FUJITSU

FUJITSU Storage ETERNUS Multipath Driver V2 (for Linux) Installation Information

July 2015

Contents

Correspondence of ETERNUS Multipath Driver 's Version Level and Patch

It is possible to update a version Level of ETERNUS Multipath Driver (hereafter referred to as "Multipath Driver") to a later one by applying a patch.

Example: When applying the patch T00812-20 to V2.0L10, the function is equal to V2.0L20.

The correspondence of version levels and patches is as follows.

Multipath Driver's Version Level and Patch correspondence table

Version Level	Patch
V2.0L01	none
V2.0L02	none
V2.0L03	T00812-04
V2.0L10	T00812-07
V2.0L11	T00812-08
V2.0L12	T00812-12
V2.0L13	T00812-17
V2.0L14	T00812-19
V2.0L20	T00812-20
V2.0L21	T00812-22
V2.0L22	T00812-23
V2.0L23	none
V2.0L24	T00812-27
V2.0L25	T00812-28
V2.0L26	T00812-29
V2.0L27	T00812-30
the latest patch	T00812-30

Supported Operating System (OS) Versions

The following tables show the version of Linux kernels supported by the Multipath Driver.
If you are going to install Multipath Driver newly, please install Multipath Driver product, don't reboot the system, and then apply the latest Multipath Driver patch. After that, please reboot the system.

Multipath Driver for Red Hat Enterprise Linux v.4

Operating System	Linux Kernel Versions	Version Level
Red Hat Enterprise Linux AS v.4 *1	2.6.9-5.0.3.EL *4	V2.0L01 or later
Red Hat Enterprise Linux AS v.4 Update 1 *2 Red Hat Enterprise Linux ES v.4 Update 1 *2	2.6.9-11.EL *4	V2.0L02 or later
Red Hat Enterprise Linux AS v.4 Update 2 *3 Red Hat Enterprise Linux ES v.4 Update 2 *2	2.6.9-22.EL *4	V2.0L03 or later
Red Hat Enterprise Linux AS v.4 Update 3 *2 Red Hat Enterprise Linux ES v.4 Update 3 *2	2.6.9-34.EL *4	V2.0L03 or later
Red Hat Enterprise Linux AS v.4 Update 4 *3 Red Hat Enterprise Linux ES v.4 Update 4 *2	2.6.9-42.EL *4	V2.0L10 or later
Red Hat Enterprise Linux AS 4.5 *3 Red Hat Enterprise Linux ES 4.5 *2	2.6.9-55.EL	V2.0L11 or later
Red Hat Enterprise Linux AS 4.7 *3 Red Hat Enterprise Linux ES 4.7 *2	2.6.9-67.EL	V2.0L12 or later
Red Hat Enterprise Linux AS 4.8 *3 Red Hat Enterprise Linux ES 4.8 *2	2.6.9-78.EL *5	V2.0L13 or later
Red Hat Enterprise Linux AS 4.9 *3 Red Hat Enterprise Linux ES 4.9 *2	2.6.9-89.EL *5	V2.0L13 or later
Red Hat Enterprise Linux AS 4.10 *3 Red Hat Enterprise Linux ES 4.10 *2	2.6.9-100.EL *5	V2.0L21 or later

*1 Only Itanium platform.
*2 Only x86 or EM64T platform.
*3 Only x86, EM64T or Itanium platform.
*4 hugemem kernel and largesmp kernel are not supported.
*5 errata kernel is supported.

Multipath Driver for Red Hat Enterprise Linux 5

Operating System *1	Linux Kernel Versions	Version Level
Red Hat Enterprise Linux 5	2.6.18-8.el5	V2.0L11 or later
Red Hat Enterprise Linux 5.1	2.6.18-53.el5	V2.0L12 or later
	2.6.18-53.1.21.el5	V2.0L13 or later
Red Hat Enterprise Linux 5.2	2.6.18-92.el5 *2*3	V2.0L13 or later
Red Hat Enterprise Linux 5.3	2.6.18-128.el5 *3	V2.0L13 or later
Red Hat Enterprise Linux 5.4	2.6.18-164.el5 *3	V2.0L14 or later
Red Hat Enterprise Linux 5.5	2.6.18-194.el5 *3*4	V2.0L20 or later
Red Hat Enterprise Linux 5.6	2.6.18-238.el5 *3	V2.0L21 or later
Red Hat Enterprise Linux 5.7	2.6.18-274.el5 *3	V2.0L22 or later
Red Hat Enterprise Linux 5.8	2.6.18-308.el5 *3	V2.0L22 or later

Operating System *1	Linux Kernel Versions	Version Level
Red Hat Enterprise Linux 5.9	2.6.18-348.el5 *3	V2.0L22 or later
Red Hat Enterprise Linux 5.10	2.6.18-371.el5 *3	V2.0L22 or later
Red Hat Enterprise Linux 5.11	2.6.18-398.el5 *3	V2.0L22 or later

*1 Only x86, Intel64 or Intel Itanium platform.
*2 The kernel version 2.6.18-92.1.18.el5 or later is needed to use Multipath Driver on the server which has a SATA interface HDD.
*3 errata kernel is supported.
*4 Please refer to " Recovery from failure of update to Red Hat Enterprise Linux 5.5" , when a server cannot boot after updating OS to Red Hat Enterprise Linux 5.5. This happens when using V2.0L14 or earlier that doesn't support Red Hat Enterprise Linux 5.5.

Multipath Driver for Red Hat Enterprise Linux 6

Operating System *1	Linux Kernel Versions *2	Version Level
Red Hat Enterprise Linux 6	2.6.32-71.el6	V2.0L21 or later
Red Hat Enterprise Linux 6.1	2.6.32-131.0.15.el6	V2.0L22 or later
Red Hat Enterprise Linux 6.2 (for x86)	2.6.32-220.4.1.el6 *3	V2.0L22 or later
Red Hat Enterprise Linux 6.2 (for Intel64)	2.6.32-220.el6	
Red Hat Enterprise Linux 6.3	2.6.32-279.el6	V2.0L22 or later
Red Hat Enterprise Linux 6.4	2.6.32-358.el6	V2.0L22 or later
Red Hat Enterprise Linux 6.5	2.6.32-431.el6	V2.0L22 or later
Red Hat Enterprise Linux 6.6	2.6.32-504.el6	V2.0L22 or later

*1 Only x86 or Intel64 platform.
*2 errata kernel is supported.
*3 It is necessary to apply the Advisory ID RHSA-2012:0052-01.

Multipath Driver for Red Hat Enterprise Linux 7

Operating System *1	Linux Kernel Versions *2	Version Level
Red Hat Enterprise Linux 7	3.10.0-123.el7	V2.0L26 or later
Red Hat Enterprise Linux 7.1	3.10.0-229.el7	V2.0L27 or later

*1 Only Intel64 platform.
*2 errata kernel is supported.

Multipath Driver for SUSE Linux Enterprise Server 9

Operating System *1	Linux Kernel Versions	Version Level
SUSE Linux Enterprise Server 9 for x86 SUSE Linux Enterprise Server 9 for EM64T SUSE Linux Enterprise Server 9 for Itanium Processor Family	2.6.5-7.191 (SP2)	V2.0L10 or later
	2.6.5-7.244 (SP3)	V2.0L03 or later
	2.6.5-7.308 (SP4)	V2.0L12 or later

*1 gcc, kernel-source and make package must be installed on the server.

Multipath Driver for SUSE Linux Enterprise Server 10

Operating System *1	Linux Kernel Versions	Version Level
SUSE Linux Enterprise Server 10 for x86 SUSE Linux Enterprise Server 10 for EM64T SUSE Linux Enterprise Server 10 for Itanium Processor Family	2.6.16.46-0.12 (SP1)	V2.0L12 or later
	2.6.16.60-0.21 (SP2)	V2.0L13 or later
	2.6.16.60-0.54.5(SP3)	V2.0L20 or later
	2.6.16.60-0.85.1(SP4)	V2.0L22 or later

*1 gcc, kernel-source and make package must be installed on the server.

Multipath Driver for SUSE Linux Enterprise Server 11

Operating System *1	Linux Kernel Versions	Version Level
SUSE Linux Enterprise Server 11 for x86 SUSE Linux Enterprise Server 11 for EM64T	2.6.32.12-0.7 (SP1)	V2.0L21 or later
	3.0.13-0.27 (SP2)	V2.0L23 or later
	3.0.76-0.11 (SP3)	V2.0L25 or later

*1 gcc, kernel-source, make and kernel-default-devel (or kernel-pae-devel) package must be installed on the server.

Multipath Driver for SUSE Linux Enterprise Server 12

Operating System *1	Linux Kernel Versions	Version Level
SUSE Linux Enterprise Server 12 for EM64T	3.12.28-4	V2.0L27 or later

*1 gcc, kernel-source, make, kernel-default-devel, linux-glibc-devel and rpm-build packages must be installed on the server.

Restrictions and Resolution schedule

The Multipath Driver has following restrictions on each OS.

