Fujitsu Storage ETERNUS AX/AC/HX series, ETERNUS AB/HB series

Supplement to the Express Configuration Guide -Common for Linux[®], VMware[®], Windows[®], and Oracle Solaris-





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Preface

Fujitsu would like to thank you for purchasing the Fujitsu Storage ETERNUS AX series All-Flash Arrays, ETERNUS AC series All-Flash Arrays, ETERNUS HX series Hybrid Arrays, ETERNUS AB series All-Flash Arrays, ETERNUS HB series Hybrid Arrays (hereinafter referred to as ETERNUS AX/AC/HX and ETERNUS AB/HB).

The ETERNUS AX/AC/HX and ETERNUS AB/HB are designed to be connected to Fujitsu servers (Fujitsu SPARC Servers, PRIMEQUEST, PRIMERGY, and other servers) or non-Fujitsu servers.

This manual provides supplemental explanations such as error corrections and cautions for the content of the following documents.

- Fujitsu Storage ETERNUS AX/AC/HX series
 "FC Configuration Using VSC Express Guide (ESXi[®])"
 "FC Configuration Express Guide (Red Hat[®] Enterprise Linux[®])"
 "FC Configuration Express Guide (Windows[®])"
- Fujitsu Storage ETERNUS AB/HB series
 "Express Configuration For (Linux[®])"
 "Express Configuration For (VMware[®])"
 "Express Configuration For (Windows[®])"
 "Express Configuration For (Oracle Solaris)"

Please carefully review the information outlined in this manual.

This manual is written for the latest version of SANtricity OS software.

Refer to "Server Support Matrix" to check the support status and refer to the manual of the server, OS, or the Fibre Channel card that is to be used. In addition, if "Server Support Matrix" cannot be referenced, contact us from "Contact" at the following website. https://www.fujitsu.com/global/products/computing/storage/

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Trademarks

Third-party trademark information related to this product is available at: https://www.fujitsu.com/global/products/computing/storage/eternus/trademarks.html

About This Manual

Intended Audience

This manual is intended for systems administrators who perform system installation and operation management of ETERNUS AX/AC/HX series and ETERNUS AB/HB series, or field engineers who perform maintenance. Read as required.

Related Information and Documents

The latest information for your model is available at: https://www.fujitsu.com/global/support/products/computing/storage/manuals-list.html

Document Conventions

Notice Symbols

The following notice symbols are used in this manual:

Caution

Indicates information that you need to observe when using the ETERNUS AB/HB and ETERNUS AX/AC/HX. Make sure to read the information.

Note

Indicates information and suggestions that supplement the descriptions included in this manual.

1. Supported OS

ETERNUS AX/AC/HX

OS Туре	Version Number
Solaris	Solaris 11.4 Solaris 11.3
IBM AIX	AIX 7.3 AIX 7.2 AIX 7.1
IBM VIOS	VIOS 3.1
Microsoft Windows Server	Windows Server 2022 Windows Server 2019
Red Hat Enterprise Linux	RHEL Server 9.2 RHEL Server 8.8
SUSE Linux Enterprise Server	SLES 15 SP5 SLES 15 SP4
Oracle Linux	Oracle Linux 9.2
VMware ESXi	ESXi 8.0 Update1 ESXi 8.0

Caution

- Support status for ONTAP 9.13.1 and later.
- Contact us for the support status of OS versions not mentioned.
- Contact us for the support status of HBAs (host adapters). There may be Fujitsu model HBAs that cannot supported.
- For problems with out of support OSs, we will try our best to provide support.

ETERNUS AB/HB

OS Type	Version Number
Solaris	Solaris 11.4 Solaris 11.3
Microsoft Windows Server	Windows Server 2022 Windows Server 2019 Windows Server 2016
Red Hat Enterprise Linux	RHEL Server 9.0 RHEL Server 8.6 RHEL Server 8.4 RHEL Server 7.9 RHEL Server 7.8
SUSE Linux Enterprise Server	SLES 15 SP3 SLES 15 SP2 SLES 12 SP5
Oracle Linux	Oracle Linux 9.0 Oracle Linux 8.6 Oracle Linux 8.5 Oracle Linux 8.4 Oracle Linux 8.3

OS Type	Version Number
VMware ESXi	ESXi 8.0 Update1 ESXi 8.0 ESXi 7.0 Update3 ESXi 7.0 Update2 ESXi 7.0 Update1 ESXi 6.7 Update3

Caution

- Support status for SANtricity 11.70 and later.
- Contact us for the support status of OS versions not mentioned.
- Contact us for the support status of HBAs (host adapters). There may be Fujitsu model HBAs that cannot supported.
- For problems with out of support OSs, we will try our best to provide support.

