager attached to NEC Storage M100 series, install it according to [Installation of NEC Storage PathManager] in [User's Guide of disk array device] attached to the device.

5.2.2.5. Installation of Hyper V (only when used)

When using Hyper-V under Windows Server 2012 environment, install it according to [Windows Server 2012 Hyper-V Installation Procedure] described on the following website.

If not using Hyper-V, this procedure is not necessary.

Supports for Windows Server 2012 Hyper-V in Express5800 series

<http://support.express.nec.co.jp/os/w2012/hyper-v.html> (JP only)

- ➔ Installation Procedure
- ➔ Installation Procedure of Hyper-V
- ➔ Windows Server 2012 Hyper-V Installation Procedure
[WS2012_Hyper-V_install.pdf]

Please confirm precautions and limitations described on the following website.

Support Information for Windows Server 2012 Hyper-V on Express5800 Series Servers

<http://www.58support.nec.co.jp/global/download/w2012/hyper-v/hyper-v-ws2012.html>

- ➔ Considerations and Restrictions

After completed the above mentioned procedure, proceed to [6. Operation check and redundant path settings].

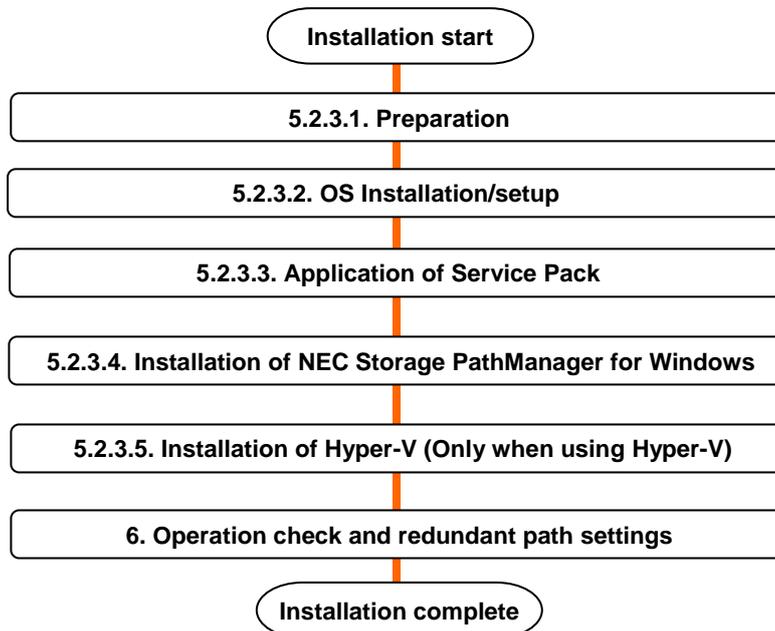
5.2.3 Installation of Windows Server 2008 R2

This chapter explains how to install Windows Server 2008 R2 into Express5800 series. Supported hardware devices are as follows.

<Express5800 series>

Product name
R120g-2M
R120g-1M
E120g-M
R120g-2E
R120g-1E
R120f-2M
R120f-1M
E120f-M
R120f-2E
R120f-1E

Install Windows OS according to the following flow.



5.2.3.1. Preparations



**Do not configure path redundancy between server and NEC Storage if NEC Storage PathManager is not installed.
It may cause phenomena such as OS installation failure.**

Prerequisites for installation

- R120g-1M / R120g-2M / E120g-M / R120g-2E / R120g-1E
R120f-1M / R120f-2M / E120f-M / R120f-2E / R120f-1E
 - ◆ EXPRESSBUILDER DVD
 - R120g-1M / R120g-2M: Ver. 7.10-012.02 or later
 - E120g-M: Ver. 7.10-013.01 or later
 - R120g-2E: Ver. 7.10-015.01 or later
 - R120g-1E: Ver. 7.10-014.01 or later
 - R120f-1M / R120f-2M: Ver. 7.10-007.01 or later
 - E120f-M: Ver. 7.10-008.02 or later
 - R120f-1E: Ver. 7.10-009.01 or later
 - R120f-2E: Ver. 7.10-010.01 or later
 - ◆ Installation Guide (Windows) (included in PL EXPRESSBUILDER DVD)
 - ◆ Either of the following OS installation disc
 - NEC operating system installation disc
 - Microsoft operating system installation disc

How to obtain necessary documents

- R120g-1M / R120g-2M / E120g-M / R120g-2E / R120g-1E
R120f-1M / R120f-2M / E120f-M / R120f-2E / R120f-1E

The Installation Guide (Windows) can be downloaded from the following website.

Downloads - Express5800 Server Series

<http://www.58support.nec.co.jp/global/download/index.html>

- ◆ Select Documents & Software.
- ◆ Select Rack.
- ◆ Select model
- ◆ Select Installation guide (Windows) and display the latest one.

5.2.3.2. OS installation/setup

R120g-1M / R120g-2M / E120g-M / R120g-2E / R120g-1E

R120f-1M / R120f-2M / E120f-M / R120f-2E / R120f-1E

Install and setup OS by using OS standard installer according to the Installation Guide (Windows).

When using 16G FC controller (N8190-157A/158A), load its driver from the driver CD attached to FC controller at the step where specifying installation location.

Emulex Light Pulse HBA – Storport Miniport Driver

<¥win¥drv¥WS2008R2x64>

Execute [Update to the latest version] after swapping OS Installation disc to prevent the case an error message "Windows cannot be installed to this disk" to popup after applying the driver.

5.2.3.3. Application of Service Pack

Apply Service Pack 1 according to the following website.

About Windows Server 2008 R2 and Windows 7 Service Pack 1

<http://www.58support.nec.co.jp/global/download/w2008r2/sp1.html>

5.2.3.4. Installation of NEC Storage PathManager for Windows

Install NEC Storage PathManager to duplicate path to the storage. Do not duplicate the path between server and NEC Storage until the installation completes.

When using NEC Storage PathManager products, install it according to [Installation] in [Installation Guide] attached to the products.

When using NEC Storage PathManager attached to NEC Storage M100 series, install it according to [Installation of NEC Storage PathManager] in [User's Guide of disk array device] attached to the device.

5.2.3.5. Installation of Hyper V (only when used)

When using Hyper-V under Windows Server 2008 R2 environment, install it according to "Hyper-V 2.0 Installation Procedure" described on the following website.

When not using Hyper V-2.0, this procedure is not necessary.

Supports for Hyper-V 2.0 in Express5800 series

<http://support.express.nec.co.jp/os/w2008r2/hyper-v-v2.html> (JP only)

- ➔ Installation Procedure
- ➔ Installation Procedure of Hyper-V 2.0
- ➔ Hyper-V 2.0Installation Procedure [Hyper-V2.0_install.pdf]

Please confirm precautions and limitations described on the following website.

Hyper-V 2.0

<http://www.58support.nec.co.jp/global/download/w2k8r2/hyper-v/hyper-v-v2.html>

- ➔ Considerations and Restrictions

After completed the above mentioned procedure, proceed to [6. Operation check and redundant path settings].

5.3 Linux

5.3.1 Installation of Red Hat Enterprise Linux 7

This chapter explains how to install RHEL6 into NEC Express5800 series. Supported hardware devices are as follows

- NEC Express5800/R120f-2M
- NEC Express5800/R120f-1M
- NEC Express5800/R120f-2E
- NEC Express5800/R120f-1E

[Important]

For OS installation, purchase of [Linux service set], licensing of [PP support service], and access right to [Red Hat customer portal] are required. For details about [Linux service set], please refer to the following website.

<http://jpn.nec.com/linux/linux-os/ss/> (JP only)

For construction of SAN Boot system, perform initial installation of RHEL by using the below minor releases. Then, construct minimum RHEL environment to support SAN Boot configuration.

Server HardWare	Minor release for initial installation	Minimum RHEL environment
R120f-2M R120f-1M R120f-2E R120f-1E	RHEL7.1	RHEL7.1 or later

Supplementary notes:

- Installation with media other than minor release for initial installation is not supported.
- If [minor release for initial installation] and [minimum RHEL environment] contradict each other, make sure to update to [minimum RHEL environment]. Operation with [minor release for initial installation] is not supported.

5.3.1.1. Preparations

Confirm if all the necessary items for installation is prepared. Additionally, confirm that the path between server and FC SAN storage is single path configuration before the installation.

Precautions

- Do not duplicate the path between server and NEC Storage until the installation of NEC Storage PathManager completes. Wrong procedures may cause OS installation failures.
- **Prerequisites for installation**

- Installation Guide (Linux) (included in PL EXPRESSBUILDER DVD)
- Initial configuration script (nec_setup.sh) (included in EXPRESSBUILDER DVD)
- Red Hat Enterprise Linux 6.5 installation media
Refer to the following website for creation of installation media
[RHEL] Installation media creation procedure
<https://www.support.nec.co.jp/View.aspx?id=3140100979> (JP only)

[Linux media kit (Red Hat Enterprise Linux version 6.5)] can be also used (separately sold).
<http://jpn.nec.com/linux/linux-os/ss/mediakit.html> (JP only)

- Network number fixation script (persist-network-ordering.tgz)
[RHEL6] OS installation in FC SAN Boot environment
<https://www.support.nec.co.jp/View.aspx?id=3140100973> (JP Only)

- **Necessary items for update**

- RHEL6.5 errata kernel (2.6.32-431.20.3.el6)
- Update module for kernel (2.6.32-431.20.3.el6)
Update of [RHEL6] kernel (2.6.32-431.el6(RHEL6.5) or later)
<https://www.support.nec.co.jp/View.aspx?id=9010102917> (JP only)

5.3.1.2. Initial installation of RHEL7

R120f-1M / R120f-2M / R120f-2E / R120f-1E

Please refer to Installation Guide (Linux). And execute initial installation of RHEL7.

- > [Chapter 1 Linux installation]
- > [3.3 Setup flow of OS standard installer]
- > [3.3.5 (5) Setup procedures] *1 *2

***1 Please refer to the following procedures instead of [Procedure 1 - 4] of [(5) Execution of setup].**

1. Turn on the power of peripheral devices, then the server.
2. To boot installer, set Red Hat Enterprise Linux 6.5 installation media to optical disk drive.
3. Reboot the server by resetting (<Ctrl> + <Alt> + <Delete>) or power OFF/ON.

***2 Don't set the item of [The MAC address of the device (D):] at [Ethernet] tab in a setting screen in each LAN port that described at [Procedure 17] of [(5) Execution of a setup].**

Notice:

- [Set up with EXPRESSBUILDER] does not support RHEL installation to SAN Boot environment.
- Please refer to the following website of "NEC support portal" and confirm the presence of an additional notice in the SAN boot environment.
[RHEL7] about installation of OS in the FC - SAN boot setting
<https://www.support.nec.co.jp/View.aspx?id=3140102889>
> Release notes for each hardware equipment

5.3.1.3. Environemnt configuration of RHEL7

Application of default setting script

- R120f-2M/R120f-1M/R120f-2E/R120f-1E
Please refer the following chapter/section of [Installation Guide (Linux)].
 - > [Chapter 1 Installation of Linux]
 - > [3.3 Setup flow of OS standard installer]
 - > [3.3.5 (6) Application of default setting script]

Network configurarion

- R120f-2M/R120f-1M/R120f-2E/R120f-1E
Please refer to below of "installation guide (Linux)" as the need arises and put network setting into effect by a root permission.
>[Chapter 1 Linux installation]

> [3.1 Setup of a pre-installation model]

> [(6) Setting of a network] in [3.1.2 Procedure of a setup (early stage introduction setting)].

Precautions

Please don't set MAC address data as a network setting file (ifcfg file) in setting of a network.

When condition practical use of the state that MAC address data was included in a network setting file is performed, when changing to a spare server by an obstacle, disagreement of the MAC address can't bring and start OS by the same network environment as in front of the block.

Please confirm that MAC address data isn't included in a network setting file with the following procedure.

1. Open the "/etc/sysconfig/network-scripts/ifcfg-< network device name >" by text editor.

2. Confirm following description of HWADDR parameter.

```
"HWADDR=XX:XX:XX:XX:XX"
```

3. Delete "HWADDR=XX:XX:XX:XX:XX" and overwrite setting file.

Return to step1 and check the remaining network device equally.

4. Reboot the system by executing following command.

```
# systemctl reboot
```

5.3.1.4. Update of RHEL7

Refer to the following In case of updating the package from initial installation.

In case to add or update the package besides the kernel.

- R120f-2M/R120f-1M/R120f-2E/R120f-1E
Please refer to below of "installation guide (Linux)"
>[Chapter 1 Linux installation]
>[3.3 Setup by OS standard installer]
>[3.3.5 (8) Addition of a package and update of a package]
>[addition or update of the package besides the kernel]

In case to update the kernel package.

- R120f-2M/R120f-1M/R120f-2E/R120f-1E
Please refer to below of "installation guide (Linux)"
>[Chapter 1 Linux installation]
>[3.3 Setup by OS standard installer]
>[3.3.5 (8) Addition of a package and update of a package]
>[addition or update of the kernel package]

5.3.2 Installation of Red Hat Enterprise Linux 6

This chapter explains how to install RHEL6 into NEC Express5800 series. Supported hardware devices are as follows

- Express5800/R120f-2M
- Express5800/R120f-1M
- Express5800/R120f-2E
- Express5800/R120f-1E

[Important]

For OS installation, purchase of [Linux service set], licensing of [PP support service], and access right to [Red Hat customer portal] are required. For details about [Linux service set], please refer to the following website.