Common Restrictions for all OS

Restrictions	Resolution schedule
When using iSCSI or Dual Port SAS card to connect storage systems, do not use iompadm change adapter and iompadm restart adapter commands. Use iompadm change controller and iompadm restart controller commands instead.	TBD
Even if a cable is connected after a server is started when iscsi-initiator-utils or open-iscsi is used, LUs are not automatically recognized. Please follow the procedure to recognize LUs. ・Get the information of recognized node by "iscsiadm -m node" command. ("IP address:Port number Target name" is displayed.) ・Get the information of connection by "iscsiadm -m node" command. ("IP address:Port number Target name" is displayed.) ・The unrecognized target is confirmed from the above result. Please run the following command. "iscsiadm -m node -T <unrecognized target name> -p IP address:Port number --login"	TBD

Red Hat Enterprise Linux AS v.4, Red Hat Enterprise Linux ES v.4

Restrictions	Resolution schedule
The hot deletion of LUs, paths and storage systems cannot be executed. The hot addition of paths and storage systems is not supported.	TBD
The hot addition of LUs using PG-FCD101, PG-FCD102,or QLogic FC cards cannot be executed.	TBD
The maximum number of LU which can be assigned to a LU Mapping and an Affinity Group is 255 when using the mptsas driver.	RHEL4.8 *

Red Hat Enterprise Linux 5

Restrictions	Resolution schedule
Don't run the "service iscsi stop" command and "service iscsi restart" command when using the iscsi-initiator-utils. Please run the "mpdconfig -d" command when logging out from storage systems by the iscsiadm command.	TBD
When iSCSI interface is used to connect storage systems, FC interface, FCoE interfasce and SAS interface must not be used to connect storage systems.	TBD
The iSCSI boot environment is not supported, when LVM is used.	TBD

Red Hat Enterprise Linux 6, Red Hat Enterprise Linux 7

Restrictions	Resolution schedule
In the iSCSI boot environment, do not run the dracut command with “-hostonly” option to make an initramfs file.	TBD

SUSE Linux Enterprise Server 9

Restrictions	Resolution schedule
The hot deletion of LUs, paths and storage systems cannot be executed. The hot addition of paths and storage systems is not supported.	TBD
The hot addition of LUs using PG-FCD101, PG-FCD102 or QLogic FC cards cannot be executed.	TBD
The PCI Hot Plug (PHP) of a HBA under control of the Multipath Driver is not supported.	V2.0L11
Hot addition of LUs using iSCSI initiator on SUSE Linux Enterprise Server 9 Service Pack 3.	SLES9 SP4
Don't run the "service iscsi stop" command and "service iscsi restart" command when using the iSCSI initiator.	TBD
When iSCSI interface is used to connect storage systems, FC interface must not be used to connect storage systems.	TBD
The iSCSI boot environment is not supported.	TBD

SUSE Linux Enterprise Server 10

Restrictions	Resolution schedule
When using the open-iscsi on SUSE Linux Enterprise Server 10 Service Pack 2, download the 2.0.707-0.47 or later version of the open-iscsi from the web site of Novell.	SLES10 SP3
Don't run the "service iscsi stop" command and "service iscsi restart" command when using the open-iscsi. Please run the "mpdconfig -d" command when logging out from storage systems by the iscsiadm command.	TBD
When iSCSI interface is used to connect storage systems, FC interface, FCoE interface and SAS interface must not be used to connect storage systems.	TBD
When kernel-kdumppae is used as a kdump kernel on SUSE Linux Enterprise Server 10 Service Pack 3 and a storage system is a dump output device, only one path is used as an access path.	V2.0L21
The iSCSI boot environment is not supported.	TBD

SUSE Linux Enterprise Server 11, SUSE Linux Enterprise Server 12

Restrictions	Resolution schedule
The iSCSI boot environment is not supported.	TBD
The EFI boot environment is not supported.	V2.0L23

Supported Storage Systems

Multipath Driver supports the following storage systems.

ETERNUS DX60
ETERNUS DX80
ETERNUS DX90
ETERNUS DX60 S2
ETERNUS DX80 S2
ETERNUS DX90 S2
ETERNUS DX60 S3
ETERNUS DX100 S3
ETERNUS DX200 S3
ETERNUS DX200F
ETERNUS DX400 series
ETERNUS DX400 S2 series
ETERNUS DX500 S3
ETERNUS DX600 S3
ETERNUS DX8000 series
ETERNUS DX8000 S2 series
ETERNUS DX8700 S3
ETERNUS DX8900 S3
ETERNUS2000
ETERNUS4000
ETERNUS8000
ETERNUS3000
ETERNUS6000
ETERNUS GR series

The version of Multipath Driver which supports the storage system is as below.

ETERNUS DX60, ETERNUS DX80, ETERNUS DX90

Storage System	Version Level
ETERNUS DX60 *1 ETERNUS DX80 *1 ETERNUS DX90	V2.0L14 or later

* Only FC Interface is supported on V2.0L13 or later.

ETERNUS DX60 S2, ETERNUS DX80 S2, ETERNUS DX90 S2

Storage System	Version Level
ETERNUS DX60 S2 ETERNUS DX80 S2 ETERNUS DX90 S2	V2.0L22 or later

ETERNUS DX60 S3, ETERNUS DX100 S3, ETERNUS DX200 S3, ETERNUS DX200F

Storage System	Version Level
ETERNUS DX60 S3 ETERNUS DX100 S3 ETERNUS DX200 S3 ETERNUS DX200F	V2.0L25 or later

ETERNUS DX400 series

Storage System	Version Level
ETERNUS DX400 series	V2.0L14 or later

ETERNUS DX400 S2 series

Storage System	Version Level
ETERNUS DX400 S2 series	V2.0L22 or later

ETERNUS DX500 S3, ETERNUS DX600 S3

Storage System	Version Level
ETERNUS DX500 S3 ETERNUS DX600 S3	V2.0L25 or later

ETERNUS DX8000 series

Storage System	Version Level
ETERNUS DX8000 series	V2.0L14 or later

ETERNUS DX8000 S2 series

Storage System	Version Level
ETERNUS DX8000 S2 series	V2.0L22 or later

ETERNUS DX8700 S3, ETERNUS DX8900 S3

Storage System	Version Level
ETERNUS DX8700 S3 ETERNUS DX8900 S3	V2.0L27 or later

ETERNUS2000

Storage System	Version Level
ETERNUS2000	V2.0L13 or later

ETERNUS4000

Storage System	Version Level
ETERNUS4000 model 80, 100, 300, 500	V2.0L03 or later
ETERNUS4000 model 400, 600	V2.0L13 or later

ETERNUS8000

Storage System	Version Level
ETERNUS8000 model 700, 900, 1100, 2100	V2.0L03 or later
ETERNUS8000 model 800, 1200, 2200	V2.0L13 or later

ETERNUS3000

Storage System	Version Level
ETERNUS3000	V2.0L01 or later

ETERNUS6000

Storage System	Version Level
ETERNUS6000	V2.0L01 or later

ETERNUS GR series

Storage System	Version Level
GR710 GR720 GR730 GR740 GR820 GR840	V2.0L01 or later

* Multipath Driver doesn't support GR series on Red Hat Enterprise Linux 6, Red Hat Enterprise Linux 7, SUSE Linux Enterprise Server 11 and SUSE Linux Enterprise Server 12.

Connection Requirements

The tables below shows related products supported by Multipath Driver. For combination of servers and FC cards, please contact us.

Hardware Requirements

Please use the same cards of product ID to configure a multipath access. If using the different cards of product ID, a multipath access cannot be configured. For example, the combination of a PG-FC202 and a PG-FC202 is good, but the combination of a PG-FC201 and a PG-FC202 is not good.

FC card

<table>
<tr><th>Server</th><th colspan="2">HBAs</th><th>Version Level</th></tr>
<tr><td rowspan="16">PRIMERGY</td><td>PG-FC106</td><td>S26361-F2843-E1
S26361-F2843-E201</td><td>V2.0L02 or later</td></tr>
<tr><td>PG-FC107</td><td>S26361-F3141-L10
S26361-F3141-L210</td><td rowspan="3">V2.0L03 or later</td></tr>
<tr><td>PG-FC201</td><td>S26361-F3141-E1</td></tr>
<tr><td>PG-FC202(L)</td><td>S26361-F3306-L1
S26361-F3306-L201</td></tr>
<tr><td>PG-FC203(L)
PY-FC201(L)</td><td>S26361-F3961-L1
S26361-F3961-L201</td><td rowspan="2">V2.0L13 or later</td></tr>
<tr><td>PG-FC204(L)
PY-FC202(L)</td><td>S26361-F3961-L2
S26361-F3961-L202</td></tr>
<tr><td>PG-FC205(L)
PY-FC211(L)</td><td>S26361-F3631-L1</td><td rowspan="2">V2.0L22 or later</td></tr>
<tr><td>PG-FC206(L)
PY-FC212(L)</td><td>S26361-F3631-L2</td></tr>
<tr><td>PY-FC221(L)
PYBFC221(L)</td><td>S26361-F4994-L501
S26361-F4994-E1</td><td rowspan="3">V2.0L24 or later</td></tr>
<tr><td>PY-FC222(L)
PYBFC222(L)</td><td>S26361-F4994-L502
S26361-F4994-E2</td></tr>
<tr><td>PY-FCD12
PYBFCD121
PYBFCD12</td><td>S26361-F4994-E402
S26361-F4994-L402</td></tr>
<tr><td>PG-FCD101
PG-FCD102</td><td>S26361-F3023-E1
S26361-F3023-E2
S26361-F3023-L1
S26361-F3023-L2</td><td>V2.0L02 or later</td></tr>
<tr><td>PG-FCD201</td><td>S26361-F3306-E601
S26361-F3306-L601</td><td>V2.0L11 or later</td></tr>
<tr><td>PG-FCD202
PY-FCD02</td><td>MC-FC82E</td><td>V2.0L13 or later</td></tr>
<tr><td rowspan="4">PRIMEQUEST</td><td colspan="2">MC-08FC11</td><td>V2.0L01 or later</td></tr>
<tr><td colspan="2">MC-08FC31
MC-08FC41
MC-08FC51
MC-08FC61
MC-08FC71</td><td>V2.0L03 or later</td></tr>
<tr><td colspan="2">MC-08FC81
MC-08FC91</td><td>V2.0L13 or later</td></tr>
<tr><td colspan="2">MC-0JFC11 / MC-0JFC1L
MC-0JFC21 / MC-0JFC2L</td><td>V2.0L14 or later</td></tr>
</table>