2. Express Configuration Guide Errata

ETERNUS AB/HB

Linux

Page No.	Correction	Error	Reference
P. 7	Install and configure Linux Unified Host Utilities In the ETERNUS AB/HB series, instal- lation of Linux Unified Host Utilities is not required. Note that even if it is installed by mis- take, it will not have an affect on the system operation. (Modification)	 Install and configure Linux Unified Host Utilities Linux Unified Host Utilities 7.1 includes tools to manage ETERNUS AB/HB Series, including failover policies and physical paths. Procedure 1. Determine the appropriate version of Unified Host Utilities 7.1 to install. For the version of each supported configuration, contact Fujitsu Support. 2. Download the Unified Host Utilities 7.1 from the DVD included in the Product. 	(Modifica- tion)
P. 14 P. 20 P. 32 P. 42	Install and configure Host Utilities In the ETERNUS AB/HB series, instal- lation of Linux Unified Host Utilities is not required. Note that even if it is installed by mis- take, it will not have an affect on the system operation. (Modification)	 Install and configure Host Utilities Linux Unified Host Utilities 7.1 includes tools to manage ETERNUS AB/HB Series, including failover policies and physical paths. Procedure Determine the appropriate version of Unified Host Utilities 7.1 to install. For the version of each supported configuration, contact Fujitsu Support. Download the Unified Host Utilitiet is 7.1 from the DVD included in the Product. 	(Modifica- tion)

Page No.	Correction	Error	Reference
P. 9 P. 16 P. 22 P. 33 P. 43	<pre>2. If the OS version is RHEL 8.4 or later, Oracle Linux 8.4 or later, or SLES 15.3 or later, the default multipath settings are used. Therefore, leave the mul- tipath.conf file blank. If the OS version is RHEL 7.x, RHEL 8.1 to 8.3, Oracle Linux 7.x, Oracle Linux 8.1 to 8.3, SLES 12.x, or SLES 15.1 to 15.2, the multipath settings for the ETERNUS AB/HB series are not configured by default. Therefore, configure the multipath.conf file as shown below: devices { devices { device { vendor "(LSI FUJITSU)" product "ETERNUS_AHB" path_grouping_policy group_by_prio detect_prio yes prio rdac path_checker rdac hardware_handler "1 rdac" failback immediate features "2 pg_init_retries 50" no_path_retry 30 retain_attached_hw_handler yes product_blacklist "Universal Xport" } </pre>	2. Use the default multipath settings by leaving the multipath.conf file blank.	(Modifica- tion)
	In addition, to remove devices such as internal disks from the multipath configuration, specify the device names to the "black- list". For details, refer to the Red Hat website.		
	blacklist { }		
P. 9 P. 16 P. 34 P. 44	For example, for grub2 it is /boot/ grub2/menu.cfg.	<pre>For example, for grub it is /boot/ grub/menu.lst and for grub2 it is / boot/grub2/menu.cfg.</pre>	(Modifica- tion)