<http://jpn.nec.com/linux/linux-os/ss/>

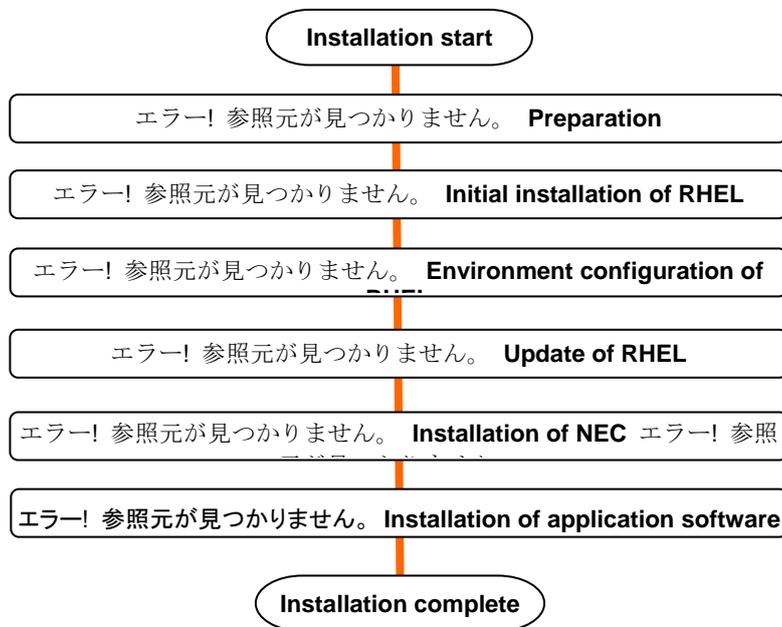
For construction of SAN Boot system, perform initial installation of RHEL by using the below minor releases. Then, construct minimum RHEL environment to support SAN Boot configuration.

Express5800 series	Minor release for initial installation	Minimum RHEL environment
R120f-2M R120f-1M R120f-2E R120f-1E	RHEL6.5	RHEL6.5 + RHEL6.5 errata kernel (2.6.32-431.20.3.el6) or later

Supplementary notes:

- Installation with media other than minor release for initial installation is not supported.
- If [minor release for initial installation] and [minimum RHEL environment] contradict each other, make sure to update to [minimum RHEL environment]. Operation with [minor release for initial installation] is not supported.

Construct the RHEL environment according to the following flow.



5.3.2.1. Preparations

Confirm if all the necessary items for installation is prepared. Additionally, confirm that the path between server and FC SAN storage is single path configuration before the installation.

Precautions

- Do not duplicate the path between server and NEC Storage until the installation of NEC Storage PathManager completes. Wrong procedures may cause OS installation failures.
 - **Prerequisites for installation**
 - Installation Guide (Linux) (included in PL EXPRESSBUILDER DVD)
 - Initial configuration script (nec_setup.sh) (included in EXPRESSBUILDER DVD)
 - Red Hat Enterprise Linux 6.5 installation media
 - Refer to the following website for creation of installation media
 - [RHEL] Installation media creation procedure
 - <https://www.support.nec.co.jp/View.aspx?id=3140100979> (JP only)
 - [Linux media kit (Red Hat Enterprise Linux version 6.5)] can be also used (separately sold).
 - <http://jpn.nec.com/linux/linux-os/ss/mediakit.html> (JP only)
 - Network number fixation script (persist-network-ordering.tgz)
 - [RHEL6] OS installation in FC SAN Boot environment
 - <https://www.support.nec.co.jp/View.aspx?id=3140100973> (JP only)
 - **Necessary items for update**
 - RHEL6.5 errata kernel (2.6.32-431.20.3.el6)

- Update module for kernel (2.6.32-431.20.3.el6)
Update of [RHEL6] kernel (2.6.32-431.el6(RHEL6.5) or later)
<https://www.support.nec.co.jp/View.aspx?id=9010102917> (JP only)

5.3.2.2. Initial installation of RHEL

Initial installation of RHEL is as follows.

Precautions

- SAN Boot configuration with LVM is not recommended regardless of the system area/data area. Before implementing LVM to SAN Boot environment, execute validation test.
 - [Set up with EXPRESSBUILDER] does not support RHEL installation to SAN Boot environment.
- Please refer to Installation Guide (Linux) -> [Chapter 1 Linux installation] -> [3.3.5 Setup procedures] -> [(5) Execution of setup].
- * Please refer to the following procedures instead of [Procedure 1 - 4] of [(5) Execution of setup].
4. Turn on the power of peripheral devices, then the server.
 5. To boot installer, set Red Hat Enterprise Linux 6.5 installation media to optical disk drive.
 6. Reboot the server by resetting (<Ctrl> + <Alt> + <Delete>) or power OFF/ON.
- * Select [Enterprise storage device] in [Procedure 10] of [(5) Execution of setup]. Then tick the storage device to be installed and click [Next (N)].
- Please refer to the following release note in [NEC support portal] web site for precautions regarding SAN Boot environment construction in [Installation Guide (Linux)].
OS installation in [RHEL6] FC SAN Boot environment
<https://www.support.nec.co.jp/View.aspx?id=3140100973> (JP only)

5.3.2.3. Environment configuration of RHEL

- **Application of default setting script**
- Please refer the following chapter/section of [Installation Guide (Linux)].
- > [Chapter 1 Installation of Linux]
 - > [3.3.4 Setup flow of OS standard installer]
 - > [(6) Application of default setting script]

- **Change of runlevel**
- Please refer to the following chapter/section of [Installation Guide (Linux)] for change of runlevel.
 - > [Chapter 1 Installation of Linux
 - > [3.3.1 Change of runlevel]

- **Immobilization setting of network device name**
- Network number immobilization script setups network device name from location information of network card. Apply network number immobilization script as root according to the following procedures.

Precautions

- Soon after OS installation, both network configuration file and udev rules configuration file contain mac address information. If operate without application of network number immobilization script, network may not operate normally due to mismatch of MAC address when switched to the preliminary server at failure occurrence.
5. Obtain module (persist-network-ordering.tgz) from [NEC support portal] website.
OS installation in [RHEL6] FC SAN Boot environment
<https://www.support.nec.co.jp/View.aspx?id=3140100973> (JP only)

7. Execute the following command and expand.

```
# cd /tmp/work
# tar zxvf persist-network-ordering.tgz
```

The following is the example of when module

(persist-network-ordering.tgz) is allocated to "/tmp/work". Replace the description "/tmp/work" with the relevant one according to the actual environment.

8. Execute the following command and apply network number immobilization script. To confirm for creation of new udev rule configuration file, input "yes" and press <Enter> key. If there is an existing udev rule configuration file, the backup will be created as the following file name.

70-persistent-net.rules.backup-<Year>-<Month>-<Day>.<Time>.<Second>

```
# sh persist-network-ordering.sh
```

The current network ordering is below:

device	MAC address	PCI address	driver
eth0	XX:XX:XX:XX:XX:XX	0000:01:00.0	igb
eth1	XX:XX:XX:XX:XX:XX	0000:01:00.1	igb

If you continue, the new udev rules file will be created.

Do you continue ? (yes or no) [default: no] **yes**

Enter "yes"

old rules file was copied:

55-eth.rules.backup--YYYY-MM-DD.HHMM.SS

new rules file was generated: /etc/udev/rules.d/55-eth.rules

This script was finished normally.

Restart your system.

9. Execute the following command to reboot the system.

```
# reboot
```

S

upplementary notes:

- When optional network cards are added, re-execute this procedure after completing network settings for additional ones. However, no need to re-execute when kernel update is executed.

5.3.2.4. Update of RHEL6

- **Update to RHEL6.5 errata kernel (2.6.32-431.20.3.el6)**
- Update the kernel package to RHEL6.5 errata kernel (2.6.32-431.20.3.el6) according to the release note in the following NEC support portal site.
[RHEL6 5] kernel (2 6 3- 431.el6(RHEL6.5) or later) update
<https://www.support.nec.co.jp/View.aspx?id=9010102917> (JP Only)

5.3.3 Installation of NEC Storage PathManager for Linux

This chapter explains the procedures to install [NEC Storage PathManager for Linux] (SPM) to SAN Boot environment.

This procedure requires Red Hat Enterprise Linux 6, and 5.1.5 or later version of SPM functions or Red Hat Enterprise Linux 7 and 6.2.0 or later version of SPS functions.

5.3.3.1. Before the setup

Please confirm the followings before starting SPM setup.

- (1) FibreChannel (FC) driver setup is completed according to the setup manual of FibreChannel Controller. If using FC driver attached to OS, re-setup is not required.
- (2) If connected to FC switches, the setup of the switches is completed.
- (3) Setup of EXPRESSCLUSTER is not performed.
If using EXPRESSCLUSTER, perform SPM setup before the setup of EXPRESSCLUSTER. To install SPM into EXPRESSCLUSTER environment, EXPRESSCLUSTER needs to be stopped temporarily.
- (4) `sg_scan` command is executable:
In the middle of the procedure, `sg_scan` command is required. If execution of the command is not available (the corresponding package is not installed), install the package.(For more details, refer to **[Confirmation of `sg_scan` command]**.)

Confirmation of `sg_scan` command

Confirm whether or not `sg_scan` command is executable for [Implementation to SAN Boot environment] in **[5.3.6.2. Installation]**.Please follow the procedures below:

Supplementary notes:
The output result in the procedure is an example. The result differs in each environment.

(1) Execute sg_scan command.

```
# sg_scan
/dev/sg0: scsi0 channel=0 id=0 lun=0
/dev/sg1: scsi0 channel=0 id=0 lun=1
```

(2) In case of above or nothing has been outputted, there is no problem to execute sg_scan. Proceed to the next section **[Preparation of SPM installation CD]**.

In case of "command not found" is displayed, proceed to the next procedure.

(3) Confirm whether or not sg3_utils is installed by using rpm command.

```
# rpm -qa | grep sg3_utils
sg3_utils-x.xx-x.x
sg3_utils-libs-x.xx.x.x
```

(4) When the version is displayed as above, there is no problem. When the message "command not found" is displayed in procedure 2, it may be because the execution path to sg_scan (to /usr/bin) is not created.

Confirm that the path is created, and if not, add /usr/bin to \$PATH and proceed to **[Preparation of SPM installation CD]**. If nothing has been displayed, proceed to procedure 5.

(5) Prepare RPM package of sg3_utils included in OS installation media.

(6) Install sg3_utils. If sg3_utils-libs is not installed yet, prioritize it.

```
# rpm -ivh sg3_utils-libs-x.xx-x.x.xxx.rpm
Preparing... ##### [100%]
 1:sg3_utils-libs ##### [100%]
# rpm -ivh sg3_utils-x.xx-x.x.xxx.rpm
Preparing... ##### [100%]
 1:sg3_utils ##### [100%]
```

In some cases, warning messages such as DSA signature: NOKEY, key ID db42a60e" may be displayed, however, there is no problem. Confirm that sg_scan is executable.

```
# sg_scan
/dev/sg0: scsi0 channel=0 id=0 lun=0
/dev/sg1: scsi0 channel=0 id=0 lun=1
```

Confirmation of sg_scan commands is now completed.

Proceed to the next section **[Preparation of SPM installation CD]**.

Preparation of SPM installation CD

Insert SPM installation CD and mount to arbitrary directory.

```
# mkdir -p /media/cdrom
# mount /dev/cdrom /media/cdrom
```

When SPM installation CD is mounted automatically, move to destination directory of automatic mount.

```
# cd /media/mountpoint
```

Files included in SPM installation CD are shown in the table 1-1.

Table 1-1 List of files included in the installation CD (*1)

Directory/file name	Description
Express5800_100	RPM file
└ RPMS	
└ RHEL4	
└ RHEL5	SPM package
└ RHEL6	
└ 6.1	
└ 6.2	
└ 6.3	
└ 6.4	
└ 6.5	
└ IA32	
└ sps-utils-5.3.0-1.i686.rpm (*1)	
└ sps-driver-E-5.3.0-2.6.32.431.el6.i686.rpm	
└ sps-driver-E-5.3.0-2.6.32.431.17.1.el6.i686.rpm	
└ sps-driver-E-5.3.0-2.6.32.431.20.3.el6.i686.rpm	
└ EM64T	
└ sps-utils-5.3.0-1.x86_64.rpm	
└ sps-driver-E-5.3.0-2.6.32.431.el6.x86_64.rpm	
└ sps-driver-E-5.3.0-2.6.32.431.17.1.el6.x86_64.rpm	
└ sps-driver-E-5.3.0-2.6.32.431.20.3.el6.x86_64.rpm	
└ RHEL7	
└ 7.1	
└ EM64T	
└ sps-utils-6.2.0-1.el7.x86_64.rpm	
└ sps-driver-E-6.2.0-3.10.0.229.el7.x86_64.rpm	
└ SLES10	
Express5800_100	SPM for Linux manual (PDF) SPM for Linux Installation Guide (PDF)
└ doc	
└ IS202_PathManager.pdf	
└ INSTALL.pdf	
Express5800_A1000	For Express5800/A1000 series
└ RPMS	
└ doc	
readme.txt	
readme.euc	
readme.utf	
filelist.txt	
gpl.txt	
install.txt	Installer
install.sh	

Supplementary notes:

- The files in grey in the list are not used in SAN Boot environment.
The contents of the list are parts of SPS 5.11 for Linux.
- (*1) RPM files (SPM 4.2.1 or later) are divided per function as below.
Sps-utils (utility), sps-driver-E (driver)

The preparation of SPM installation CD is now completed.

Proceed to the next section **[5.3.3.2 Installation]**.

5.3.3.2. Installation

SPM Installation

Follow the procedures below and use the installer of SPM installation CD. For the installation, start OS with the kernel in which SPM is used, and perform as root.

(1) Move to the directory where SPM installation CD is mounted.