Server	HBAs	Version Level
	MC-0JFC31 / MCX0JFC31 / MC-0JFC3L MC-0JFC91 / MCX0JFC91 / MC-0JFC9L MC-0JFC71 / MCX0JFC71 / MC-0JFC7L MC-0JFC72 / MCX0JFC72 MC-0JFC81 / MCX0JFC81 / MC-0JFC8L MC-0JFC82 / MCX0JFC82 MC-0JFC41 / MCX0JFC41 / MC-0JFC4L MC-0JFCA1 / MCX0JFCA1 / MC-0JFCAL	V2.0L22 or later
3rd party PC servers	Emulex FC cards QLogic FC cards	V2.0L02 or later
	Brocade FC cards	V2.0L20 or later

SAS card

Server	HBAs	Version Level
PRIMERGY	PG-228B(L) PY-SC1Y0(L)	V2.0L13 or later
	PG-22DC(L) PG-SAD201 PY-SC2Z0 PY-SCD08	V2.0L22 or later *1
3rd party PC servers	LSI Logic 3Gb/s SAS cards	V2.0L13 or later
	LSI Logic 6Gb/s SAS cards	V2.0L22 or later *1

*1 The earlier Multipath Driver doesn't support it even if applying the latest patch.

iSCSI *1

Server	NICs	Version Level
PRIMERGY	NIC which PRIMEGY supports	V2.0L20 or later *2
3rd party PC servers	Intel Pro/1000MT etc.	

*1 Multipath Driver supports the iSCSI interface on Red Hat Enterprise Linux 5 (Update 4 or later), Red Hat Enterprise Linux 6, Red Hat Enterprise Linux 7, SUSE Linux Enterprise Server 9 (Service Pack 3 or later), SUSE Linux Enterprise Server 10 (Service Pack 2 or later), SUSE Linux Enterprise Server 11 and SUSE Linux Enterprise Server 12.

*2 The patch T00812-15 or later can support iSCSI interface only connected to ETERNUS2000 on SUSE Linux Enterprise Server 9 Service Pack 3 or later.

FCoE

Server	Card		Version Level
PRIMERGY	PG-292B(L) PY-CN202(L)	S26361-F3592-L2 S26361-F3592-L202	V2.0L20 or later
	PG-CND201	MC-CNA102E-F	
3rd party PC servers	Emulex CNA cards		

Topology

Interface	Topology	Version Level
FC	FC-AL	V2.0L01 or later
	Fabric	
SAS	Point-to-Point	V2.0L13 or later
	Fabric *1	V2.0L22 or later
iSCSI	Point-to-Point	V2.0L20 or later
	Switch	
FCoE	Switch	V2.0L20 or later

*1: Only ETERNUS DX80 S2, DX90 S2, DX100 S3 or DX200 S3.

Virtualization Switch

Model Name	Version Level
VS900 model 300	V2.0L13 or later

* When using VS900 model 300, please set the Max Throttle to 16.

Software Requirements

Clustering Software

Clustering Software	Version Level
PRIMECLUSTER	V2.0L01 or later
LifeKeeper for Linux v6 or later	V2.0L12 or later

Virtualization Environments

Virtualization Environments	Running on Host OS	Running on Guest OS
Hyper-V	N/A	Not Supported
VMware	Not Supported	Not Supported
Linux Citrix Xen	Not Supported	Not Supported
Linux Native Xen	Supported *1	Not Supported
Linux KVM	Supported *2	Not Supported

*1 Only Red Hat Enterprise Linux 5.When using Xen system on the Intel Itanium platform, Red Hat Enterprise Linux 5.1 or later is required.
*2 Only Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7.

UEFI Secure Boot

Server	Firmware	Version Level
PRIMERGY	N/A	Not Supported
PRIMEQUEST 2000 Series	BB15071 or later	V2.0L27 or later *1
PRIMEQUEST 1000 Series PRIMEQUEST 500A/500/400 Series	N/A	Not Supported
3rd party PC servers	N/A	Not Supported

*1 Multipath Driver supports the UEFI Secure Boot on Red Hat Enterprise Linux 7.1 or later.

Adapter Port Number and Connection Points

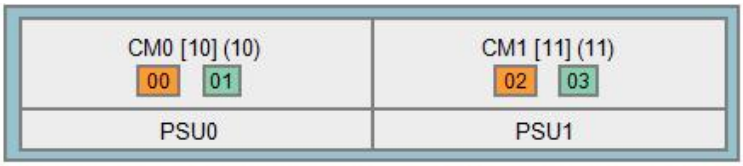
The iompadm command with “info” option shows attached disks information with adapter port number as the following example. The adapter port number means a connection point and is uniquely defined on each storage system. The figures below show the adapter port number of supported storage systems.

Example:
```
# /opt/FJSVmpd/bin/iompadm info
IOMP: vhba0
    Element:
        DISK: E6000-    000001-0000-0180 (sdf)
        PATH:
                sdf 0000:02:03.0 active "online" 0, 21, 87
                sdf 0000:02:09.0 active "online" 10, 31, c7
```

Group No. Exchange Unit No. Adapter Port No.

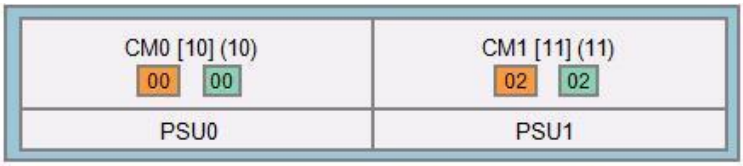
Note:
An adapter port number is different from a port number. Please refer to the User’s Guide of a storage system to check a port number. The relation between the port number and the physical position of the port depends on a storage system.

ETERNUS DX60, ETERNUS DX80 rear view (FC, iSCSI connection)



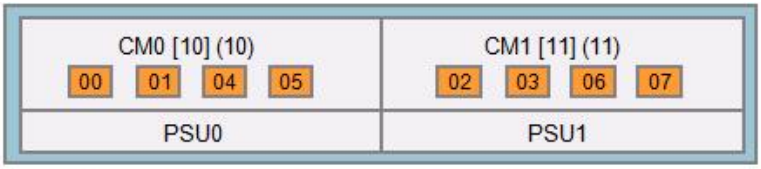
[ ] : Group No. ( ) : Exchange Unit No. : Adapter Port No. : When using 2 port CM

ETERNUS DX60, ETERNUS DX80 rear view (SAS connection)



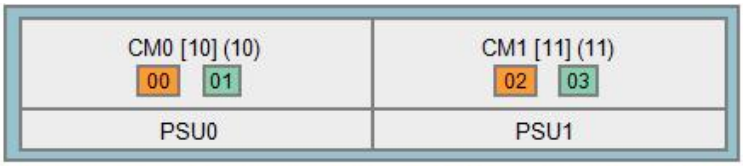
[ ] : Group No. ( ) : Exchange Unit No. : Adapter Port No. : When using 2 port CM

ETERNUS DX90 rear view



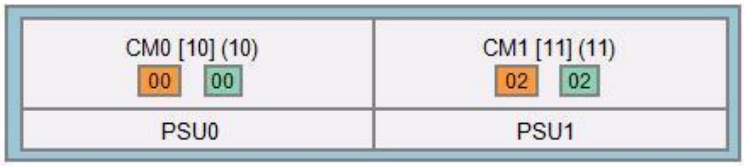
[ ] : Group No. ( ) : Exchange Unit No. : Adapter Port No.

ETERNUS DX60 S2 rear view (FC, iSCSI connection)



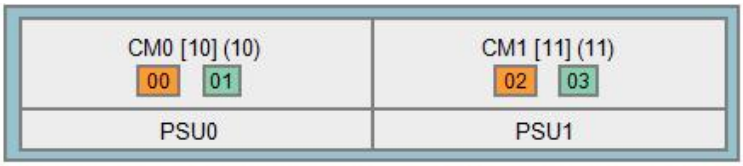
[ ] : Group No. ( ) : Exchange Unit No. : Adapter Port No. : When using 2 port CM

ETERNUS DX60 S2 rear view (SAS connection)



[ ] : Group No. ( ) : Exchange Unit No. : Adapter Port No. : When using 2 port CM

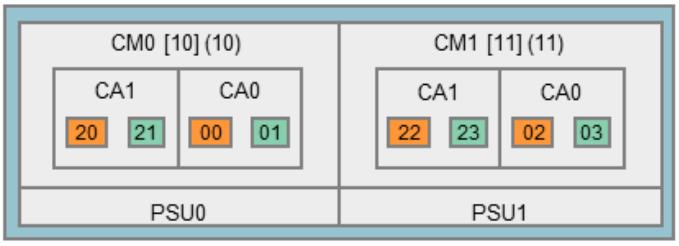
ETERNUS DX60 S3 rear view



[ ] : Group No. ( ) : Exchange Unit No. : Adapter Port No. : When using 2 port CM