Page No.	Correction	Error	Reference
P. 11 P. 17 P. 27 P. 37 P. 46	 Retrieve the SCSI ID of the mapped disk by issuing the mul- tipath -ll command. The SCSI ID is a 33-character string of hexadecimal digits, beginning with the number 3. If user-friendly names are enabled, Device Mapper reports disks as mpath instead of by a SCSI ID. 	 Retrieve the SCSI ID of the mapped disk by issuing the san- lun lun show -p command. The SCSI ID is a 33-character string of hexadecimal digits, beginning with the number 3. If user-friendly names are enabled, Device Mapper reports disks as mpath instead of by a SCSI ID. 	(Modifica- tion)
	<pre># multipath -11 36d039ea00001a06c000017e45 e5dba65 dm-6 FUJITSU ,ETERNUS_AHB size=5.0G features='4 queue_if_no_path pg_init_retries 50 retain_attached_hw_ handle' hwhandler='1 alua' wp=rw -+- policy='service-time 0' prio=50 status=active `- 8:0:0:2 sdc 8:32 active ready running `-+- policy='service-time 0' prio=10 status=enabled</pre>	<pre># sanlun lun show -p ETERNUS AB/HB Series Array: ictml619s01c01- SRP(60080e50002908b4000000 0054efb9d2) Volume Name: Preferred Owner: Controller in Slot B Current Owner: Controller in Slot B Mode: RDAC (Active/ Active) UTM LUN: None LUN: 116 LUN Size: Product: ETERNUS AB/HB Series Host Device: mpathr(360080e50004300ac00 0007575568851d) Multipath Policy: round- robin 0 Multipath Provider: Native </pre>	

Page No.	Correction	Error	Reference
P. 27	In this example, the iSCSI target IP address is 192.168.2.8.	In this example, the iSCSI target IP address is 192.0.2.8.	(Modifica- tion) The IP
	<pre>#ping -I 192.168.2.100 -s 8972 -d 192.168.2.8 Pinging 192.168.2.8 with 8972 bytes of data: Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Ping statistics for 192.168.2.8: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 2ms, Average = 2ms</pre>	<pre>#ping -I 192.0.2.100 -s 8972 -d 192.0.2.8 Pinging 192.0.2.8 with 8972 bytes of data: Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Ping statistics for 192.0.2.8: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 2ms, Average = 2ms</pre>	addresses that can- not be set are listed in the setting example.
P. 59	1. Add the NVMe ETERNUS AB/HB	1. Add the NVMe ETERNUS AB/HB	(Addition)
P. 76 P. 88	section of the /etc/mul- tipath.conf file, as shown in the following example:	series device entry to the devices section of the /etc/mul- tipath.conf file, as shown in the following example:	
	<pre>devices { device { vendor "NVME" product "ETERNUS_AHB" path_grouping_policy group_by_prio failback immediate no_path_retry 30 } In addition. to remove devices</pre>	<pre>devices { device { vendor "NVME" product "Fujitsu ETERNUS AB/HB Series*" path_grouping_policy group_by_prio failback immediate no_path_retry 30 } }</pre>	
	such as internal disks from the multipath configuration, specify the device names to the "black- list". For details, refer to the Red Hat website. blacklist { }		

Page No.	Correction	Error	Reference
P. 96	Use the resources listed here if you need additional information. You can also use the online help for SANtricity System Manager. • Online help describes how to use SANtricity System Manager to complete configuration and stor- age management tasks. It is avail- able within the product and as a PDF download. (Deletion)	 Use the resources listed here if you need additional information. You can also use the online help for SANtricity System Manager. Online help describes how to use SANtricity System Manager to complete configuration and storage management tasks. It is available within the product and as a PDF download. For additional documentation and instructions for ETERNUS AB/HB Series products, including SANtricity software, go to the ETERNUS AB/HB series Manual Page. 	(Deletion)

VMware

Page No.	Correction	Error	Reference
P. 3	The "express method" for installing your storage array and accessing SANtricity System Manager is appro- priate for setting up a standalone VMware host to an ETERNUS AB/HB Series storage system. It is designed to get the storage system up and running as quickly as possible with minimal decision points. (Deletion)	The "express method" for installing your storage array and accessing SANtricity System Manager is appro- priate for setting up a standalone VMware host to an ETERNUS AB/HB Series storage system. It is designed to get the storage system up and running as quickly as possible with minimal decision points. Note: The configuration that the express method provides might not meet the needs of your production environment.	(Deletion)
P. 4	(Deletion)	Related information Server Support Matrix Express Configuration For Windows [®]	(Deletion)
P. 19	In this example, the iSCSI target IP	In this example, the iSCSI target IP	(Modifica-
	<pre>address is 192.168.2.8. vmkping -s 8972 -d 192.168.2.8 Pinging 192.168.2.8 with 8972 bytes of data: Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Ping statistics for 192.168.2.8: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 2ms, Average = 2ms</pre>	<pre>address is 192.0.2.8. vmkping -s 8972 -d 192.0.2.8 Pinging 192.0.2.8 with 8972 bytes of data: Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Ping statistics for 192.0.2.8: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 2ms, Average = 2ms</pre>	tion) The IP addresses that can- not be set are listed in the setting example.