(* If automatically mounted, move to the destination directory of automatic mount.)

```
# cd /media/cdrom
#
```

(2) Specify -i option for installer and install SPM (execute the underlined command in the box below).

```
# sh install.sh -i
===== Precheck for SPS Installation / Uninstallation =====
Distribution   : RedHat
Architecture  : x86_64
Kernel   Version: Linux2.6
Kernel   Details: 2.6.32-431.20.3.el6
----- The following packages will be installed. -----
driver : ./Express5800_100/RPMS/RHEL6/6.5/EM64T/sps-driver-E-5.3.0-2.6.32.431.20.3.el6.x86_64.rpm
utils  : ./Express5800_100/RPMS/RHEL6/6.5/EM64T/sps-utils-5.3.0-1.el6.x86_64.rpm
=====
Preparing...      ##### [100%]
   1:sps-driver-E  ##### [100%]
Preparing...      ##### [100%]
   1:sps-utils     ##### [100%]
Starting up sps devices:
dd_daemon (pid 3963) is running...
sps Install Completed.....
Please Reboot.....
#
```

(3) When the installation is normally completed, the message “sps Install Completed” (shaded part) is displayed. If this message is not displayed, the installation has been failed. Follow the instruction of [Appendix D: Error messages of the installer] in the Installation Guide of NEC Storage PathManager for Linux.



Do not reboot at this point although a message "Please Reboot" appears in the end of installer output.

The SPM installation is now completed.

Proceed to the next section **[Implementation into SAN Boot environment]**.

Implementation into SAN Boot environment

The procedure of this section is different in RHEL6 and RHEL7.

When you're using RHEL6,< Implementation into SAN Boot environment (RHEL6)>, when using RHEL7, please refer to< Implementation into SAN Boot environment (RHEL7)>.

< Implementation into SAN Boot environment (RHEL6) >

When using RHEL6 in SAN Boot environment, perform the following procedures.

The following are the setting procedure from the state of using SCSI device (/dev/sdX) as root device in SAN Boot environment (not using PathManager device (/dev/ddX) as root device).* Root device signifies a disk necessary for OS boot (such as "/", "/boot", and "swap", in default setting).Enable SAN Boot setting of SPM.

```
# spsconfig -sanboot-cfg-add
Addition of San-boot configuration succeeded.
```

(2) Confirm the root device. In the example below, /dev/sda and /dev/sdb are root devices.

```
# cat /etc/fstab
UUID=111d442e-0979-4d9a-a099-97995cecdb4f /          ext4    defaults  1 1
UUID=4a8155ca-dc82-4d32-9806-be29d1607321 /boot      ext4    defaults  1 2
UUID=35ac4a88-a023-4d30-9952-3052cd07161e /boot/efi  vfat
umask=0077,shortname=winnt 0 0
UUID=842d0fd5-cd45-4d9c-acc8-0d4f097e7639 swap       swap    defaults  0 0
tmpfs          /dev/shm      tmpfs    defaults      0 0
devpts         /dev/pts      devpts   gid=5,mode=620 0 0
sysfs         /sys          sysfs    defaults      0 0
proc          /proc         proc     defaults      0 0
...

# mount
/dev/sda3 on / type ext3 (rw)
none on /proc type proc (rw)
none on /sys type sysfs (rw)
none on /dev/pts type devpts (rw,gid=5,mode=620)
usbfs on /proc/bus/usb type usbfs (rw)
/dev/sda2 on /boot type ext3 (rw)
/dev/sda1 on /boot/efi type vfat (rw,umask=0077,shortname=winnt)
none on /dev/shm type tmpfs (rw)
none on /proc/sys/fs/binfmt_misc type binfmt_misc (rw)
...

# cat /proc/swaps
Filename                Type      Size      Used      Priority
/dev/sdb1                partition 1048544 0         42
...
```

From the result shown above, /dev/sda2 is mounted on "/" and /dev/sda1 on "/boot", and /dev/sdb1 is used as swap.

From the result, the correspondence of UUID and /dev/sd* written in fstab in the example above is as follows.

```
UUID=111d442e-0979-4d9a-a099-97995cecdb4f -> /dev/sda3
UUID=4a8155ca-dc82-4d32-9806-be29d1607321 -> /dev/sda2
UUID=35ac4a88-a023-4d30-9952-3052cd07161e -> /dev/sda1
UUID=842d0fd5-cd45-4d9c-acc8-0d4f097e7639 -> /dev/sdb1
```

If PathManager device (/dev/dd*) is displayed as the contents of mount and /proc/swap, the device is PathManager device corresponding to the root device of each mount point. These devices do not require procedure 3.

- (3) Confirm PathManager device corresponding to the root device (/dev/sd*) confirmed in procedure 2. PathManager device corresponding to root device can be confirmed by executing spsconfig command with -chk option as follows. In the example below, /dev/sda corresponds to /dev/dda, and /dev/sdb to /dev/ddb.

```
# spsconfig -chk /dev/sda /dev/sdb
/dev/sda -> /dev/dda
/dev/sdb -> /dev/ddb
```

- (4) After backing up the current "/etc/fstab", change the root device written in "/etc/fstab" to PathManager device confirmed in procedure 2 and 3.

```
# cp -p /etc/fstab /etc/fstab.sps
# vi /etc/fstab
/dev/dda3          /          ext4    defaults        1 1
/dev/dda2         /boot      ext4    defaults        1 2
/dev/dda1         /boot/efi  vfat    umask=0077,shortname=winnt 0
0
/dev/ddb1         swap       swap    defaults        0 0
tmpfs             /dev/shm   tmpfs   defaults        0 0
devpts           /dev/pts   devpts  gid=5,mode=620 0 0
sysfs            /sys       sysfs   defaults        0 0
proc             /proc      proc    defaults        0 0
...
```

- (5) Create boot RAM disk in which SPM driver is incorporated. When executed dracut command as follows, boot RAM disk is created. In the example below, the boot RAM disk "/boot/initramfs-sps.img" is created.

```
# dracut /boot/initramfs-sps.img `uname -r`
```

Supplementary notes:

Before and after `uname -r`, make sure to add backquote (```).

(6) Add the setting of enabling booting with boot RAM disk created in Procedure 5 to the boot loader settings. Follow the procedure below.

- 1) Backup /boot/efi/EFI/redhat/grub.conf
- 2) Copy the settings used for booting currently.
- 3) Change the title to arbitrary name.
- 4) Change initrd to the file name of the boot RAM disk created in Procedure 5.
- 5) Specify PathManager device corresponding to UUID as root according to the result confirmed in Procedure 3.
- 6) Change the value in default row (if necessary). In the example, the value is 0 as it is the top-most entry.

```
# cp -p /boot/efi/EFI/redhat/grub.conf /boot/efi/EFI/redhat/grub.conf.sps
# vi /boot/efi/EFI/redhat/grub.conf
...
#boot=/dev/sda
device (hd0) HD(1,800,64000,22b4dcc6-637d-4d9d-a7ec-f426df09010d)
default=0
timeout=5
splashimage=(hd0,0)/grub/splash.xpm.gz
hiddenmenu

title Red Hat Enterprise Linux (2.6.32-431.20.3.el6.x86_64)
    root (hd0,0)
    kernel /vmlinuz-2.6.32-431.20.3.el6.x86_64 ro root=/dev/ddd3 rd_NO_LUKS
rd_NO_LVM rd_NO_MD rd_NO_DM LANG=ja_JP.UTF-8 KEYBOARDTYPE=pc
KEYTABLE=jp106 crashkernel=256M rhgb quiet nmi_watchdog=0
    initrd /initramfs-sps.img

title Red Hat Enterprise Linux (2.6.32-431.20.3.el6.x86_64)
    root (hd0,0)
    kernel /vmlinuz-2.6.32-431.20.3.el6.x86_64 ro
root=UUID=111d442e-0979-4d9a-a099-97995cecdb4f rd_NO_LUKS rd_NO_LVM
rd_NO_MD rd_NO_DM LANG=ja_JP.UTF-8 KEYBOARDTYPE=pc KEYTABLE=jp106
crashkernel=256M rhgb quiet nmi_watchdog=0
    initrd /initramfs-2.6.32-431.20.3.el6.x86_64.img
...

```

Annotations in the image:

- Box 1) Backup: points to the backup command.
- Box 2) Copy the current setting used for booting: points to the original title block.
- Box 3) Change title: points to the new title.
- Box 4) Change initrd: points to the new initrd path.
- Box 5) Change root: points to the new root device.
- Box 6) Change the value of default row: points to the default=0 line.

(7) Connect the disconnected path for redundant state.

(8) Reboot the system to confirm that the setting added to the boot loader operates normally. If not booted normally, restore the setting of "/etc/fstab" and retry with existing boot RAM disk.

```
# sync
# shutdown -r now
```

(9) Confirm that PathManager device is used as root device.

```
# mount
/dev/dda3 on / type ext3 (rw)
none on /proc type proc (rw)
none on /sys type sysfs (rw)
none on /dev/pts type devpts (rw,gid=5,mode=620)
usbfs on /proc/bus/usb type usbfs (rw)
/dev/dda2 on /boot type ext3 (rw)
/dev/dda1 on /boot/efi type vfat (rw,umask=0077,shortname=winnt)
none on /dev/shm type tmpfs (rw)
none on /proc/sys/fs/binfmt_misc type binfmt_misc (rw)
...

# cat /proc/swaps
Filename                                Type      Size      Used      Priority
/dev/ddb1                               partition 1048544 0         42
...
```

Implementation of SPM into SAN Boot environment is now completed. If applications or setting files which use SCSI device (/dev/sdX) of NEC Storage already exist, proceed to the next section **[Migration to the environment which uses SPM]**.

< Implementation into SAN Boot environment (RHEL7) >

When using RHEL7 in SAN Boot environment, perform the following procedures.

The following are the setting procedure from the state of using SCSI device (/dev/sdX) as root device in SAN Boot environment (not using PathManager device (/dev/ddX) as root device). * Root device signifies a disk necessary for OS boot (such as "/", "/boot", and "swap", in default setting).

(1) Confirm the root device. In the example below, /dev/sda and /dev/sdb are root devices.

```
# cat /etc/fstab
UUID=111d442e-0979-4d9a-a099-97995cecdb4f / xfs defaults 1 1
UUID=4a8155ca-dc82-4d32-9806-be29d1607321 /boot xfs defaults 1 2
UUID=35ac4a88-a023-4d30-9952-3052cd07161e /boot/efi vfat umask=0077,shortname=winnt 0 0
UUID=842d0fd5-cd45-4d9c-acc8-0d4f097e7639 swap swap defaults 0 0
tmpfs /dev/shm tmpfs defaults 0 0
devpts /dev/pts devpts gid=5,mode=620 0 0
sysfs /sys sysfs defaults 0 0
proc /proc proc defaults 0 0
...

# mount
/dev/sda3 on / type xfs (rw)
none on /proc type proc (rw)
none on /sys type sysfs (rw)
none on /dev/pts type devpts (rw,gid=5,mode=620)
usbfs on /proc/bus/usb type usbfs (rw)
/dev/sda2 on /boot type xfs (rw)
/dev/sda1 on /boot/efi type vfat (rw,umask=0077,shortname=winnt)
none on /dev/shm type tmpfs (rw)
none on /proc/sys/fs/binfmt_misc type binfmt_misc (rw)
...

# cat /proc/swaps
Filename Type Size Used Priority
/dev/sdb1 partition 1048544 0 42
...
```

From the result shown above, /dev/sda2 is mounted on "/" and /dev/sda1 on "/boot", and /dev/sdb1 is used as swap.

From the result, the correspondence of UUID and /dev/sd* written in fstab in the example above is as follows.

```
UUID=111d442e-0979-4d9a-a099-97995cecdb4f -> /dev/sda3
UUID=4a8155ca-dc82-4d32-9806-be29d1607321 -> /dev/sda2
UUID=35ac4a88-a023-4d30-9952-3052cd07161e -> /dev/sda1
UUID=842d0fd5-cd45-4d9c-acc8-0d4f097e7639 -> /dev/sdb1
```

If PathManager device (/dev/dd*) is displayed as the contents of mount and /proc/swaps, the device is PathManager device corresponding to the root device of each mount point. These devices do not require procedure 3.

- (2) Confirm PathManager device corresponding to the root device (/dev/sd*) confirmed in procedure (1). PathManager device corresponding to root device can be confirmed by executing spsconfig command with -chk option as follows. In the example below, /dev/sda corresponds to /dev/dda, and /dev/sdb to /dev/ddb.

```
# spsconfig -chk /dev/sda /dev/sdb
/dev/sda -> /dev/dda
/dev/sdb -> /dev/ddb
```

- (3) After backing up the current "/etc/fstab", change the root device written in "/etc/fstab" to PathManager device confirmed in procedure 2 and 3.

```
# cp -p /etc/fstab /etc/fstab.sps
# vi /etc/fstab
/dev/dda3          /                xfs     defaults        1 1
/dev/dda2          /boot            xfs     defaults        1 2
/dev/dda1          /boot/efi        vfat    umask=0077,shortname=winnt 0 0
/dev/ddb1          swap             swap    defaults        0 0
tmpfs              /dev/shm         tmpfs   defaults        0 0
devpts             /dev/pts         devpts  gid=5,mode=620 0 0
sysfs              /sys             sysfs   defaults        0 0
proc               /proc            proc    defaults        0 0
...
```

- (4) Create boot RAM disk in which SPM driver is incorporated. When executed dracut command as follows, boot RAM disk is created. In the example below, the boot RAM disk "/boot/initramfs-sps.img" is created.

```
# dracut --fstab /boot/initramfs-sps.img `uname -r`
```

Supplementary notes:

Before and after `uname -r`, make sure to add backquote (`).

(5) Pick setting of menuentry which is being used currently to start the system, from setting of a boot loader.