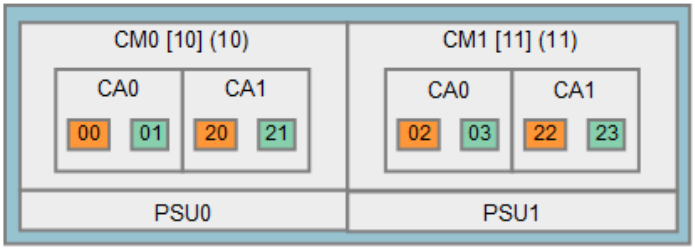
ETERNUS DX100 S3 rear view

When CA of FC is installed in the basic host interface



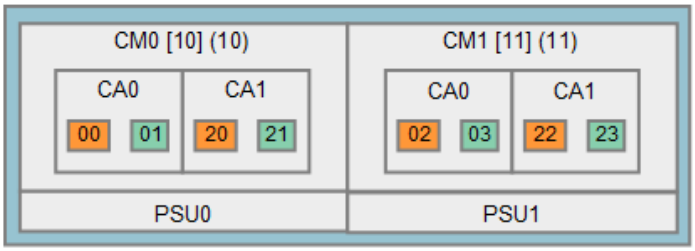
[ ]: Group No. (): Exchange unit No. : adapter Port No. : When using 2port-CA

When CA other than FC are installed in the basic host interface



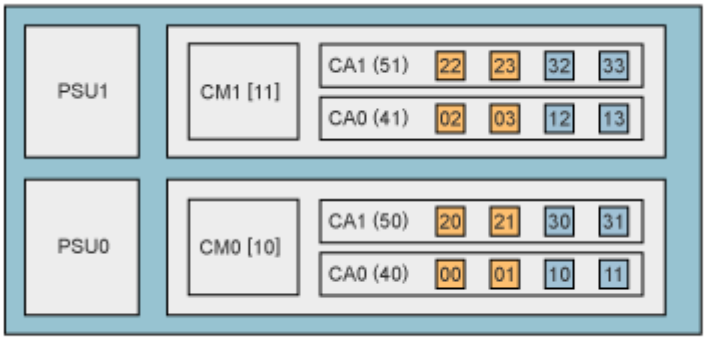
[ ]: Group No. (): Exchange unit No. : adapter Port No. : When using 2port-CA

ETERNUS DX80 S2, ETERNUS DX90 S2, ETERNUS DX200 S3, ETERNUS DX200F rear view



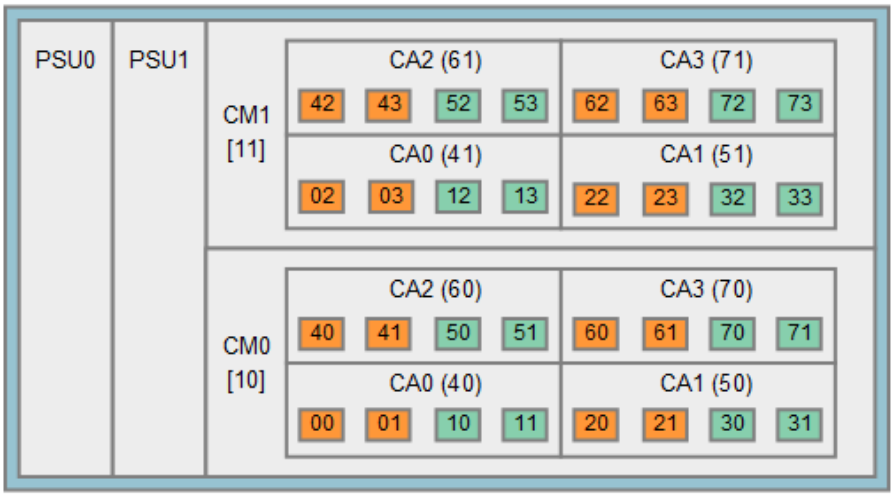
[ ]: Group No. (): Exchange unit No. : adapter Port No. : When using 2port-CA

ETERNUS DX400 series rear view



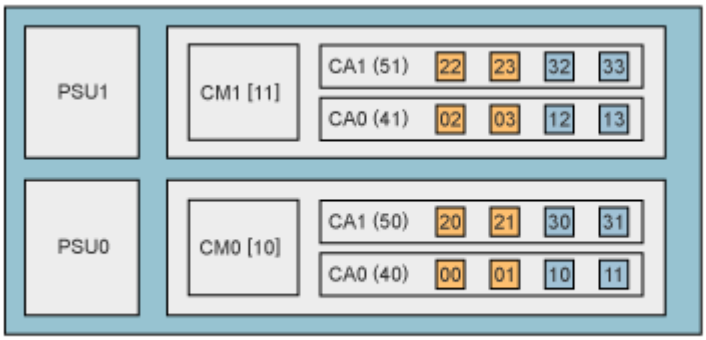
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 4port-CA

ETERNUS DX400 S2 series, ETERNUS DX500 S3, ETERNUS DX600 S3 rear view



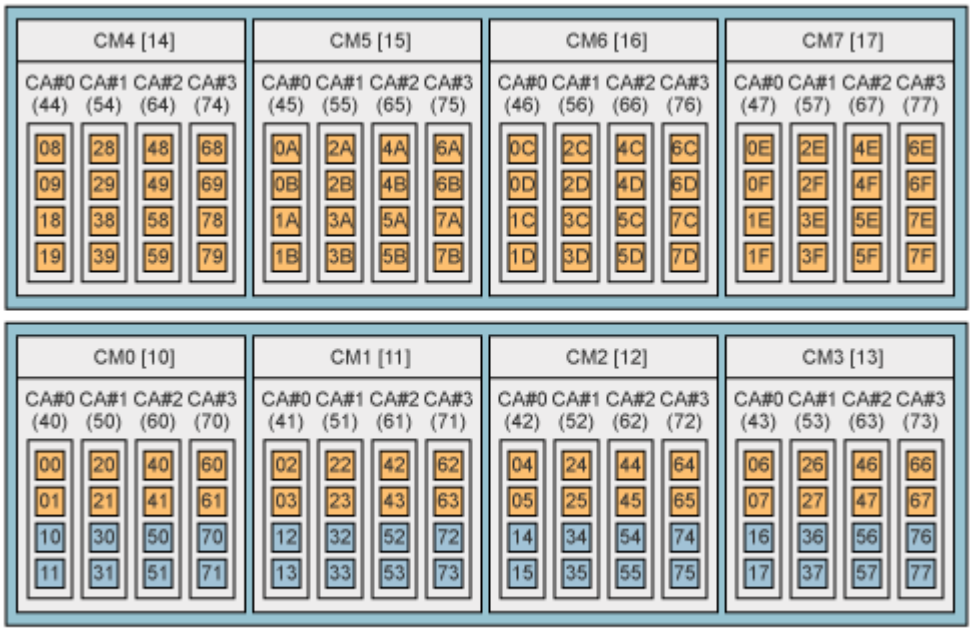
[ ]: Group No. (): Exchange unit No. : adapter Port No. : When using 4port-CA

ETERNUS DX8100 rear view



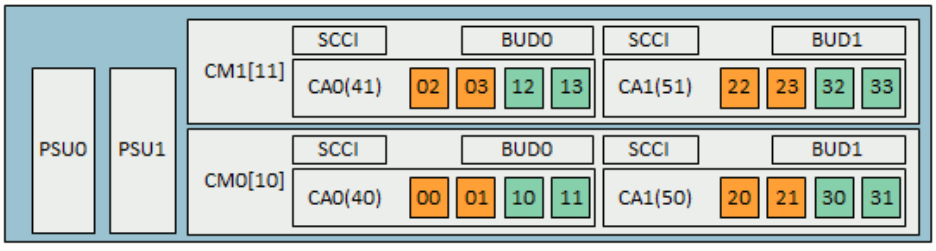
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 4port-CA

ETERNUS DX8400, ETERNUS DX8700 front view



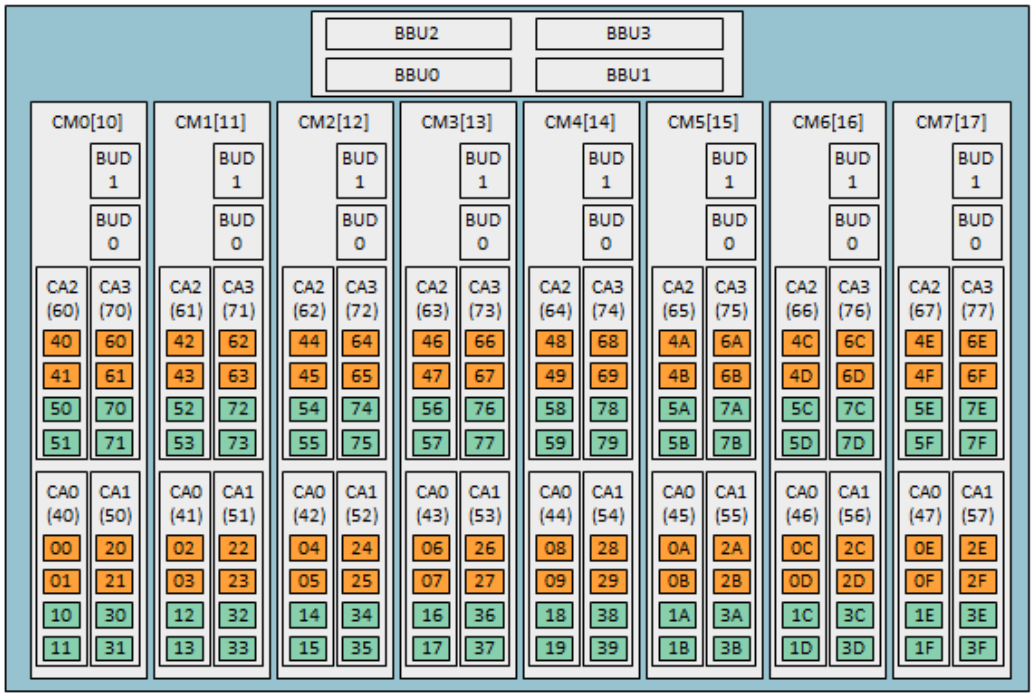
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 4port-CA