Page No.	Correction	Error	Reference
P. 21	(Deletion)	3. Use the HBA BIOS to select the appropriate settings for your con- figuration. See the Server Support Matrix for recommendations. Please contact Fujitsu support personnel for the Server Support Matrix.	(Deletion)
P. 24	 Procedure For instructions on creating VMFS datastores using the vSphere Client, see the VMware pubs webpage (https://www.vmware.com/) for documentation on this topic. For instructions on using volumes as RDMs using the vSphere Client, see the VMware pubs webpage (https://www.vmware.com/) for documentation on this topic. Note that the Web page URL may change. Contact us if the URL is inaccessible due to a broken link. Contact: https://www.fujitsu.com/global/products/computing/storage/contact-us/ 	 Procedure For instructions on creating VMFS datastores using either the vSphere Client or the vSphere Web Client, see the VMware pubs webpage (https://www.vmware.com/support/pubs/) for documentation on this topic. For instructions on using volumes as RDMs using either the vSphere Client, see the VMware pubs webpage (https://www.vmware.com/support/pubs/) for documentation on this topic. 	(Modifica- tion) (Addition)

• Windows

Page No.	Correction	Error	Reference
P. 4	(Deletion)	Related information Server Support Matrix Linux express configuration	(Deletion)
P. 8	About this task You will install the SANtricity Windows DSM package on the man- agement station. To install, refer to "FUJITSU Storage ETERNUS AB series All-Flash Arrays, ETERNUS HB series Hybrid Arrays SANtricity Windows DSM Software Manual".	About this task You will install the SANtricity Windows DSM package on the man- agement station.	(Addition)

Page No.	Correction	Error	Reference
P. 9	Install and configure Windows Uni- fied Host Utilities (Deletion) About this task To install and configure, refer to "FUJITSU Storage ETERNUS AX series All-Flash Arrays, ETERNUS HX series Hybrid Arrays, ETERNUS AB series All-Flash Arrays, ETERNUS HB series Hybrid Arrays Windows [®] Unified Host Utilities Installation Guide". https://www.fujitsu.com/global/sup- port/products/computing/storage/ manuals-list.html	 Install and configure Windows Unified Host Utilities 7.0 Windows Unified Host Utilities 7.0 includes tools to enable you to connect host computers to storage systems and set required parameters on host computers. You can also set appropriate disk timeouts for best read/write performance with storage. About this task Use the Server Support Matrix to determine the appropriate version of Unified Host Utilities 7.0 to install. Download the Unified Host Utilities 7.0. Procedure Use the Server Support Matrix to determine the appropriate version of Unified Host Utilities 7.0 to install. Download the Unified Host Utilities 7.0 to install. Download the Unified Host Utilities 7.0 to install. Download the Unified Host Utilities 7.0 to install. Download the Unified Host Utilities 7.0 to install. Download the Unified Host Utilities 7.0 to install. Download the Unified Host Utilities 7.0. Note: Alternatively, you can use the SANtricity SMdevices utility to perform the same functions as the Unified Host Utility tool. The SMdevices utility is included as part of the SMutils package. The SMutils package is a collection of utilities to verify what the host sees from the storage array. It is included as part of the SANtricity software installation.	(Deletion) (Addition)
P. 10	(Deleted the entire chapter)	Install SANtricity System Manager for SMcli and Host Context Agent (HCA)	(Deletion)
P. 11 P. 15 P. 16	FUJITSU Storage ETERNUS AB/HB Series SANtricity System Manager Online Help	SANtricity System Manager online help	(Modifica- tion)