- 1) Output setting of the present boot loader in a temporary file.

```
# cd /tmp
# grub2-mkconfig -o grub.tmp
```

- 2) Delete all except for menuentry of the kernel which has started currently from a temporary file.

```
# vi grub.tmp
...
### BEGIN /etc/grub.d/10_linux ###
menuentry 'Red Hat Enterprise Linux Server 7.1 (Maipo), with Linux 3.10.0-229.el7.x86_64' --class
fedora --class gnu-linux --class gnu --class os --unrestricted $menuentry_id_option
'gnulinux-3.10.0-229.el7.x86_64-advanced-111d442e-0979-4d9a-a099-97995cecdb4f' {
    load_video
    set gfxpayload=keep
    insmod gzio
    insmod xfs
    if [ x$feature_platform_search_hint = xy ]; then
        search --no-floppy --fs-uuid --set=root --hint-bios=hd0,gpt2 --hint-efi=hd0,gpt2
--hint-baremetal=ahci0,gpt2 ad97fc01-a524-4205-a2c7-bd5bd89509fd
    else
        search --no-floppy --fs-uuid --set=root ad97fc01-a524-4205-a2c7-bd5bd89509fd
    fi
    linuxefi /vmlinuz-3.10.0-229.el7.x86_64 root=UUID=111d442e-0979-4d9a-a099-97995cecdb4f
ro crashkernel=auto rhgb quiet crashkernel=128M
    initrdefi /initramfs-3.10.0-229.el7.x86_64.img
}
...
```

When using “3.10.0-229.el7.x86_64”, delete menuentry that is not included “with Linux 3.10.0-229.el7.x86_64” .

3) Correct 2) as follows.

- Change the name of menuentry arbitrarily.
- Change initrdefi to the boot RAM disk created in (4).
- Specify PathManager device corresponding to UUID as root according to the result confirmed in Procedure (1).

```
# vi grub.tmp
menuentry 'Red Hat Enterprise Linux Server 7.1 (Maipo) with SPS, with Linux
3.10.0-229.el7.x86_64' --class fedora --class gnu-linux --class gnu --class os
--unrestricted $menuentry_id_option
'gnulinux-3.10.0-229.el7.x86_64-advanced-111d442e-0979-4d9a-a099-97995cecdb4f' {
    load_video
    set gfxpayload=keep
    insmod gzio
    insmod xfs
    if [ x$feature_platform_search_hint = xy ]; then
        search --no-floppy --fs-uuid --set=root --hint-bios=hd0,gpt2
        --hint-efi=hd0,gpt2 --hint-baremetal=ahci0,gpt2
        ad97fc01-a524-4205-a2c7-bd5bd89509fd
    else
        search --no-floppy --fs-uuid --set=root ad97fc01-a524-4205-a2c7-bd5bd89509fd
    fi
    linuxefi /vmlinuz-3.10.0-229.el7.x86_64 root=/dev/dda3 ro crashkernel=auto rhgb
    quiet crashkernel=128M
    initrdefi /initramfs-sps.img
}
```

Change the name of menuentry

Change initrdefi

Change root

4) Add the contents of 3) to “/etc/grub.d/40_custom”.

```
# cat grub.tmp >> /etc/grub.d/40_custom
```

Supplementary notes:
Before and after `uname -r`, make sure to add backquote (```).

5) Buck up “/etc/default/grub”, Change the GRUB_DEFAULT parameter to the name of menuentry which made in (3).

```
# cp -p /etc/default/grub /etc/default/grub.sps

# vi /etc/default/grub

...

GRUB_DEFAULT='Red Hat Enterprise Linux Server 7.1 (Maipo) with SPS, with Linux
3.10.0-229.el7.x86_64'

...
```

Input the name of menuentry which made in (3)

6) Remake "/boot/efi/EFI/redhat/grub.cfg".

```
# cp /boot/efi/EFI/redhat/grub.cfg /boot/efi/EFI/redhat/grub.cfg.sps
# grub2-mkconfig -o /boot/efi/EFI/redhat/grub.cfg
```

(6) Connect the disconnected path for redundant state.

(7) Reboot the system to confirm that the setting added to the boot loader operates normally. If not booted normally, restore the setting of "/etc/fstab" and retry with existing boot RAM disk.

```
# sync
# shutdown -r now
```

(8) Confirm that PathManager device is used as root device.

```
# mount
/dev/dda3 on / type xfs (rw)
none on /proc type proc (rw)
none on /sys type sysfs (rw)
none on /dev/pts type devpts (rw,gid=5,mode=620)
usbfs on /proc/bus/usb type usbfs (rw)
/dev/dda2 on /boot type xfs (rw)
/dev/dda1 on /boot/efi type vfat (rw,umask=0077,shortname=winnt)
none on /dev/shm type tmpfs (rw)
none on /proc/sys/fs/binfmt_misc type binfmt_misc (rw)
...

# cat /proc/swaps
Filename                                Type      Size      Used      Priority
/dev/ddb1                                partition 1048544 0         42
...
```

Implementation of SPM into SAN Boot environment is now completed. If applications or setting files which use SCSI device (/dev/sdX) of NEC Storage already exist, proceed to the next section [Migration to the environment which uses SPM].

Migration to the environment which uses SPM

If applications or setting files which use SCSI device as /dev/sdX of NEC Storage already exist, perform the following procedure.

Supplementary notes:

The following procedure is an example of using SCSI device (/dev/sd*) of NEC Storage in /etc/fstab. If using dev/sd* in other applications or setting files, change /dev/sd* to /dev/dd* according to the following procedure.

<When migrating the disk mounted to /mnt/work to the environment which uses SPM>

```
# vi /etc/fstab
...
/dev/sdf1          /mnt/work          ext3    defaults        0 0
...
```

- (1) Confirm that the target device is NEC Storage by using sg_scan command.
If displayed "NEC" "DISK ARRAY", that is NEC Storage device (shaded parts).

```
# sg_scan -i /dev/sdf
/dev/sdf: scsi0 channel=0 id=0 lun=5 [em]
  NEC      DISK ARRAY      1000 [rmb=0 cmdq=1 pqual=0 pdev=0x0]
```

- (2) Confirm corresponding /dev/ddX to /dev/sdf. The corresponding PathManager devices can be confirmed by executing spsconfig command with -chk option. In the example below, /dev/sdf corresponds to /dev/ddd.

```
# spsconfig -chk /dev/sdf
/dev/sdf -> /dev/ddd
```

- (3) After creating the backup of the file in an arbitrary name, change /dev/sdf to the confirmed device /dev/ddd in procedure (2).

```
# cp -p /etc/fstab /etc/fstab.sps
# vi /etc/fstab
...
/dev/ddd1          /mnt/work          ext3    defaults        0 0
...
```

- (4) When using SCSI device of NEC Storage for applications, etc., change as described in procedure (3).

- (5) Reboot the system.

```
# sync
# shutdown -r now
```

Migration to the environment which uses SPM is now completed.

Setting of kdump

When using Red Hat Enterprise Linux 6, kdump cannot be used in the default settings. The kdump setting which uses PathManager device requires setup separately.

Please refer to Appendix F [Setting and release of kdump] in **[NEC Storage Software NEC Storage PathManager User's Guide (Linux)]** to setup kdump.

5.3.3.3. Uninstallation

Supplementary notes:

This section explains the procedures to uninstall SPM. Perform according to the description when required due to reasons such as SPM update.

Release of kdump setting

To release the kdump setting, refer to Appendix F [Setting and release of kdump] in [NEC Storage Software NEC Storage PathManager User's Guide (Linux)].

Setting release of SAN Boot environment

If SPM is installed in SAN Boot environment, perform the following procedures before uninstalling SPM.

- (1) Confirm that the root device is PathManager device.

```
/dev/dda3 on / type ext3 (rw)
none on /proc type proc (rw)
none on /sys type sysfs (rw)
none on /dev/pts type devpts (rw,gid=5,mode=620)
usbfs on /proc/bus/usb type usbfs (rw)
/dev/dda2 on /boot type ext3 (rw)
/dev/dda1 on /boot/efi type vfat (rw,umask=0077,shortname=winnt)
none on /dev/shm type tmpfs (rw)
none on /proc/sys/fs/binfmt_misc type binfmt_misc (rw)
...

# cat /proc/swaps
Filename                                Type      Size      Used      Priority
/dev/ddb1                               partition 1048544 0         42
...
```

- (2) Return the root device settings to the condition before setting-up SAN Boot environment.

```
# mv /etc/fstab.sps /etc/fstab
```

- (3) Disable SAN Boot setting of SPM.

```
# spsconfig -sanboot-cfg-del
```

- (4) Delete boot RAM disk in which SPM driver is incorporated.

```
# rm /boot/initramfs-sps.img
```

- (5) Return the setting file of bootloader to the condition before setting-up SAN Boot environment.

```
# mv /boot/efi/EFI/redhat/grub.conf.sps /boot/efi/EFI/redhat/grub.conf
```

Setting release of SPM to SAN Boot environment is now completed.

Proceed to the next section **[Uninstallation of SPM]**.

Uninstallation of SPM

To uninstall SPM, follow the procedures below by using the uninstaller.

- (1) Move under /opt/nec/sps/installer.

```
# cd /opt/nec/sps/installer
#
```

- (2) Execute uninstaller to uninstall SPM.

* When `--silent` option was not specified, OS reboot is not executed.

In such case, reboot manually.

```
# sh uninstall.sh --silent
===== Precheck for SPS Installation / Uninstallation =====
Distribution   : RedHat
Architecture   : x86_64
Kernel  Version: Linux2.6
Kernel  Details: 2.6.32-431.20.3.el6
----- The following packages will be uninstalled. -----
driver : sps-driver-E-5.3.0-2.6.32.431.20.3.el6
utils  : sps-utils-5.3.0-1.el6
=====
sps Uninstall Completed.....
#
Broadcast message from root (Thu Feb 25 14:38:01 2010):
The system is going DOWN for reboot in 1 minute!
#
```

- (3) When the uninstallation is normally completed, the message “sps Uninstall Completed” (shaded part) is displayed. If this message is not displayed, the uninstallation has been failed. Follow the instruction of [Appendix D: Error messages of the installer] in the Installation Guide of NEC Storage PathManager for Linux.
- (4) When uninstallation is normally completed, the system reboot starts a minute later. Confirm that OS booting operates normally afterwards.

(5) After rebooting OS, confirm that the root device is not PathManager device.

```
# mount
/dev/sda3 on / type ext3 (rw)
none on /proc type proc (rw)
none on /sys type sysfs (rw)
none on /dev/pts type devpts (rw,gid=5,mode=620)
usbfs on /proc/bus/usb type usbfs (rw)
/dev/sda2 on /boot type ext3 (rw)
/dev/sda1 on /boot/efi type vfat (rw,umask=0077,shortname=winnt)
none on /dev/shm type tmpfs (rw)
none on /proc/sys/fs/binfmt_misc type binfmt_misc (rw)
...

# cat /proc/swaps
Filename                                Type              Size              Used              Priority
/dev/sdb1                               partition         1048544 0                42
...
```

The SPM uninstallation is now completed.

5.3.3.4. Update

Supplementary notes:

This section explains the procedures to update SPM. Perform according to the description when required due to reasons such as kernel update.

To update SPM, uninstall it once then install again. The following are the SPM update procedures when updating kernel.

Supplementary notes:

- Once SPM is uninstalled, /dev/ddX cannot be used.
- Therefore, stop applications that use /dev/ddX before updating SPM.
- Do not access to /dev/ddX during updating SPM.
- When using EXPRESSCLUSTER, refer to Appendix D [Implementation to the EXPRESSCLUSTER environment] in [NEC Storage Software NEC Storage PathManager User's Guide (Linux)].

- (1) Uninstall SPM. For the uninstallation procedures, refer to [5.3.6.3 Uninstallation].
- (2) Perform kernel update.
- (3) Boot OS with updated kernel.
- (4) Install SPM. For the installation procedures, refer to [5.3.6.2 Installation].

Update of SPM is now completed.

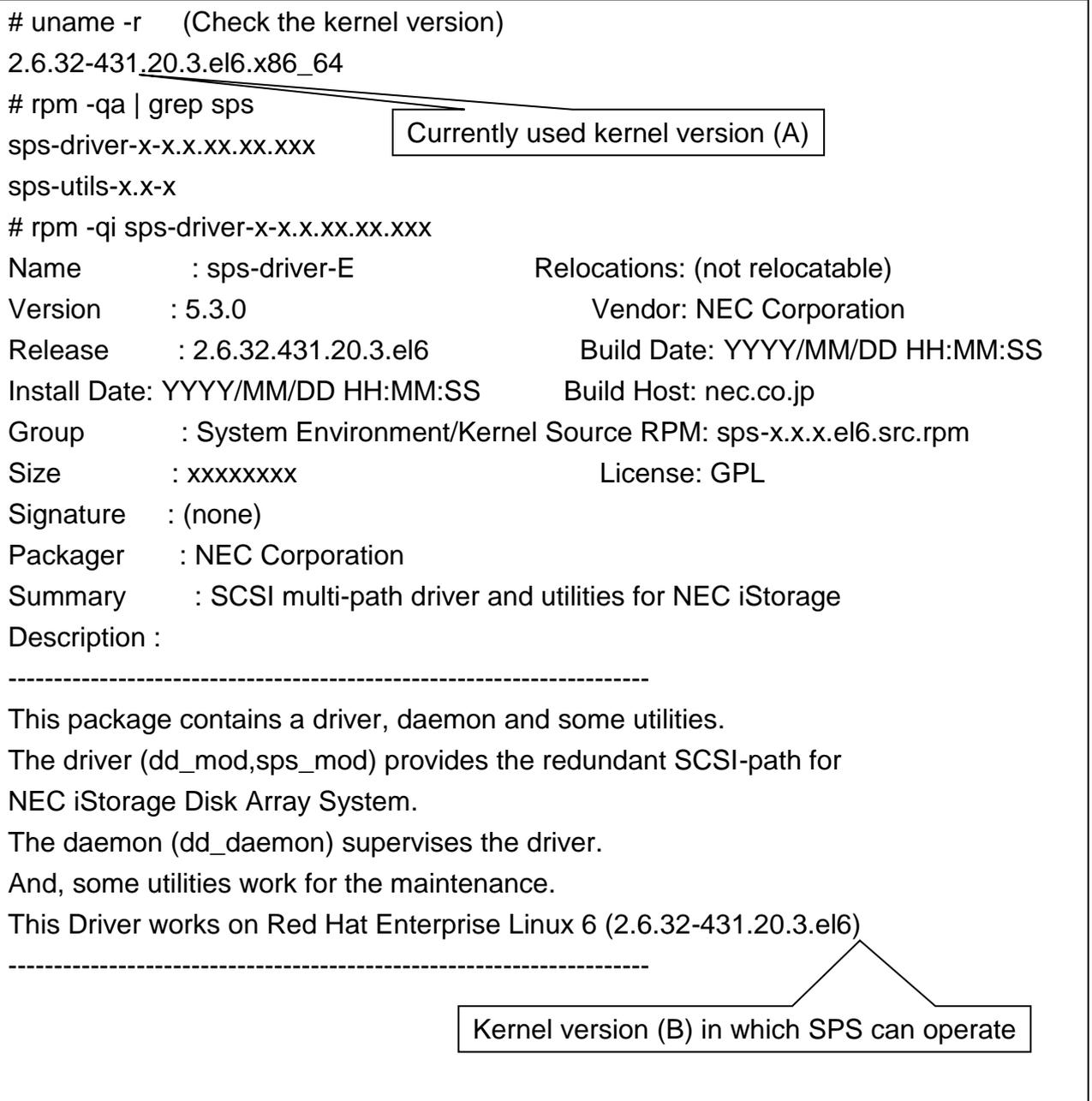
5.3.3.5. Operation preparation

By rebooting the system, SPM automatically recognizes the target disk devices and respective path. Then, the operation starts.