ETERNUS DX8100 S2 rear view



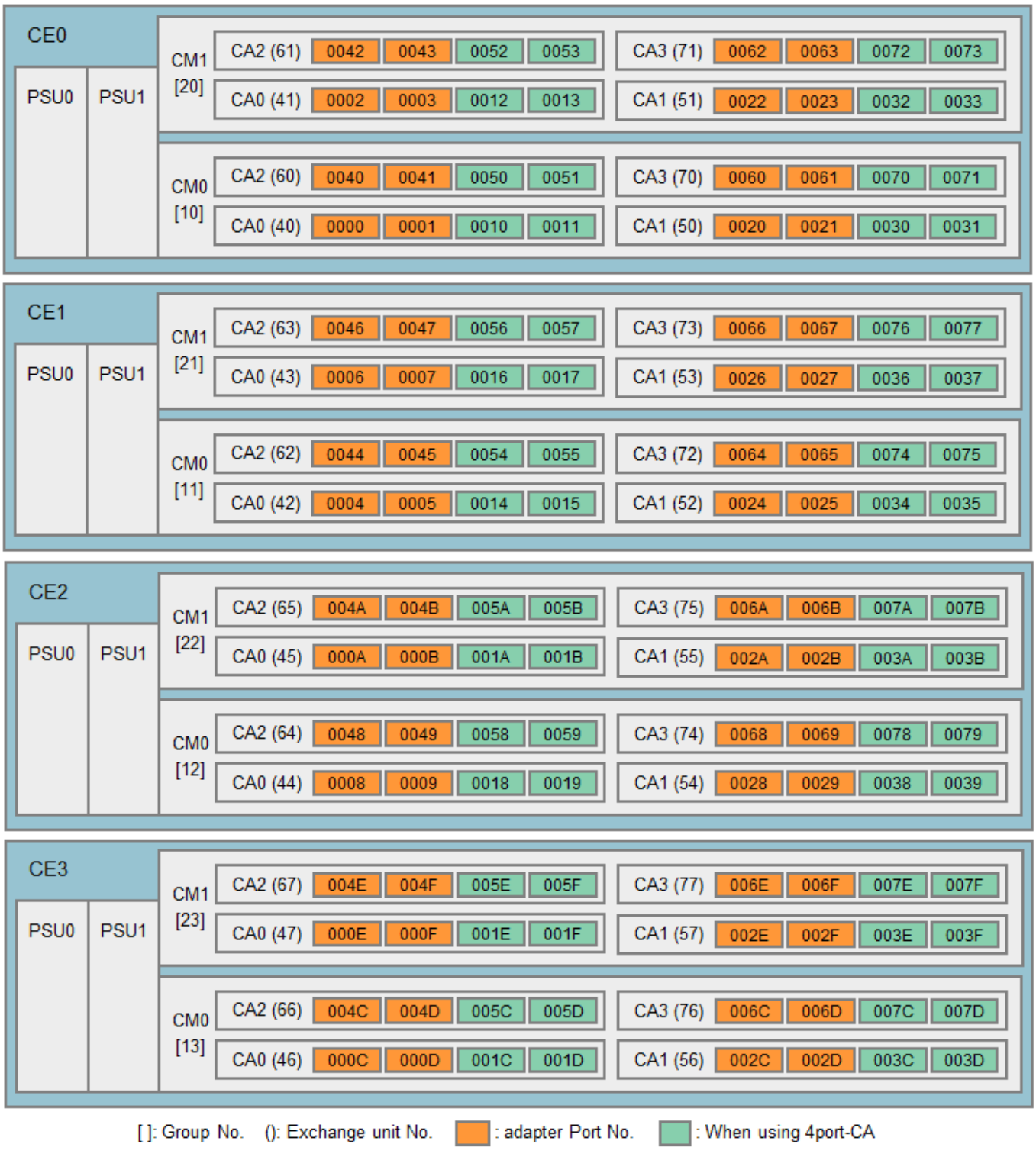
[ ]: Group No. (): Exchange unit No. : adapter Port No. : When using 4port-CA

ETERNUS DX8700 S2 front view



[ ]: Group No. (): Exchange unit No. : adapter Port No. : When using 4port-CA

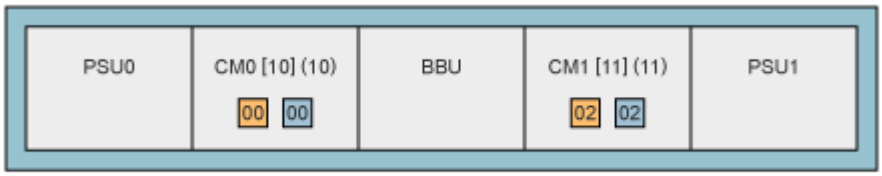
ETERNUS DX8700 S3, ETERNUS DX8900 S3 rear view



ETERNUS2000 rear view (FC, iSCSI connection)

[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 2port-CA

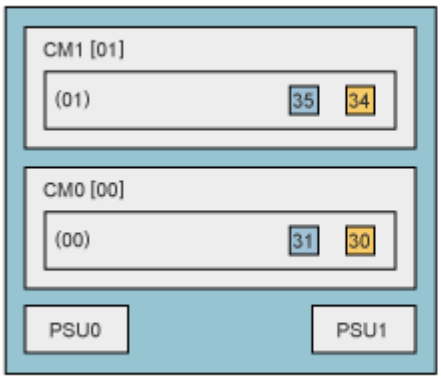
ETERNUS2000 rear view (SAS connection)



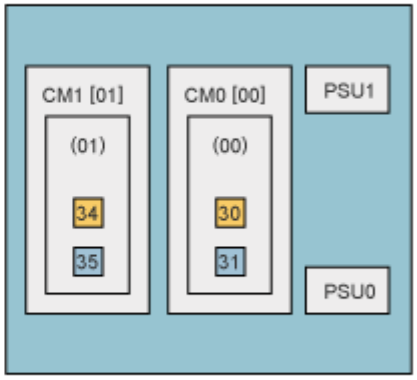
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 2port-CA

ETERNUS4000 model 80, 100 rear view

[Rack mount]

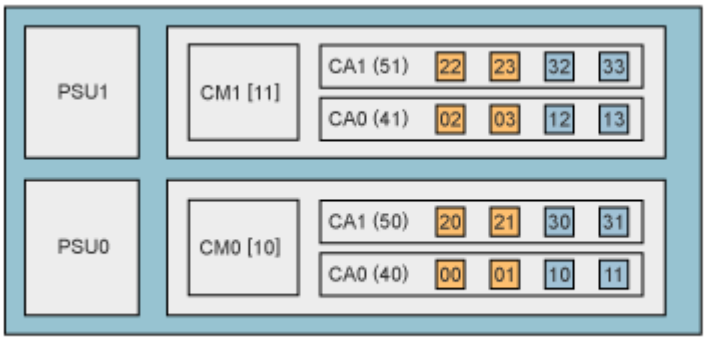


[Pedestal]



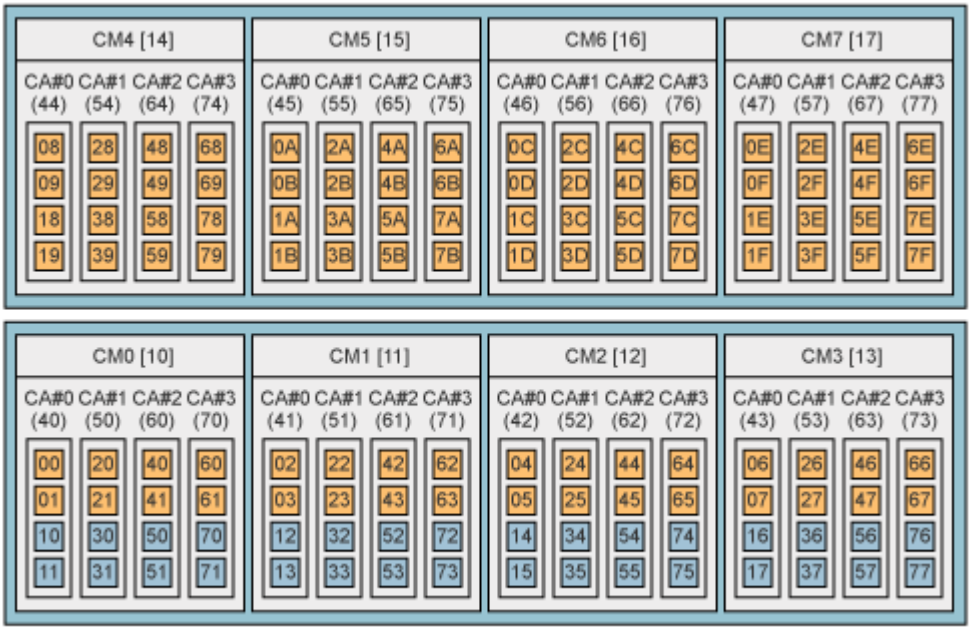
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 2port-CM

ETERNUS4000 model 300, 400, 500, 600, ETERNUS8000 model 700, 800 rear view



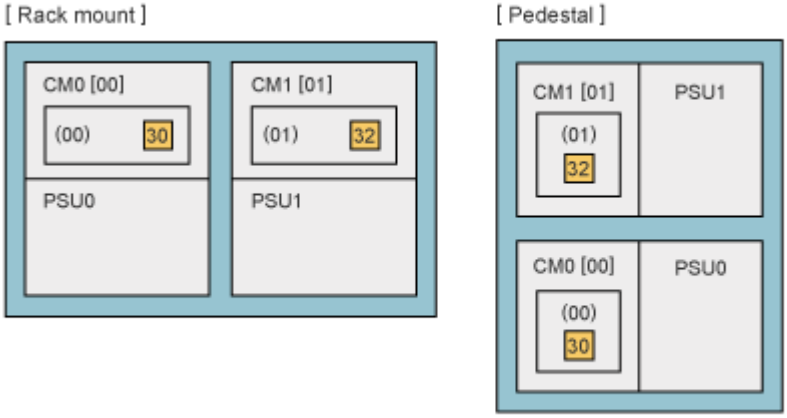
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 4port-CA