Page No.	Correction	Error	Reference
P. 19	In this example, the iSCSI target IP address is 192.168.2.8. C:\>ping -1 8972 -f 192.168.2.8 Pinging 192.168.2.8 with 8972 bytes of data: Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.168.2.8: bytes=8972 time=2ms TTL=64 Ping statistics for 192.168.2.8: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 2ms,	In this example, the iSCSI target IP address is 192.0.2.8. C:\>ping -1 8972 -f 192.0.2.8 Pinging 192.0.2.8 with 8972 bytes of data: Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Reply from 192.0.2.8: bytes=8972 time=2ms TTL=64 Ping statistics for 192.0.2.8: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 2ms, Average = 2ms	(Modifica- tion) The IP addresses that can- not be set are listed in the setting example.
	Average = 2m		(Marel)(Care
Ρ. 25	 4. Find the target ID with the CLI interface of SANtricity Windows DSM. Note: The dsmUtil utility is case sensitive. For details about dsmUtil, refer to "FUJITSU Stor- age ETERNUS AB series All-Flash Arrays, ETERNUS HB series Hybrid Arrays SANtricity Windows DSM Software Manual". 	4. Find the target ID. Note: The dsmUtil utility is case sensitive.	tion)

3. Points to Note When Using the ETERNUS AX/AC/HX

Notes Related to Linux iSCSI Connections

If a command is issued to a disk device that is connected to a server via iSCSI, response delays occur for the command and performance degradation problems may occur. As a connection configuration example, if a mixed network is used, such as an iSCSI network with a management LAN network, the occurrence of problems tends to increase.

This can be improved by disabling delayed ACK. However, depending on the type of Linux OS, disabling delayed ACK may not be possible. For information on how to disable it, refer to the Linux OS manual.

Notes Related to iSCSI Connections of VMware ESXi Servers

Phenomenon

If operations such as copying files are performed to iSCSI connected storage systems, read and write performance problems may occur in VMware ESXi servers.

Workaround

This problem can be avoided by disabling delayed ACK. For the workaround, refer to the following Broadcom website.

https://knowledge.broadcom.com/external/article?legacyId=1002598

Notes Related to the Maximum Queue Depth of NFS (VMware)

Phenomenon

The maximum queue depth set in the MaxQueueDepth advanced configuration option is not reflected in the NFS datastore.

Workaround

For the workaround, refer to the following Broadcom website.

https://knowledge.broadcom.com/external/article?legacyId=86331

Notes Related to VMware Clustered VMDK

The ETERNUS AX/AC/HX supports VMware Clustered VMDK. No additional settings are required for the ETERNUS AX/AC/HX to use VMware Clustered VMDK. Refer to "VMware Compatibility Guide" for the supported models.

https://www.vmware.com/resources/compatibility/search.php?deviceCategory=san

Notes Related to the Frequent I/O Errors in the VMware Guest OS Environment

Target OS

VMware

- vSphere 8.0
- vSphere 7.0

Phenomenon

In the VMware Guest OS, frequent I/O errors occur in the storage system. If I/O errors such as system errors and file system errors occur frequently, in rare cases it may cause a kernel panic, and the VMware Guest OS may be stopped as a result.

Cause

Disk timeout value for VMware Guest OS may be incorrect.

These phenomena may occur when a storage system is suspended for a short period of time (such as a path failover) during normal operation, and when the suspend time exceeds the disk timeout value of the VMware Guest OS.

Workaround

If an incorrect disk timeout value is specified for VMware Guest OS, change (manually increase) the disk timeout value to avoid or reduce errors. This may prevent the VMware Guest OS from stopping due to a kernel panic.

Refer to the following sections to change settings.

- "Notes Related to the Timeout Values in the Linux Guest OS Environment on VMware" (page 20)
- <u>"Notes Related to the Timeout Values in the Windows Guest OS Environment on VMware" (page 20)</u>
- <u>"Notes Related to the Timeout Values in the Solaris (x86) Guest OS Environment on VMware</u> (page 21)

Notes Related to the Timeout Values in the Linux Guest OS Environment on VMware

If RDM virtual disks are connected to the Linux Guest OS environment, set the timeout values to 40 seconds or longer.