- (1) Confirm that SPM corresponds to the used kernel is installed. Also confirm that kernel version (A) displayed as [uname -r] and kernel version (B) displayed as [rpm -qi] are the same.

<For Red Hat Enterprise Linux 6.5 (Kernel-2.6.32-431.20.3.el6)>

```
# uname -r (Check the kernel version)
2.6.32-431.20.3.el6.x86_64
# rpm -qa | grep sps
sps-driver-x-x.x.xx.xx.xxx
sps-utils-x.x-x
# rpm -qi sps-driver-x-x.x.xx.xx.xxx
Name          : sps-driver-E          Relocations: (not relocatable)
Version       : 5.3.0          Vendor: NEC Corporation
Release      : 2.6.32.431.20.3.el6    Build Date: YYYY/MM/DD HH:MM:SS
Install Date: YYYY/MM/DD HH:MM:SS    Build Host: nec.co.jp
Group        : System Environment/Kernel Source RPM: sps-x.x.x.el6.src.rpm
Size         : xxxxxxxx       License: GPL
Signature    : (none)
Packager     : NEC Corporation
Summary     : SCSI multi-path driver and utilities for NEC iStorage
Description :
-----
This package contains a driver, daemon and some utilities.
The driver (dd_mod,sps_mod) provides the redundant SCSI-path for
NEC iStorage Disk Array System.
The daemon (dd_daemon) supervises the driver.
And, some utilities work for the maintenance.
This Driver works on Red Hat Enterprise Linux 6 (2.6.32-431.20.3.el6)
-----
```



- (2) Confirm /proc/scsi/sps/ddX (X is the number of LUN created in NEC Storage, counted as a, b, c...). The path is multiplexed normally, if “path-info:” line exists each device as multiplexed and the status of “device-info:” becomes all “NML”. If nothing is displayed, NEC Storage is not recognized by any paths. Confirm the connection between sever and NEC Storage, and also confirm if FC driver is applied.

```
# cat /proc/scsi/sps/dda
device:/dev/dda
    disk-info:NEC      ,DISK ARRAY      ,0000000931000013,00000
    device-info:Host:scsi:2 Channel:0 Id:0 Lun:0 Watch:Enable Status:NML
    LoadBalance:D2
    path-info:0 Host:scsi:0 Channel:0 Id:0 Lun:0 Priority:1 Status:ACT
    path-info:1 Host:scsi:1 Channel:0 Id:0 Lun:0 Priority:2 Status:HOT
```

- (3) Confirm if path control daemon is booted by using the following command. When path patrol daemon is booted, a message such as the following is displayed.

```
# /etc/rc.d/init.d/dd_daemon status
dd_daemon (pid XXX) is running
...
```

Operation preparation of SPM is now completed.

5.3.3.6. Detailed information

For the detailed information of other than the contents of this document, refer to **[NEC Storage Software NEC Storage PathManager User's Guide (Linux)]** (Express5800_100/doc/IS202_StoragePathManager_Linux.pdf).

5.3.4 Installation of application software

Refer to the following website and install each application software.

- **NEC ESMPRO Agent**

Installation of NEC ESMPRO Agent

<https://www.express.nec.co.jp/linux/dload/esmpro/esm4.html> (JP only)

This is application software to provide server operation monitoring, preventive maintenance, and failure monitoring functions.

It is used with NEC ESMPRO Manager, which provides manager functions. For installation method, refer to the website above. Apply the one corresponding to the OS.

- **actlog**

[Linux] release of actlog, an information collection tool

<https://www.support.nec.co.jp/View.aspx?id=3140000182> (JP only)

actlog is a tool to support isolation of causes when a system error occurs.

It has functions to collect various system information (system resource data and process resource data) continuously and to follow up modifications of system setting files, which are helpful to investigate in the causes of various system troubles.

- **kdump-reporter**

[Linux] release of kdump-reporter, an information collection tool

<https://www.support.nec.co.jp/View.aspx?id=3140100097> (JP only)

kdump-reporter is a tool to create primary analysis report of Linux kernel crash dump automatically. It enables you to start investigation from the primary analysis report before sending the large capacity dump to the support desk, resulting in shortening of the duration until the investigation start.

5.3.5 Information regarding Linux service set

The following website is opened to the public for Linux service set purchasers, this is useful information regarding stable operation of Linux system such as setting after OS installation method and application method of each correction module. Refer to the website and apply to match your environment. For the stable system operation, it is recommended to apply the latest kernel package. To apply the latest package, refer to the following information.

Update other than kernel package

For the update method of packages other than kernel package, refer to the following website. <When the target device can connect to the internet>

[RHEL]Red Hat Enterprise Linux yum operation guide

<https://www.support.nec.co.jp/View.aspx?id=3140000177> (JP only)

<When the target device cannot connect to the internet>

[RHEL]RPM package application guide

<https://www.support.nec.co.jp/View.aspx?id=3140000129>

Update of kernel package

For the update method of kernel package, refer to the following website.

[RHEL6] Kernel package application in FC SAN Boot environment

<https://www.support.nec.co.jp/View.aspx?id=9010101791> (JP only)

For other information, refer to [Installation Guide (Linux)] -> [Chapter 1 Linux Installation] -> [1.1 Public Information for Linux service set purchasers].

5.4 VMware ESXi

For the details of VMware ESXi, refer to the following website.

<http://www.nec.co.jp/vmware/> (JP Only)

For VMware vSphere5.1/5.5 technical documents, please contact your local NEC sales representative or the retailer you purchased the product. [Precautions on SAN Boot configuration](#)

The following hardware/software environment is supported in SAN Boot configuration of VMware ESXi. For supported storage and software, refer to [SAN Boot Correspondence Table].

Item	Support conditions
Express5800 series	R120f-2M / R120f-1M / E120f-M / R120f-2E / R120f-1E
Target FC controller	FC controller (N8190-157A/158A/159/160)
Network	It is recommended to duplicate NIC upon separating the virtual switches of the port group for VMkernel (for management) and network for virtual machines. In addition, it is recommended to configure the dedicated network (Gbps or more recommended) when using vMotion.
FC path Redundancy	By installing NEC Storage PathManager (SPM), it is available to manage/control the redundant path optimized for NEC storage product. (For SPM, vSphere5 Enterprise edition or more is required. The target storage devices are M series only). Also in the environment without SPM installed, HBA failover and SP (Storage Port) failover are available due to standard functions of ESXi.

Precautions:

- When using VMware ESXi for SAN Boot configuration, the following functions cannot be used.
Autonomous recovery to VMware ESXi (hypervisor) spare server by SigmaSystemCenter
- Backup and restore of VMware ESXi (hypervisor) by DeploymentManager

5.4.2 Precautions at SAN Boot configuration

Before installation of VMware ESXi, perform [4.2.1 Enable setting of FC controller BIOS] of this document.

When implementing NEC Storage PathManager (SPM), install it according to the attached installation guide after completing installation of VMware ESXi 5.1/5.5.

Beware of the following points in the meantime.

6 Operation check and redundant path settings

If FC cable is not reconnected in “5. OS installation”, reconnect the FC cable removed before OS installation and setup as redundant path.

6.1 FC cable reconnection

Connect FC cable removed in “4.5. FC connection with single path” with the original FC controller.

Register the redundant path to FC controller if it has not been registered.

Refer to “4.3. Settings of FC controller (legacy BIOS mode)” or “4.4. Settings of FC controller (UEFI mode)” to additionally register redundant path as a Boot device.

6.2 Confirming redundancy of FC path

Windows OS

Redundancy of FC path in Windows OS can be confirmed by executing “spsadmin /lun” of StoragePathManager command.

Refer to “3.1.2 The list of path” in “StoragePathManager User’s Guide (Windows)” for details.

VMware ESXi5 or ESXi6

The procedure in this chapter is unnecessary, if VMware ESX ESXi is already installed and the procedure of “3.1.5 Association FC controller to LD set server” is not performed.

If NEC Storage PathManager is installed, redundancy of FC path in VMware can be confirmed from VMware vSphere Client.

Refer to “4.1.2 Confirmation of operation situation” in “NEC Storage PathManager User’s Guide (VMware)” for details.

7 Setting of additional applications

7.1 Data replication function of NEC Storage (DDR)

By using data replication function (DDR) of NEC Storage M series, backup/restoration of OS images such as Windows (incl. Hyper-V), Linux, and VMware ESX, virtual machine images of Hyper-V and VMware, and data area of physical machine, virtual machine, etc. are available.

Backup and restoration by data replication function are available by using replication management screen of NEC Storage Manager, or by using ControlCommand on the management server or on the backup server. On NEC Storage M series, backup and restoration are available by using iSMCLI on disk array.

To use data replication function, it is required to unlock DynamicDataReplication licence.

To unlock the license, refer to [11.4 License] in [NEC Storage Software Configuration Guide (GUI) - M series].

To use ControlCommand, it is required to purchase and install NEC Storage ControlCommand separately according to the usage environment.

For installation method of ControlCommand, refer to the Installation Guide (INSTALL.PDF) included in the NEC Storage ControlCommand CD-R.

To use ControlCommand on the management server, associative operations with NEC Storage Manager are required. For the associative operations with StorageManager, refer to [4.2.2 NEC Storage Manager and associative operation] in [NEC Storage Software Data Replication User's Guide - Functions], and [Chapter 8 Operation setting] in [NEC Storage Software ControlCommand Command References].

When using iSMCLI, command shall be executed on disk array. Use ssh/telnet/rsh protocol to login to disk array or execute from remote. For the backup and restoration procedures by using iSMCLI, refer to [Appendix D Disk backup and restoration with data replication functions] in [NEC Storage Manager Command Reference].

Referential Manuals

- Installation Guide of NEC Storage ControlCommand
Obtain from: INSTALL.PDF in NEC Storage ControlCommand on Windows CD-ROM
Obtain from: INSTALL.PDF in NEC Storage ControlCommand on Linux CD-ROM
- [NEC Storage Series Configuration Setting Guide (GUI)]
M series: manual¥IS051.pdf in NEC StorageManager Express Setup and Utility CD-ROM
- [NEC Storage Software Data Replication User's Guide – Functions]
Obtain from: manual¥IS015.pdf in NEC Storage ControlCommand on Windows CD-ROM
Obtain from: manual¥IS015.pdf in NEC Storage ControlCommand on Linux CD-ROM
- [NEC Storage Software ControlCommand Command Reference]
Obtain from: manual¥IS041.pdf in NEC Storage ControlCommand on Windows CD-ROM
Obtain from: manual¥IS041.pdf in NEC Storage ControlCommand on Linux CD-ROM
- [NEC Storage Software NEC Storage Manager Command Reference]

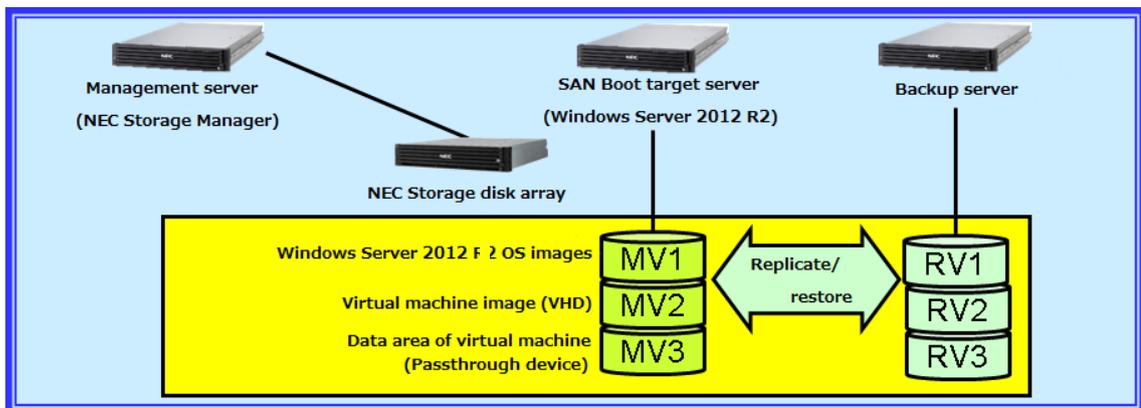
7.1.1 Backup and restoration of Hyper-V with DDR functions

This section introduces cautions and restrictions of when backup/restore the Windows Server OS image in which Hyper-V is installed, virtual machine images on Hyper-V (VHD), and data area in the virtual machine (passthrough device) by using data replication function.