ETERNUS8000 model 900, 1100, 1200, 2100, 2200 front view



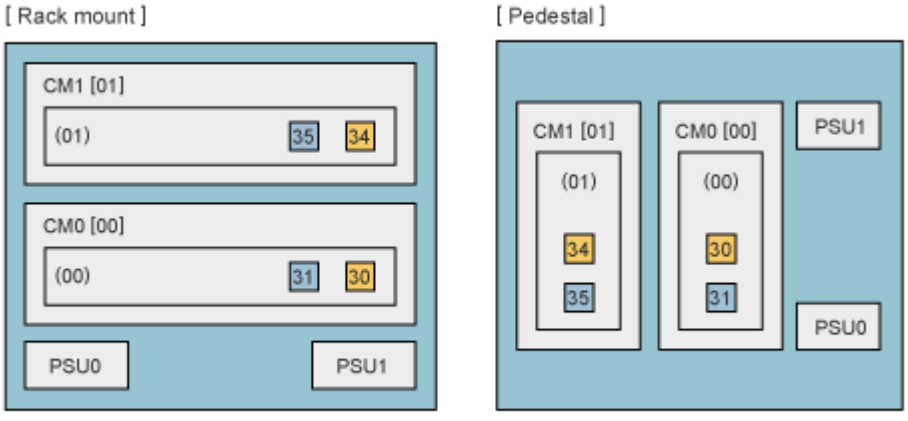
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 4port-CA

ETERNUS3000 model 50 rear view



[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No.

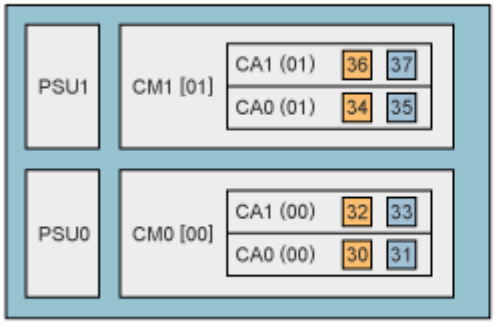
ETERNUS3000 model 80, 100 rear view



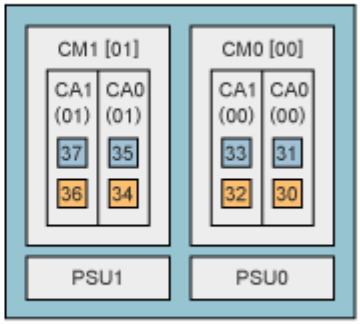
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 2port-CM

ETERNUS3000 model 200, 300, 400, 500, 600, 700 rear view

[Rack mount]



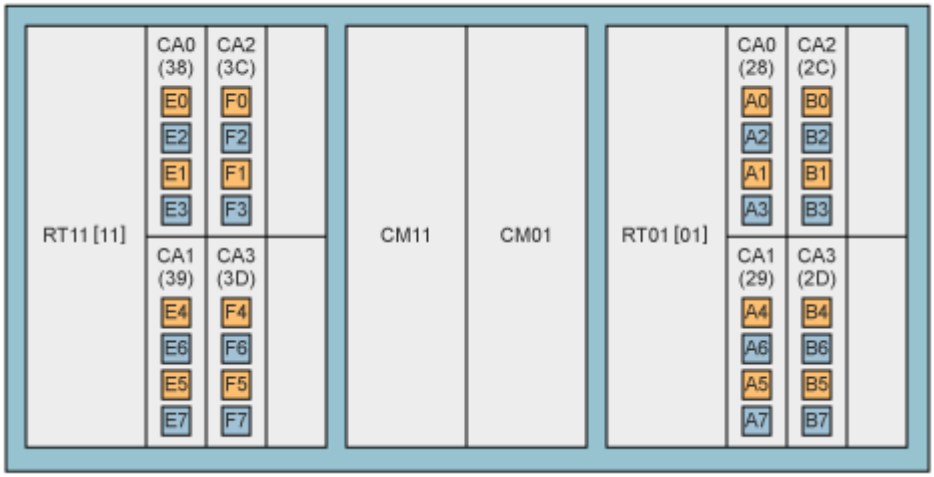
[Pedestal]



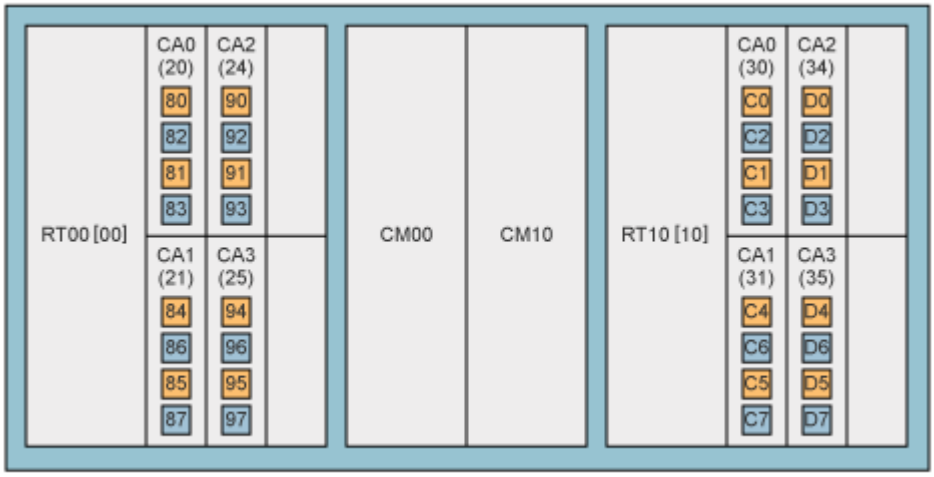
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 2port-CA

ETERNUS6000 front & rear view

[Device Front]

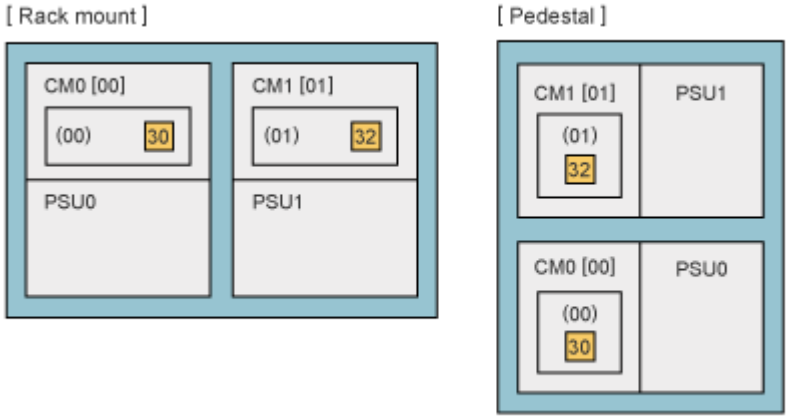


[Device Rear]



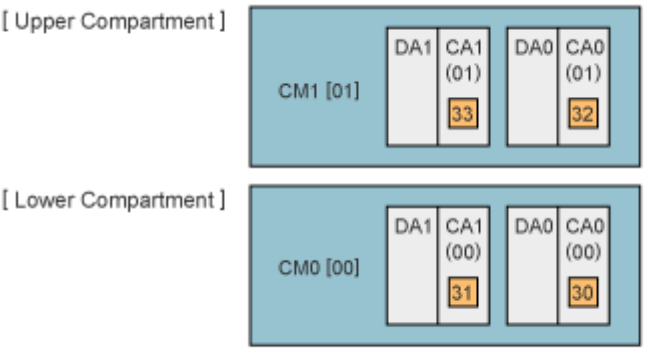
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No. : When using 4port-CA

GR710 rear view



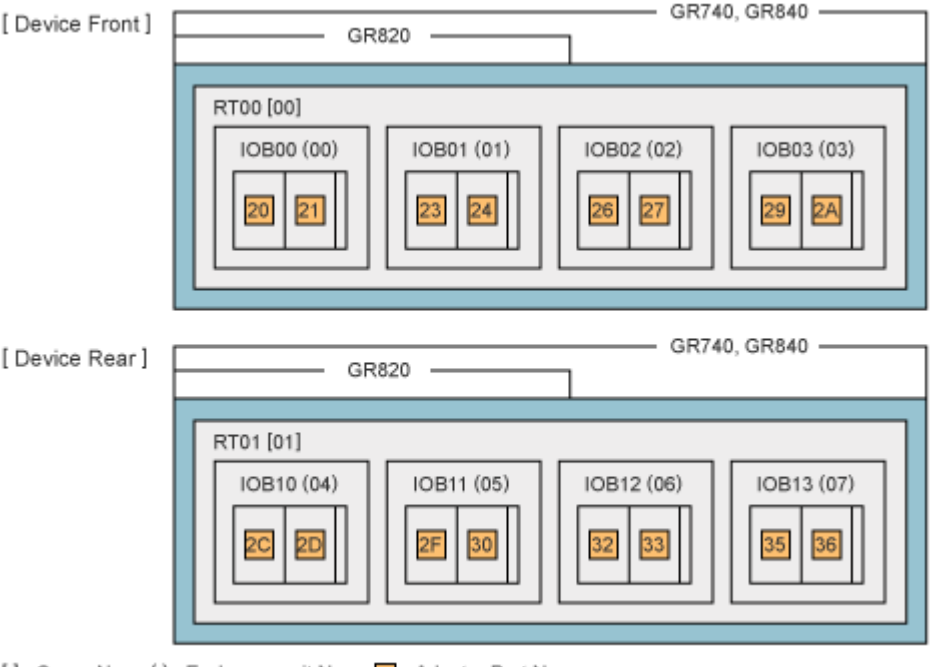
[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No.