Setting Example for Red Hat Enterprise Linux 8

Create the /etc/udev/rules.d/99-rdm-scsi-udev.rules file and add the following lines.

```
ACTION=="add", SUBSYSTEMS=="scsi", ATTRS{vendor}=="NETAPP", ATTRS{model}=="LUN.*",
ENV{DEVTYPE}=="disk", RUN+="/bin/sh -c 'echo 40 >/ sys$DEVPATH/device/timeout'"
```

Setting Example for Red Hat Enterprise Linux 7

Create the /etc/udev/rules.d/99-rdm-scsi-udev.rules file and add the following lines.

```
ACTION=="add", SUBSYSTEMS=="scsi", ATTRS{vendor}=="NETAPP", ATTRS{model}=="LUN.*", RUN+="/bin/sh -c 'echo 40 >/sys$DEVPATH/timeout'"
```

If RDM is not used for LUNs that are recognized by the Guest OS, refer to the following Broadcom website to set a timeout value.

https://knowledge.broadcom.com/external/article?legacyId=1009465

If the timeout value is not changed, the Guest OS detects a timeout faster than the host and problems such as an I/O error or unusable LUN error may occur. For vSphere 8.0 and vSphere 7.0, install the open vmware-tools that are provided by each Linux guest OS vendor. For the installation procedure, refer to the manuals provided by each OS vendor.

Notes Related to the Timeout Values in the Windows Guest OS Environment on VMware

Note

This note applies only when SAN connections are used.

To set the disk I/O timeout in a Windows Guest OS environment, modify and set the following registry key. After the modification, the virtual machine must be rebooted.

```
[HKEY_LOCAL_MACHINE\\SYSTEM\\CurrentControlSet\\Services\\Disk]
\TimeOutValue\
```

Setting Example

When specifying 180 seconds, add the following line.

\TimeOutValue\=dword:00000b4

Notes Related to the Timeout Values in the Solaris (x86) Guest OS Environment on VMware

Note

This note applies only when SAN connections are used.

In addition to the configuration of the disk I/O timeout, the bus retry and timeout settings must also be configured. For the disk timeout configuration, add the following line to the specified file.

```
/etc/system
set sd:sd_io_time=180
```

For the bus retry and timeout settings, the entries must be added. This entry differs depending on the vendor and model of the storage system. The following is an example of the added entries.

Setting Example for Solaris 10 U7 and Earlier

Setting for /kernel/drv/sd.conf

```
sd-config-list=
   "VMware Virtual disk ","netapp-sd-config",
   "NETAPP LUN.* ","netapp-sd-config";
netapp-sd-config=1,0x9c01,32,0,0,0,0,0,0,0,0,0,40,40,40,0,0,8,0,0;
```

Setting Example for Solaris 10 U8 and Later

Setting for /kernel/drv/sd.conf

```
sd-config-list=
  "VMware Virtual disk ","retries-timeout:5,retries-notready:40,retries-
busy:40,retries-reset:40";
  "NETAPP LUN.* ","retries-timeout:5,retries-notready:40,retries-
busy:40,retries-reset:40";
```

Note the blank padding in the vendor and device information. The vendor must be up to eight characters and the product ID must be up to 16 characters.

After the configuration of these files, the virtual machine must be restarted to activate them. To confirm that the settings are enabled, use the following commands.

```
echo \"*sd_state::walk softstate|::print struct sd_lun\" | mdb -k > /tmp/sd_state.out
grep un_cmd_timeout /tmp/sd_state.out
grep un_busy_retry_count /tmp/sd_state.out
grep un_notready_retry_count /tmp/sd_state.out
grep un_reset_retry_count /tmp/sd_state.out
```

Notes Related to FC Connections of VMware ESXi Server

Target OS

VMware

Phenomenon

If NVMe support is enabled during an FC connection, duplicate WWPNs may be displayed.

Workaround

During an FC connection, disabling NVMe support is recommended. For details on how to disable NVMe support, refer to the following Broadcom website.

https://knowledge.broadcom.com/external/article?legacyId=84325

For the lpfc Driver

- Execution example 1

esxcli system module parameters set -m lpfc -p "lpfc_enable_fc4_type=1 lpfc0_lun_queue_depth=8"

When changing the value of the driver parameter "lpfcX_lun_queue_depth", disable NVMe support at the same time. Even if NVMe support is already disabled and the "lpfcX_lun_queue_depth" value is changed later, disable NVMe support every time.