Refer also to [7.1.4. Notes on backup/restoration of OS images of Windows server by using DDR function] in this document.

(1) Configuration

For the backup/restoration procedures described latter, it is assumed to perform in the following configuration (Windows Server 2012 R2 is used as an example).



(2) Logical disk format

1. The logical disk format must be set as "WG" for the OS image of Windows Server in which Hyper-V is installed.
2. Setup the format of logical disk accessed from Hyper-V (virtual machine image on Hyper-V (VHD) and data area of the virtual machine (passthrough device) as follows according to the actual partition style.

When using as a disk in MBR format: "WN"

When using as a disk in GPT format: "WG"

(3) Backup/restoration of OS images of Windows server

When performing backup/restoration OS images of Windows Server 2012 R2 in which Hyper-V is installed by using data replication function of NEC Storage, follow the procedures below.

Backup procedures

(1) Execute replication (management server)

Execute "Replicate" from NEC Storage Manager, and synchronize MV and RV of the following items;

- OS images of Windows Server 2012 R2
- Virtual machine images on Hyper-V
- Data area of virtual machine

(2) Stop of Windows Server 2012 R2 (Windows Server 2012 R2)

Stop Windows Server 2012 R2 which uses MV, the backup target.

(3) Execute separation (management server)

Execute "Separate" from NEC Storage Manager, separate MV and RV of the following items;

- OS images of Windows Server 2012 R2
- Virtual machine images on Hyper-V
- Data area of virtual machine

(4) Restarting Windows Server 2012 R2 (Windows Server 2012 R2)

Boot Windows Server 2012 R2 stopped in (2) and restart the operation.

Restoration procedures

(1) Stop of Windows Server 2012 R2 (Windows Server 2012 R2)

Stop Windows Server 2012 R2 which uses MV, the restoration target.

(2) Reconfiguration of MV (management server)

To restore MV from physical failure, perform MV reconfiguration according to the following procedures.

1. AccessControl setting of MV (access prohibition)
2. LD reconfiguration
3. Re-configure pair settings
4. AccessControl setting of reconfigured MV (access permission)

(3) Execution of restoration (management server)

Execute "Restore" from NEC Storage Manager and restore RV data to MV.

(4) Restarting Windows Server 2012 R2 (Windows Server 2012 R2)

Boot Windows Server 2012 R2 stopped in (1) and restart the operation.

7.1.2 Backup/restore of Hyper-V data area by using DDR function

This section introduces notes and limitations on backup/restoration of data area (passthrough device) from the virtual machine on Windows server in which Hyper-V is installed by using data replication function of NEC Storage.

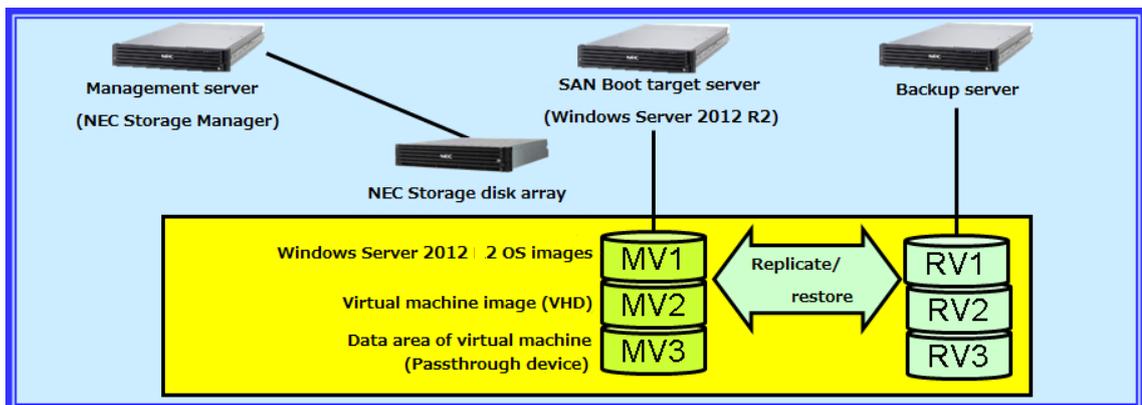
Refer also to [7.1.4. Notes on backup/restoration of OS images of Windows server by using DDR function] in this document.

1. Configuration

For the backup/restoration procedures are described latter, it is assumed to perform in the following configuration (Windows Server 2012 R2 is used as an example).

ControlCommand need to be installed in the virtual machine to use data replication function from the virtual machine.

Or, Data replication using iSMCLI embodied in the disk array is also available. In this case, installation of ControlCommand on the virtual machine is not necessary, however, an environment that enables remote login and iSMCLI command execution using ssh/telnet/rsh protocol from the virtual machine is needed.



2. Backup/restoration of data area from virtual machine

When performing backup/restoration of data area (passthrough disk) from the virtual machine on Windows server in which Hyper-V is installed by using data replication function of NEC Storage, follow the procedures below.

Preparation

(1) Execution of iSMpassthrough_enabler

To use the data replication function by ControlCommand on the virtual machine, the data area need to be recognized as a disk of NEC Storage disk array by the virtual machine.

To make the virtual machine recognize it as a disk of NEC Storage disk array, execute [iSMpassthrough_enabler] just once on Windows Server host OS after the virtual machine creation.

(When adding new virtual machine after the operation initiation, the command needs to be executed once in the same manner.)

When using data replication by iSMCLI, this procedure is not necessary.

Backup procedures

By executing [iSMpassthrough_enabler] command, backup of data area can be created by using ControlCommand from the virtual machine in the same procedure as DDR operation on usual physical server.

For backup procedure, refer to [3.1.1 Backup operation example] in [NEC Storage Software Data Replication User's Guide - Implementation and Operation (Windows)].

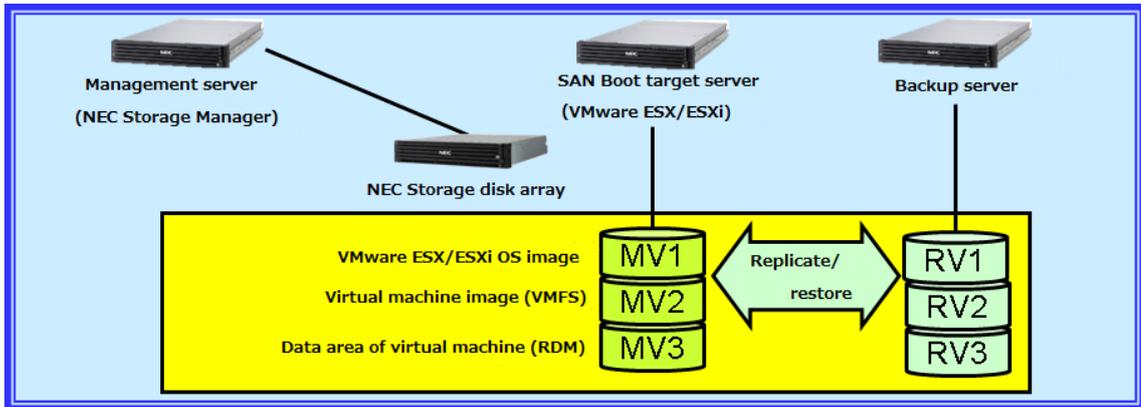
When performing backup of data area by using iSMCLI, refer to [Appendix D Disk backup and restoration operation by data replication function] in [NEC Storage Manager Command References] for the backup procedures.

7.1.3 Backup/restoration of VMware ESXi by DDR function

This section introduces cautions and restrictions on backup/restore the VMware ESX/ESXi OS image, virtual machine images of VMware ESX/ESXi (VMFS), and data area (RDM (Raw Device Mapping)) on the virtual machine by using the data replication function of NEC Storage.

Configuration

The backup/restoration procedures described latter are assumed to be performed in the following configuration.



Logical disk format

Make sure to set "LX" for the format of logical disk in which VMware ESX/ESXi OS image is installed and the one in which virtual machine image (VMFS).

For the format of the logical disk of data area (RDM (Raw Device Mapping)) on the virtual machine, setup according to the actually used OS and partition style.

Example: when using as a disk of Linux; "LX"

When using as a disk of Windows in MBR format: "WN"

When using as a disk of Windows in GPT format: "WG"

Backup/restoration of OS images of VMware ESX

When performing backup/restoration of OS images of VMware ESX by using data replication function of NEC Storage.

Backup procedures

1. Execute replication (management server)
Execute replication from NEC Storage Manager, and synchronize MV and RV of the following items;
 - OS images of VMware ESX
 - Virtual machine images on VMware ESX
 - Data area of virtual machine
2. Stop of VMware ESX (VMware ESX)
Stop VMware ESX which uses MV, a backup target.
3. Execute separation (management server)
Execute separation from NEC Storage Manager to separate MV and RV of the following items;
 - OS images of VMware ESX
 - Virtual machine images on VMware ESX
 - Data area of virtual machine
4. Restart VMware ESX (VMware ESX)
Boot VMware ESX stopped in the procedure 2 and restart the operation.

Restoration procedures

1. Stop of VMware ESX (VMware ESX)
Stop VMware ESX which uses MV, a backup target.
2. Reconfiguration of MV (management server)
To restore MV from physical failure, perform MV reconfiguration according to the following procedures.
 1. AccessControl setting of MV (access forbidden)
 2. LD reconfiguration
 3. Execute resetting of pairing
 4. AccessControl of reconfigured MV (access permission)
3. Execution of restoration (management server)
Execute restoration from NEC Storage Manager and restore RV data to MV.
4. Restart VMware ESX (VMware ESX)
Boot VMware ESX stopped in the procedure 1 and restart the operation.

Backup/restoration procedures of virtual machine image (VMFS)

When performing backup/restoration of virtual machine images by using data replication function of NEC Storage.

Backup procedures

1. Execute replication (management server)
Execute replication from NEC Storage Manager and synchronize virtual machine images with MV and RV of RDM.
2. Stop of virtual machine (VMware ESX)
Stop all the virtual machines which use backup target MV from vCenter Server (vSphere client) or service console.
3. Execute separation (management server)
Separate MV and RV from VMFS, and MV and RV from RDM respectively.
4. Restart virtual machine (VMware ESX)
Start the virtual machine stopped from vCenter Server (vSphere client) or service console in procedure 2 to restart the operation.

Restoration procedures

1. Stop and deletion of virtual machine (VMware ESX)
Stop all the virtual machines which use restoration target MV from vCenter Server (vSphere client) or service console and delete virtual machine (delete inventory).
2. Reconfiguration of MV (management server)
To restore MV from physical failure, perform MV reconfiguration according to the following procedures.
 1. AccessControl setting of MV (access forbidden)
 2. LD reconfiguration
 3. Execute resetting of pairing
 4. AccessControl of reconfigured MV (access permission)
3. Execution of restoration (management server)
Execute restoration from NEC Storage Manager and restore RV data to MV.
4. Recognition of restored VMFS (VMware ESX)
Rescan [storage adaptor] from vCenter Server (vSphere client) or service console.
5. Restart virtual machine (VMware ESX)
Boot the virtual machine stopped in the procedure 1 and restart the operation.

7.1.4 Notes on backup/restoration of OS images of Windows server by DDR function

Notes on the following points for backup of Windows OS image server by using DDR (data replication) function of NEC Storage.

Logical disk format

If the format of the logical disk is "WN", Windows disk signatures of master volume (MV) and replication volume (RV) differ each other.

Therefore, if the logical disk is restored from RV, OS cannot be booted.

The format of the logical disk to store Windows OS must be set as "WG" regardless of the actual disk format (MBR, GPT) used from the server.

Supplementary notes:

- When performing backup OS images on NEC Storage connected via FC by using ControlCommand from management server, "GPTDISK=USE" needs to be added to [Check] section in operation option setting file (%SystemRoot%\%ismvol%\iSMrpl.ini) to operate logical disk in "WG" format.

Encryption of BitLocker drive

When using OS image encrypted by BitLocker (MV, RV created from MV as backup, or MV restored from RV), the operations differ as described below depending on the server (whether or not to use the one on which the encryption is performed or on another).

When using the server on which encryption is performed

- Boot OS: available
- Disable/enable BitLocker encryption: available
- BitLocker decryption: available

When using on the other server

- Boot OS:
Recovery keys must be entered to boot.
(The following operation refers to the situation when the server is booted by entering the recovery keys.)
- Disable/enable BitLocker encryption:
Disable/enable BitLocker encryption can be disabled, however, cannot be enabled once disabled.
- BitLocker decryption:
Available

8 Precautions and limitations

This chapter explains precautions and limitations regarding configuration of SAN Boot system on Express server.

8.1 Server

8.1.1 About mixed attaching of FC controller cards

FC controllers with mixed part numbers cannot be loaded in the same server (only FC controllers with the same part number can be installed in the same server).

8.1.2 Multi-path

It is not allowed to assign the same logical system disk to multiple servers (multiple servers cannot share the same system as OS disk).

8.1.3 About BIOS version up-to-date

When using R120f-1M / R120f-2M in FC SAN Boot environment, make sure to update BIOS version to 5.0.4015 or later.

BIOS update may be necessary depending on the OS type. It is strongly recommended to update to the latest version released.

For the update procedure, refer to the release note on download page for BIOS of each device and "Readme.txt" included in the BIOS update module downloaded.

Refer to the following website to confirm if there is any new BIOS update module released.