GR720 and GR730 rear view



[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No.

GR740, GR820, GR840 front & rear view



[ ] : Group No. ( ) : Exchange unit No. : Adapter Port No.

Assigned-/Non-assigned CM Type Storage Systems

For ETERNUS storage systems, there are two system types: “Assigned-CM” and “Non-assigned-CM.” With Assigned-CM storage systems, the main access path for each LU is assigned to a particular controller. With Non-assigned-CM storage systems, there are no assigned LU access paths as such.

With “Assigned-CM” type storage systems, the path connected to the assigned controller is active. Paths to other controllers are on standby. With “Non-assigned-CM” type storage systems, all paths are active and used for access.

The table below shows the “Assigned-CM” and “Non-assigned-CM” storage systems.

Load balancing/Failover performance can differ depending on “Assigned-CM” and “Non-assigned-CM” use and the number of paths employed. For details, refer to the supplied product manual.

Assigned CM type	ETERNUS DX60, ETERNUS DX80, ETERNUS DX90, ETERNUS DX60 S2, ETERNUS DX80 S2, ETERNUS DX90 S2, ETERNUS DX60 S3, ETERNUS DX100 S3, ETERNUS DX200 S3, ETERNUS DX200F, ETERNUS DX400 series, ETERNUS DX400 S2 series, ETERNUS DX500 S3, ETERNUS DX600 S3, ETERNUS2000, ETERNUS4000, ETERNUS3000, GR710, GR720, GR730
Non-assigned CM type	ETERNUS DX8000 series, ETERNUS DX8000 S2 series, ETERNUS DX8700 S3, ETERNUS DX8900 S3, ETERNUS8000, ETERNUS6000, GR740, GR820, GR840

Change Unit of Storage Systems

The iompadm change/restart command has a “change unit” parameter. The change unit represents a module of a storage system as follows.

Storage System	cu/controllerunit	g/groupmodule
ETERNUS DX60, ETERNUS DX80, ETERNUS DX90, ETERNUS DX60 S2, ETERNUS DX80 S2, ETERNUS DX90 S2, ETERNUS DX60 S3, ETERNUS DX100 S3, ETERNUS DX200 S3, ETERNUS DX200F, ETERNUS2000, ETERNUS4000 model 80, 100, ETERNUS3000	-	CM
ETERNUS DX400 series, ETERNUS DX400 S2 series, ETERNUS DX500 S3, ETERNUS DX600 S3, ETERNUS DX8000 series, ETERNUS DX8000 S2 series, ETERNUS DX8700 S3, ETERNUS DX8900 S3, ETERNUS4000 model 300, 400, 500, 600, ETERNUS8000	CA	CM
ETERNUS6000	CA	ROUTER
GR740, GR820, GR840	IOB	ROUTER
GR710, GR720, GR730	-	CM

When a CA of ETERNUS6000 is exchanged, the change unit must be cu or controllerunit. When a CM of ETERNUS3000 is exchanged, the change unit must be g or groupmodule.

Setting of Max Throttle value

When connecting to the following storage systems, please set the Max Throttle value with mpdconfig –m command. For detailed operation, please refer to a software information.

ETERNUS2000
ETERNUS4000 model 80, 100
ETERNUS3000
ETERNUS GR series

Linux Kernel and Multipath Driver Update

Multipath Driver Update

Never use '-U' option of the rpm command. Please check a software information or a patch installation manual.

How to Update Linux Kernel

Apply the latest patch of Multipath Driver Update the Linux kernel. If the update fails, refer to the next section.

1. In the case of Red Hat Enterprise Linux 7

   If a kernel is updated, make sure to execute the following command before rebooting the OS.
   # /opt/FJSVmpd/system/mpdchkdup

   If the following message is displayed, the Multipath Driver cannot operate with the updated kernel.
   Change the configuration to a single path, or update the Multipath Driver.

   !!! ERROR !!!
   In ETERNUS Multipath Driver, this kernel is not supported.

2. In the case of SUSE Linux Enterprise Server

   When the kernel is updated, the renewal of the following packages are needed.

Operating System	packages
SUSE Linux Enterprise Server 9, SUSE Linux Enterprise Server 10	kernel-source
SUSE Linux Enterprise Server 11	kernel-source, kernel-xxxx-devel
SUSE Linux Enterprise Server 12	kernel-source, kernel-xxxx-devel, linux-glibc-devel

   If a kernel or a device driver is updated after the Multipath Driver is installed,
   make sure to execute the following command before rebooting the OS
   # /opt/FJSVmpd/system/mpdsetup

Recovery from Failure of Linux Kernel Update

When Linux kernel update fails, follow the instructions below.

Run the "mpdsetup" command with fjmkinitrd option as root user.
/opt/FJSVmpd/system/mpdsetup fjmkinitrd

Check the /boot/grub/grub.conf file. When there is not an initrd line corresponding to the title line,
add the initrd line as follows. Then, set the above kernel as default kernel of grub.

Example: When you failed to apply 2.6.9-42.ELsmp kernel
[before correction]

```
        title Red Hat Enterprise Linux AS (2.6.9-42.ELsmp)
                root (hd0,0)
                kernel /vmlinuz-2.6.9-42.ELsmp ro root=LABEL=/
```

[after correction]

```
        title Red Hat Enterprise Linux AS (2.6.9-42.ELsmp)
                root (hd0,0)
                kernel /vmlinuz-2.6.9-42.ELsmp ro root=LABEL=/
                initrd /initrd-2.6.9-42.ELsmp.img    <- Add this line!
```

Apply the kernel update again.

Run the "mpdsetup" command.
/opt/FJSVmpd/system/mpdsetup

Reboot the server

WARNING Message During Linux Kernel Update

The following message might be displayed when updating the Linux kernel on Red Hat Enterprise Linux AS v.4, Red Hat Enterprise Linux ES v.4 or Red Hat Enterprise Linux 5. Please ignore the message.

WARNING: No module mpdh found for kernel XXXXX, continuing anyway
（XXXXX: kernel version）

Recovery from Failure of Update to Red Hat Enterprise Linux 5.5

OS doesn't start in the following conditions.
1.The Multipath Driver before V2.0L14 is installed in the Red Hat Enterprise Linux 5.5
2.The environment that uses the Multipath Driver before V2.0L14 is updated to Red Hat Enterprise Linux 5.5.
3.The environment that uses the Multipath Driver that applies the patches before T000972LP-09, T000973LP-09 or T000971QP-09 is updated to Red Hat Enterprise Linux 5.5.

Please follow the instructions below to recover from the failure.
(Please prepare installation CD1 of Red Hat Enterprise Linux 5.5 and product CD of Multipath Driver V2.0L20 or later.)

Set installation CD1 of Red Hat Enterprise Linux 5.5 to the drive, and boot up a system in the rescue mode.

"Selection of the language" and "Selection of the keyboard" screen are displayed, and select the item corresponding to the environment.
"Setting of the network" screen is displayed, and select “no”.
"Selection of the method of the mount" screen is displayed, and select either following methods.
- “Continue “is selected.:automatic mount to /mnt/sysimage is done.
- “skip” is selected. manual mount to /mnt/sysimage,after the shell starts.

Execute/usr/sbin/chroot command after the shell starts, and change the root directory.
/usr/sbin/chroot /mnt/sysimage

In case /boot partition etc. are set besides/root partition, execute the mount command for those partitions.

Take out installation CD1, and exchange it for product CD of Multipath Driver V2.0L20 or later.

Execute the mount command for product CD of Multipath Driver V2.0L20 or later.
For instance, it becomes the following when the device of the CD drive is /dev/hda.
mount /dev/hda /media

Move to the CD, and install Multipath Driver V2.0L20 or later by the mpdpkgadd command.
cd /media
./mpdpkgadd

Move to the root, and take out product CD of Multipath Driver V2.0L20 or later after unmounting.
cd /
umount /media

Execute exit twice, and end the chroot environment and the rescue mode. The server reactivates by the automatic operation after the rescue mode ends.
exit
exit

Notes

FC Switch

When using Multipath Driver with FC switches, zoning settings must be defined. For the details of setting zones, please refer to the manual of FC switches.

When connecting to both the storage system that is supported by Multipath Driver and the storage system that is not supported by Multipath Driver, use different HBA in both storage systems.

Emulex OneCommand Manager

When using Emulex OneCommand Manager on Red Hat Enterprise Linux 7 (Update 1 or later), please run the following command to load sg driver.

```
# modprobe sg
```

Setting of qla2xxx driver

When using the Red Hat Enterprise Linux 5 and a driver downloaded from the QLogic web site is installed, the following messages that are described below may be added in the "/etc/modprobe.conf" file. Multipaths cannot be configured with these messages. When these messages are added, add "#" on the top of the lines to comment-out these messages. If the Multipath Driver is already installed, comment-out these messages and then execute the "mpdsetup" command.

```
install qla2xxx /sbin/modprobe qla2xxx_conf; /sbin/modprobe --ignore-install qla2xxx
remove qla2xxx /sbin/modprobe -r --first-time --ignore-remove qla2xxx && { /sbin/modprobe -r --ignore-remove
qla2xxx_conf; }
```

iSCSI

When iSCSI interface is used to connect storage systems, please set the iSCSI timer using the iscsiadm command. Please refer to the guide of the storage system for details concerning the use of iSCSI initiator.