- Execution example 2

esxcli system module parameters set -m lpfc -p lpfc_enable_fc4_type=1 (*1)
esxcli system module parameters set -a -m lpfc -p lpfc0_lun_queue_depth=8 (*2)

- *1: Disable NVMe support.
- *2: Change the value of the driver parameter "lpfcX_lun_queue_depth". By specifying the "-a" option, the "lpfcX_lun_queue_depth" value is changed but the NVMe support remains disabled.

For the glnativefc Driver

- Execution example 1

```
# esxcli system module parameters set -m qlnativefc -p "ql2xnvmesupport=0
ql2xmaxqdepth=8"
```

When changing the value of the driver parameter "ql2xmaxqdepth", disable NVMe support at the same time. Even if NVMe support is already disabled and the "ql2xmaxqdepth" value is changed later, disable NVMe support every time.

- Execution example 2

```
# esxcli system module parameters set -m qlnativefc -p ql2xnvmesupport=0 (*1)
# esxcli system module parameters set -a -m qlnativefc -p ql2xmaxqdepth=8 (*2)
```

- *1: Disable NVMe support.
- *2: Change the value of the driver parameter "ql2xmaxqdepth". By specifying the "-a" option, the "ql2xmaxqdepth" value is changed but the N
 - By specifying the "-a" option, the "ql2xmaxqdepth" value is changed but the NVMe support remains disabled.

Notes Related to Windows Server iSCSI Connections (Including Hyper-V Environments)

If a command is issued to a disk device that is connected to a server via iSCSI, response delays occur for the command and performance degradation problems may occur.

This can be improved by disabling delayed ACK. For information on how to disable it, refer to the Windows Server manual.

Notes Related to the Disk Driver for Oracle Solaris

In Solaris 11.4, the disk driver used in the FC or iSCSI connected storage system has changed from ssd to sd.

In Solaris 11.3 and earlier, the parameter set to ssd must be changed to sd.

Note

If an OS that is Solaris 11.3 or earlier is updated to Solaris 11.4, because the ssd driver will still be used, problems will not occur.

Because the settings content is not valid for the following, problems may occur.

- The ssd driver parameter is set the same as before
- The sd driver is not reassigned to the ssd driver

In addition, it may be affected by the parameters for the sd driver set for the internal disk. As a result, business may be suspended.

- Target servers
 - SPARC Enterprise
 - SPARC Servers
- Target OS
 - Solaris 11.4

The following is comparison information between OS versions when a storage system is used.

Item	Solaris 11.3 and earlier	Solaris 11.4 and later (During a new OS install)
Driver name	ssd	sd
Physical device name (*1)	/pci@ ~ /ssd@w <i>XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX</i>	/pci@ ~ /disk@w <i>XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX</i>
Instance name	ssd1	sd1
Parameter	Definition file: /etc/driver/drv/ssd.conf Definition parameter: • ssd-config-list • throttle-max • retries-timeout	Definition file: /etc/driver/drv/sd.conf Definition parameter: • sd-config-list • throttle-max • retries-timeout • cmd-timeout
	Definition file: /etc/system Definition parameter: • ssd_max_throttle • ssd_io_time	Definition file: /etc/system Definition parameter: • sd_max_throttle • sd_io_time

Depending on the environment and requirements, the storage device (Fujitsu storage, non-Fujitsu storage, or virtual storage) that is connected using FC or iSCSI will not work as expected and the setting may not be valid.

An example of the phenomenon is shown below.

Note

For iSCSI, an MPxIO connection is a requirement.

Phenomenon 1

During a path failure of a multipath configuration, the path may take time to switch and I/O may slow down.

Environment

The storage system is connected using FC or iSCSI and the multipath is configured using the Oracle Solaris standard multipath driver (MPxIO).

Occurrence Conditions

A Solaris 11.4 or later OS is newly installed (*1) and the parameter for the ssd driver is used to perform a storage system configuration.