R120f-2M / R120f-1M

Express5800 series PC (IA) server support information

<http://support.express.nec.co.jp/pcserver/> (JP only)

→ 100 series (standard servers: tower/rack): Select 110(120/140/180).

→ Select model

→ Select "download" and confirm if there is any new BIOS update module released.

E120f-M

Express5800 series PC (IA) server support information

<http://support.express.nec.co.jp/pcserver/> (JP only)

→ Select ECO CRMTER/i model (server for data center).

→ Select model

→ Select "download" and confirm if there is any new BIOS update module release.

8.1.4 FW version of FC controller

In case the FW version of N8190-157A/158A is 1.1.55.1, FW must be updated to the latest.

Refer to [9.2 Confirmation of FW version for FC controller] to confirm FW version of N8190-157A/158A. In case the FW version is 1.1.55.1, obtain FW update module to update FW. For the update procedure, refer to the release note on download page and “Readme.txt” included in the BIOS update module downloaded.

Obtain the latest FW update module for N8190-157A/158A from the following website.

Express5800 series PC (IA) server support information

<http://support.express.nec.co.jp/pcserver/> (JP only)

→ Search from model number/name.

→ Enter product’s model number (N8190-157A/158A) and click “Search from model number”.

→ Select target model number from search result.

8.1.5 Attaching limitation of internal option parts

The configuration of which HDD/SSD and RAID controller are attached on SAN Boot target server is unsupported.

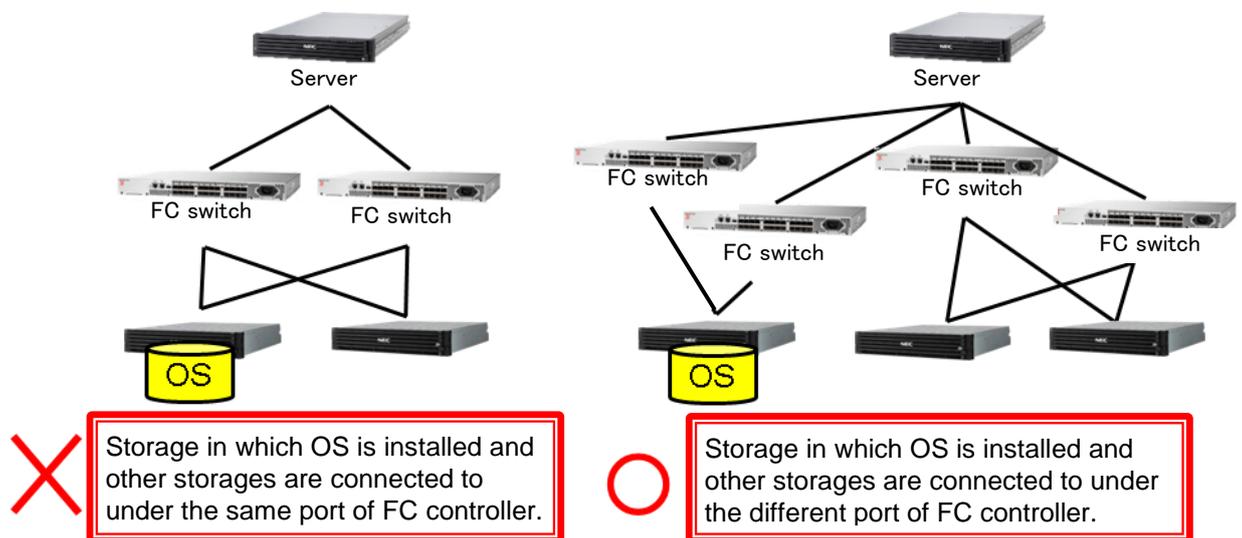
8.1.6 Setting of system BIOS

Disable the parameter of the devices under [SATA AHCI] or [SATA RAID] on system BIOS setting screen.

8.1.7 Connection of multiple storages

For the port which belongs to the FC controller using for FC SAN boot, it is not allow to connect the port to multiple storage devices via FC switch devices. Use different port to connect to multiple storage devices.

It is available to use a port of N8190-158A/160 for booting FC SAN meanwhile another port for access to multiple storage devices.



8.1.8 Booting from SAN by using 16G FC controller (N8190-157A/158A)

When booting the OS besides VMware from FC SAN by using 16G FC controller (N8190-157A/158A), connect FC controller to FC switch (WB6500).

Direct connection to storage is not supported.

8.2 Storage

8.2.1 Storage performance and number of stored OS

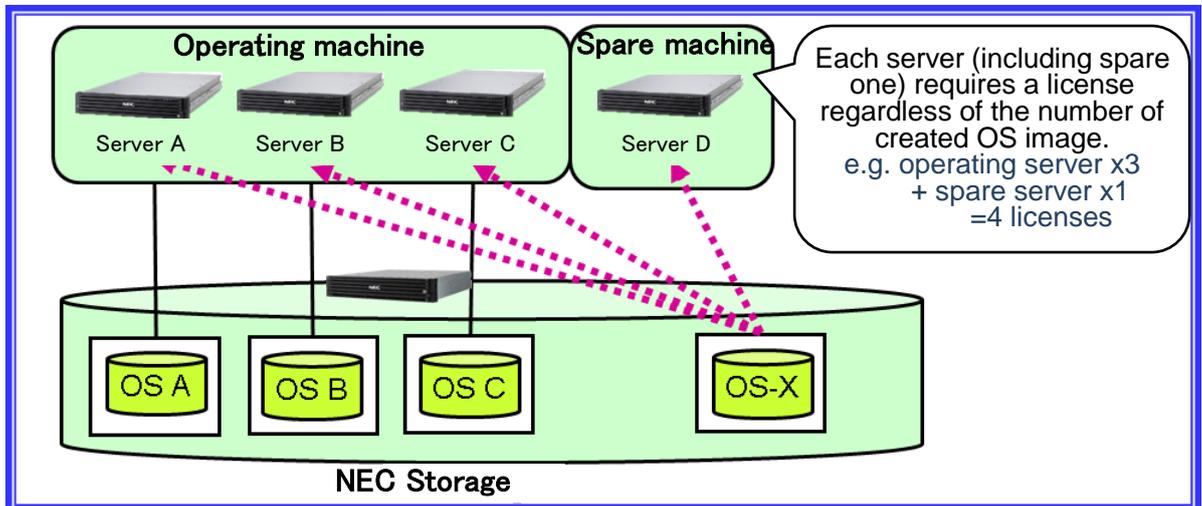
Regarding quantity of OS located per storage device, estimate it by considering the performance of storages in advance on the responsibility of a staff in charge of configuration division.

8.3 OS

8.3.1 Quantity of OS license needed

Windows Server OS

About the quantity of Windows Server OS license, the same quantity for instance (servers) is required.



Even in the configuration which automatically uses OS-X when failure occurs as above picture, four licenses are required in total; for the server in which OS is executed, including spare machine.

For the definition of instance, refer to the software license agreement of each Windows Server OS.

8.3.2 OS memory dump

If a failure occurs in OS boot path (including redundancy) at server booting, memory dump may not be collected normally even after the path normalized (including during OS booting).

Windows Server 2008 R2 / Windows Server 2012 / Windows Server 2012 R2

The path used to acquire dump (dump path) is the one booted by Ossfify the dump path disappears with PnP due to some reason such as path fault, it will be switched to an alternative path. However, if FC path fault occurs during collecting dump, dump collection is not available. In the configuration in which multiple paths to storage exist for each FC port, dump may not be collected when path fault occurs. To collect dump securely, only a path each must be configured from FC port in the server side to the storage. [Redundancy path connection at OS installation](#)

If the path between the server and NEC Storage is duplicated when installing Windows or Linux, OS installation will fail. Cancel the redundancy configuration and install. When installing VMware ESX, redundancy path configuration causes no problem.

8.4 SPM

8.4.1 Version of NEC Storage PathManager

The version of NEC Storage PathManager corresponding to the contents of this document is as follows (as of June 2016).

- NEC Storage PathManager for Windows : Ver. 6.4
- NEC Storage PathManager for Linux : Ver. 6.3
- NEC Storage PathManager for VMware : Ver. 2.2

8.4.2 Change of the boot device in which SPM is installed

When changing boot device by access control of storage side in Windows in which SPM is installed, make sure to turn off the server in advance. If performed when the server is on, STOP error occurs in OS.

When OS device is recognized as a new device such as when redundancy path configuration has been changed, OS may require server reboot.

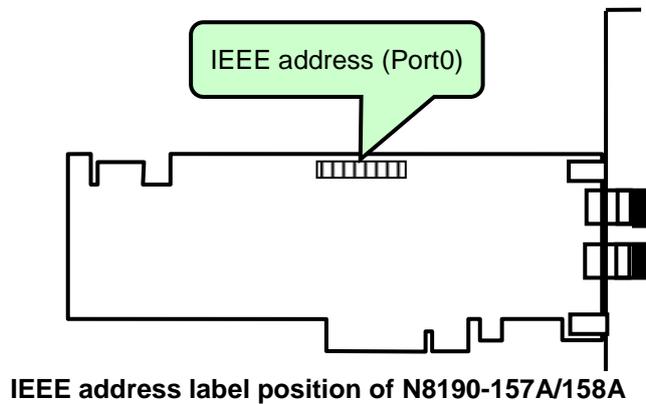
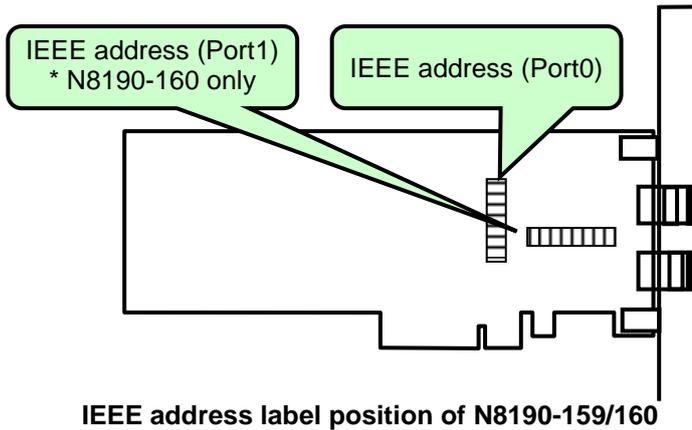
Start the operation after confirming the change of the path configuration and that the OS device is correctly recognized.

9 Appendix

9.1 Confirmation method of FC controller WWP/WWNN

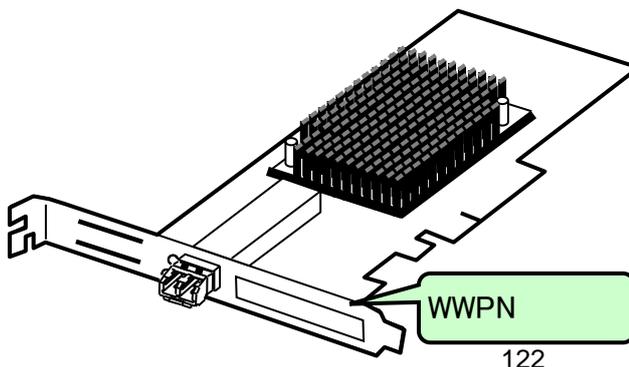
9.1.1 Confirmation from IEEE address label

To FC controller, a label to indicate IEEE address of FC port is attached (to N8190-160, labels of 2 ports are attached). This IEEE address of WWP/WWNN is a 16-digit number, and the first 4 digits number of WWP is "1000", WWNN is "2000". In case of N8190-158A, the WWP/WWNN value of port0 (hexadecimal) plus 1 is that of port 1.



9.1.2 Confirmation from WWP address label (N8190 157A/159 only)

For N8190-157A/159, WWP address can be confirmed from the WWP label attached to the bracket. When the first 4 digits "1000" of WWP address are replaced with "2000", it becomes WWNN address.



9.1.3 Confirmation from BIOS menu

If FC controller is installed, WWPNN/WWNN can be confirmed from BIOS menu by setting up server BIOS. For the setup procedures of server BIOS, refer to section 4.2.

Legacy BIOS mode

- (1) When the following message is displayed at server boot, press <Alt> and <E> or <Ctrl> and <E> simultaneously to boot BIOS configuration utility of FC controller.

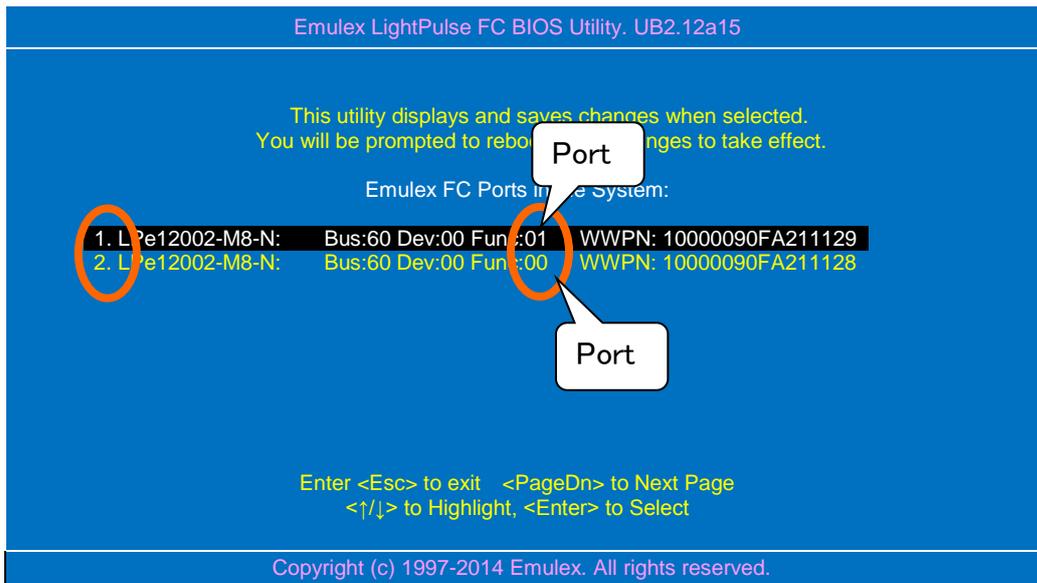
```
Emulex LightPulse FC BIOS, Version 2.12a15
Copyright (c) 1997-2014 Emulex. All rights reserved.

Press <Alt E> or <Ctrl E> to enter Emulex BIOS configuration
utility. Press <s> to skip Emulex BIOS
```

- (2) The following message appears when key depressions are recognized, then the menu will be displayed.