Notes when Multipath is Composed

Please connect the HBA in the server and the disk array device as there is a redundancy.
For instance, please use CM0 and CM1 of ETEURNUS DX400 series to configure multipaths.
Moreover, it is necessary to consider even number/odd number of CM for the disk array device with three CMs or more such as ETEURNUS DX8000 series.
Contact a Fujitsu engineer for details.

LU Configuration

The LU number has to be allocated from 0 in ascending order, and the LU configuration of each port that configure a multipath has to be equal. Please refer to the manual of ETERNUS storage system for the details of how to set LUN Mapping, Affinity Group or Zone and how to check a logical volume number.

Hotplug of FC card on Red Hat Enterprise Linux 5.3 (for Intel Itanium)

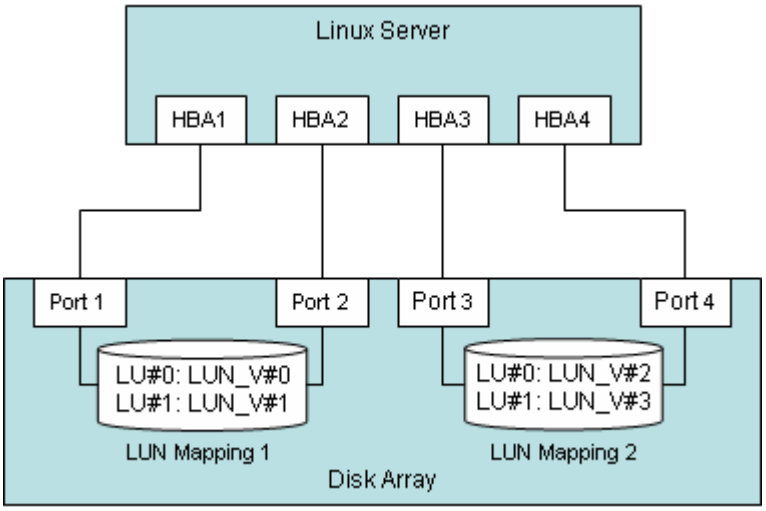
The lpfc driver bundled with Red Hat Enterprise Linux 5.3 (for Intel Itanium) has a problem about hotplug. The problem is that hotplug procedure takes a lot of time. The problem has been resolved by the following version of the lpfc driver which is released by Fujitsu.

lpfc-fjstd-RHEL5-8.2.0.33.3p-2 / lpfc-fjext-RHEL5-8.2.0.33.3p-2
lpfc-fjstd-RHEL5-xen-8.2.0.33.3p-2 / lpfc-fjext-RHEL5-xen-8.2.0.33.3p-2

Multiple LUN Mappings Configuration

In the case of Multipath Driver V2.0L10 or later, a server can recognize multiple LUN Mappings, Affinity Group or Zones set in a storage system.

Example of Multiple LUN Mappings Configuration:
2 paths to the LUN Mapping 1 and 2 paths to the LUN Mapping 2 are correctly configured.



LUN Mapping 1
The logical volume (LUN_V) #0 is mapped on LU#0, and the logical volume (LUN_V) #1 is mapped on LU#1.

LUN Mapping 2
The logical volume (LUN_V) #2 is mapped on LU#0, and the logical volume (LUN_V) #3 is mapped on LU#1.

Hotplug Procedure of FC card (dual port)

Update Multipath Driver to V2.0L10, Patch 5(T00812-05) or later in order to enable the hotplug of FC card (dual port) on Red Hat Enterprise Linux AS v.4 or Red Hat Enterprise Linux ES v.4. When each port of a FC card (dual port) is connected to storage system, perform the following procedure. If only one port of a FC card (dual port) is connected to storage system, perform as usual.

- adding a card
  Follow the procedure of "PRIMEQUEST 500/400 SERIES REFERENCE MANUAL" Appendix B.5.2.1.
- deleting a card
  In the step 1 of "PRIMEQUEST 500/400 SERIES REFERENCE MANUAL" Appendix B.5.2.2,
  execute 'iompadm change adapter' and 'iompadm del' command for each port, then go to step 2.
- swapping a card
  In the step 1 of "PRIMEQUEST 500/400 SERIES REFERENCE MANUAL" Appendix B.5.2.3,
  execute 'iompadm change adapter' and 'iompadm del' command for each port, then go to step 2.

Notes in Linux KVM environment

It is necessary to do the following procedures in guest OS.
- Guest OS is Red Hat Enterprise Linux 6, and
- LU of the storage system is allocated on a virtual disk as IDE Disk for guest OS.

1. Please arrange "50- ide.rules" in/etc/udev/rules.d/directory.
   Please set the following to "50- ide.rules".

```
ACTION=="add", SUBSYSTEM=="scsi" , SYSFS{type}=="0", RUN+="/bin/sh -c 'echo 40 > /sys$$DEVPATH/timeout'"
```

2. Please reboot guest OS.

udev Configuration

When you use the follow OS, please use by-id names of udev function.
- Red Hat Enterprise Linux AS v.4 (Update 4 or later)
- Red Hat Enterprise Linux ES v.4 (Update 4 or later)
- Red Hat Enterprise Linux 5
- Red Hat Enterprise Linux 6
- Red Hat Enterprise Linux 7
- SUSE Linux Enterprise Server 10
- SUSE Linux Enterprise Server 11
- SUSE Linux Enterprise Server 12

When the Multipath Driver is installed, the by-path names as the device names of the disks in the storage system cannot be used. To install the Multipath Driver into the system where the by-path names are used as the device names of the disks in the storage system, change the by-path names in all setting files to the by-id names.

1. Setting

1.1 Setting of ETERNUS storage systems.

To use by-id names, the firmware version of ETERNUS storage systems should be equal to or later than that of the following table. When earlier version is used, please update the firmware.

Product Name	Version of the firmware
ETERNUS4000 model 80, 100	V30L11
ETERNUS4000 model 300, 500 ETERNUS8000 model 700, 900, 1100, 2100	V10L53
ETERNUS3000 model 80, 100 (Product ID: E308xxxA, E308xxxA1, E310xxxA, E310xxxB, E310xxxB1)	V20L61
ETERNUS3000 model 80, 100 (Product ID: E308xxxD, E310xxxD)	V30L11
ETERNUS3000 model 200, 400, 600	V20L61
ETERNUS3000 model 300, 500, 700	V10L23
ETERNUS3000 model 300, 500, 700 (Product ID: E330xxxA, E330xxxB, E330xxxD, E350xxxA, E350xxxB, E350xxxD, E370xxxA, E370xxxB, E370xxxD)	V20L30
ETERNUS6000 all models	V30L10
Other ETERNUS storage systems	All versions are available

After checking the firmware version of ETERNUS storage system, perform the following setting. Please refer to the manual of ETERNUS storage system for details.

In the case of ETERNUS4000 model 80, 100 and ETERNUS3000, select ‘Type 01 & 03’ as a value of ‘Inquiry Command Page 83’ in ‘Append/Delete Host Response Pattern(s)’ page.
In the case of ETERNUS6000, select ‘type1 + type3’ as a value of ‘response data type for Inquiry PageCode 0x83’ in ‘Set Host Response’ page.

1.2 Setting of Linux server.

In the case of Red Hat Enterprise Linux AS v.4 and Red Hat Enterprise Linux ES v.4, in the '/etc/scsi_id.config' file, change from 'options=-b' to 'options=-gu' and add the following lines to end of the file. Then reboot the server.

```
vendor=FUJITSU, model=ETERNUS_DXL, options=-p 0x83
vendor=FUJITSU, model=ETERNUS_DX400, options=-p 0x83
vendor=FUJITSU, model=ETERNUS_DX8000, options=-p 0x83
vendor=FUJITSU, model=E2000, options=-p 0x83
vendor=FUJITSU, model=E4000, options=-p 0x83
vendor=FUJITSU, model=E400A, options=-p 0x83
vendor=FUJITSU, model=E8000, options=-p 0x83
vendor=FUJITSU, model=E3000, options=-p 0x83
vendor=FUJITSU, model=E6000, options=-p 0x83
```

In the case of other OS, by-id names can be used in default setting.

2. Correspondence between the by-id names and the usual /dev/sda type names

The by-id names are symbolic link to /dev/sdX name. So you can confirm relation between the by-id name and /dev/sdX name by executing the 'ls –l /dev/disk/by-id' command.

Example: Check the by-id name of /dev/sdb

```
# ls -l /dev/disk/by-id/
total 0
lrwxrwxrwx   1 root root   9 Dec   2   2006 scsi-3600e000000cb00000000000100000000 -> ../../sdb
lrwxrwxrwx   1 root root   9 Dec   2   2006 scsi-3600e000000cb00000000000100010000 -> ../../sdc
```

The result shows that the by-id name of /dev/sdb is /dev/disk/by-id/scsi-3600e000000cb00000000000100000000.

3. Notice

When you use by-id names as device names of disks in a storage system, change all storage system related settings of OS and applications from /dev/sdX type names to by-id names.
If you use PRIMECLUSTER GDS, change Host Response setting before installing PRIMECLUSTER GDS. If you have already used PRIMECLUSTER GDS, don't change Host Response setting.
If sadump is used on PRIMEQUEST server, after changing the setting of ETERNUS, set the sadump again.
It isn't necessary to use the recognition order setting (fixed-recognition-order initial RAM disk), if by-id names are specified as the device names for all configuration file such as /etc/fstab.

About This Installation Information
This Installation Information is devoted to providing technical information and an overview of the basic facilities of Multipath Driver. The contents of this document may be modified without any prior notice.
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