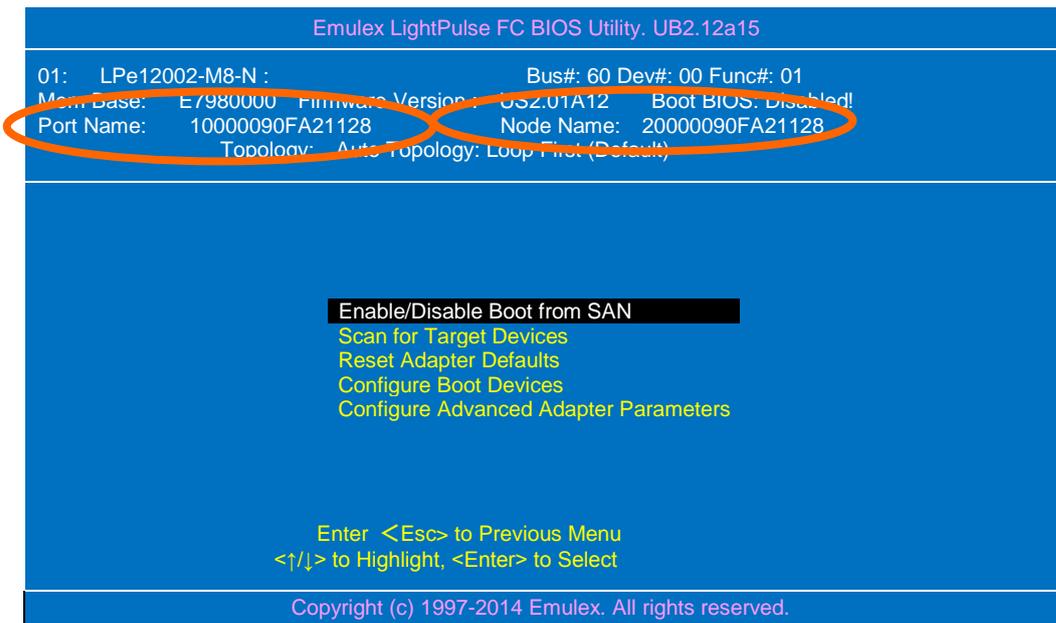
```
Emulex FC BIOS configuration utility selected
Bringing the Link up, Please wait...
```

- (3) When the list of ports of FC controllers installed in the server appears, enter FC controller number to confirm WWPN /WWNN and the detailed information will be displayed.



* In case of N8190-158A/160, ports in the following condition are displayed: which have the same Bus and Dev; and which Func are 00 and 01. Func [00] corresponds to Port0 of FC controller, and Func [01] to Port1. The displaying order of Port0 and Port1 depends on server.

- (4) The value shown next to [port name] is WWPN of FC controller port, and the one next to "Node Name:" is WWNN. * The last 12 digit of WWPN and WWNN of the same port are the same numbers.



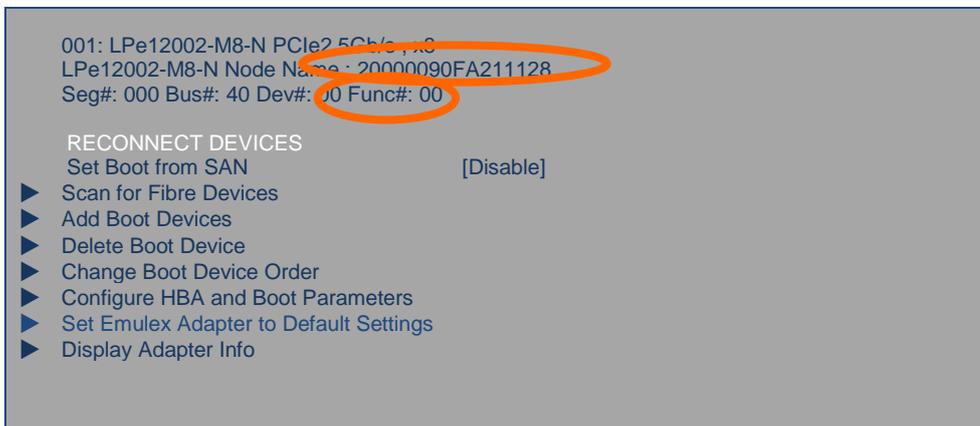
- (5) Press <ESC> key to return to [(3)] screen, and confirm WWPN/WWNN of other ports.

UEFI mode

- (1) Press <F2> key at server booting and display the system setup screen.
- (2) After starting BIOS setup utility, select [UEFI Driver Configuration] in the following location.
[BIOS setting screen]
→ [Advanced]
[UEFI Driver Configuration]
- (3) When the list of devices (UEFI drivers recognizable from the server are installed in) is displayed, select FC port for confirmation. The correspondence table of model number and display name is shown below.

Model number	Display name
N8190-157A	LPe16000B
N8190-158A	LPe16002B
N8190-159	LPe1250
N8190-160	LPe12002

- (4) WWNN is displayed in Node Name of the port selected in the following screen. By replacing "2000" in the first 4 digits of the value with "1000", it becomes WWPN. In case of N8190-158A/160, [Func#] 00 signifies Port 0, and 01 signifies Port 1.



- (5) Press <ESC> key to return to the list of UEFI devices, and confirm WWPN/WWNN of other ports.
- (6) When WWPN/WWNN of all the ports is confirmed, press <Esc> to return to the list of UEFI devices, select [Save & Exit] → [Save Changes and Power Off] in BIOS Setup Utility to power off.

9.2 Confirmation method of FW version of FC controller

FW version of FC controller can be confirmed from BIOS menu. Perform BIOS settings in advance according to section 4.2.

9.2.1 Legacy BIOS mode

- (1) When the following message is displayed at server boot, press <Alt> and <E> or <Ctrl> and <E> simultaneously to boot BIOS configuration utility of FC controller.

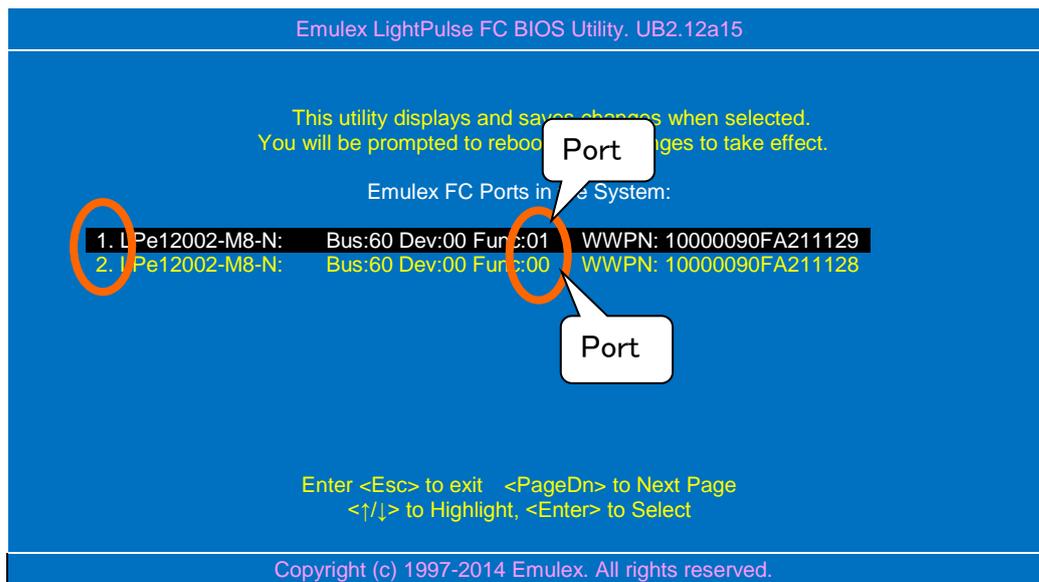
```
Emulex LightPulse FC BIOS, Version 2.12a15
Copyright (c) 1997-2014 Emulex. All rights reserved.

Press <Alt E> or <Ctrl E> to enter Emulex BIOS configuration
utility. Press <s> to skip Emulex BIOS
```

- (2) The following message appears when key depressions are recognized, and then the menu will be displayed.

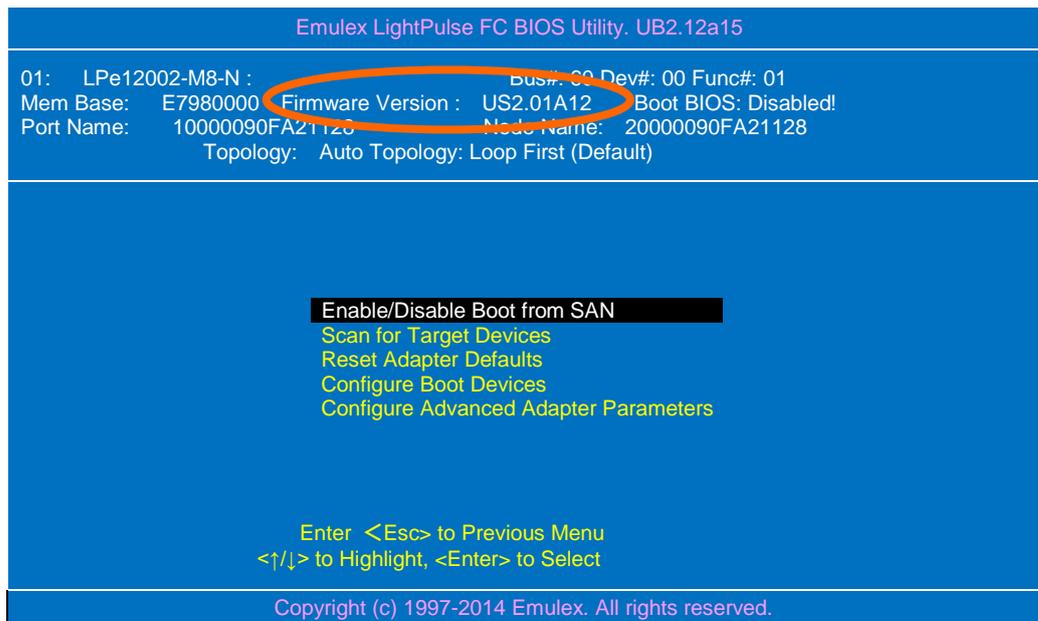
```
Emulex FC BIOS configuration utility selected
Bringing the Link up, Please wait...
```

- (3) When the list of ports of FC controllers installed in the server appears, enter FC controller number to confirm FW version and the detailed information will be displayed.



* In case of N8190-158A/160, ports which Bus and Dev are the same, and Func is 00 and 01 are displayed. Func [00] corresponds to Port0 of FC controller, and Func [01] to Port1. The displaying order of Port0 and Port1 depends on server.

- (4) The value displayed next to [Firmware Version] is FW version.



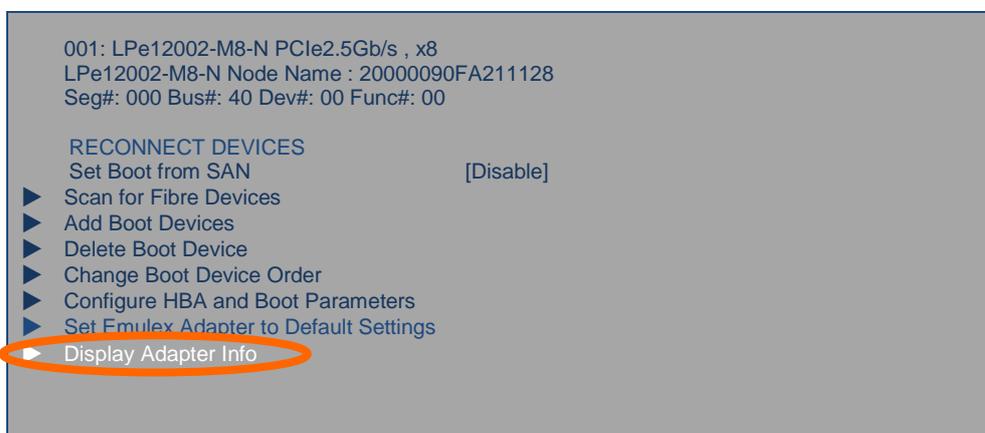
- (5) Press <ESC> key to return to [(3)] screen, and confirm WWPAN/WWNN of other ports.

9.2.2 UEFI mode

- (1) Press <F2> key at server booting and display the system setup screen.
- (2) After starting BIOS setup utility, select [UEFI Driver Configuration] in the following location.
[BIOS setting screen]
→ [Advanced]
[UEFI Driver Configuration]
- (3) When the list of devices (UEFI drivers recognizable from the server are installed in) is displayed, select FC port for confirmation. The correspondence table of model number and display name is shown below.

Model number	Display name
N8190-157A	LPe16000B
N8190-158A	LPe16002B
N8190-159	LPe1250
N8190-160	LPe12002

(4) Select [Display Adapter Info] and press <Enter> to display the port information.



(5) The value displayed right of [Firmware] or [FW] is FW version.



(6) Press <ESC> twice to return to the list of UEFI devices, and confirm FW version of other ports.

(7) When all the FW version is confirmed, press <Esc> to return to the list of UEFI devices, and in BIOS Setup Utility select [Save & Exit] → [Save Changes and Power Off] to power off.