Configuration example to the /etc/system file

```
set ssd:ssd_io_time = 20
set ssd:ssd max throttle = 8
```

*1: Does not occur if the OS is updated from Solaris 11.3 or earlier to Solaris 11.4.

Phenomenon 2

If a load that exceeds the processing performance is applied when a Fujitsu storage system is connected, the performance is significantly reduced and I/O slows down. Note that for non-Fujitsu storage systems, in addition to significant performance reduction and I/O slowdown, I/O hang ups also occur.

Environment

The storage system is connected using FC or iSCSI.

Occurrence Conditions

A Solaris 11.4 or later OS is newly installed (*1) and the parameter for the ssd driver is used to perform a storage system configuration.

Configuration example to the /etc/system file

```
set ssd:ssd_io_time = 20
set ssd:ssd_max_throttle = 8
```

*1: Does not occur if the OS is updated from Solaris 11.3 or earlier to Solaris 11.4.

Phenomenon 3

I/O to the storage system quickly times out and takes time.

Environment

The storage system is connected using FC or iSCSI, and the internal disk is set with the sd driver parameter (*1).

Configuration example to the /etc/system file

set sd:sd_io_time = 30 (the default for Oracle Solaris is 60 seconds)

*1: This parameter can be set if PRIMECLUSTER GD is being used.

Occurrence Conditions

A Solaris 11.4 or later OS is newly installed (*2) and the parameter for the ssd driver is used to perform a storage system configuration.

Configuration example to the /etc/system file

set ssd:ssd_io_time = 20
set ssd:ssd_max_throttle = 8

*2: Does not occur if the OS is updated from Solaris 11.3 or earlier to Solaris 11.4.

How to Prevent Problems from Occurring

For Phenomena 1 to 3

For the parameter set in the ssd driver as below, it is changed to the sd driver parameter.

Item	Pre-change	Post-change
Configuration file	/etc/system (Common file for the sd and ssd driv- ers)	No change due to commonality
Configuration	ssd_io_time	sd_io_time
parameter	ssd_max_throttle	sd_max_throttle

Item	Pre-change	Post-change
Configuration file	/etc/driver/drv/ssd.conf	/etc/driver/drv/sd.conf
Configuration parameter	ssd-config-list	sd-config-list

Note that for Solaris 11.4 and later, the sd driver parameter is a common parameter for internal disks and storage systems.

If different parameter settings are required for both the internal disk and the storage system, each can be set in the following files.

- Internal disk: /etc/system file

- Storage system: /etc/driver/drv/sd.conf file

When the parameter set in /etc/system is set in /etc/driver/drv/sd.conf, the correspondence is as follows.

ltem	Pre-change	Post-change
Configuration file	/etc/system	/etc/driver/drv/sd.conf
Configuration	sd_io_time	cmd-timeout in sd-config-list
parameter	sd_max_throttle	throttle-max in sd-config-list

Note

For details of the sd-config-list parameter, refer to the following Oracle website. https://docs.oracle.com/cd/E53394_01/html/E54792/ Reference: "Appendix C Tuning Disk Target Driver Properties"

Recovery Method After Problems Occur

If the system hangs up, follow the model-specific procedure to force a panic and restart the system. After that, perform <u>"How to Prevent Problems from Occurring" (page 25)</u>.

The forced panic instructions are included in the operation for collecting the crash dump during a hang up.

Note that if an investigation is not performed, the collected crash dump can be deleted.

Notes Related to iSCSI Connections of Oracle Solaris

Workaround

Use the following command to change the conn-login-max value in the iSCSI initiator to "60".

iscsiadm modify initiator-node -T conn-login-max=60

Notes Related to the Maximum Number of Commands That Can Be Processed Simultaneously (Queue Depth)

Workaround

An optimal value is set by installing Host Utilities. In addition, for a vSphere that does not have Host Utilities, set "64" in FC/iSCSI.

 Setting the queue depth Changing the queue depth for QLogic, Emulex, and Brocade HBAs https://knowledge.broadcom.com/external/article?legacyId=1267

However, if the performance does not meet expectations, the setting can also be changed manually according to the system requirements. To change the setting, refer to the following manual to perform the calculation and setting.

- Calculating the queue depth FUJITSU Storage ETERNUS AX/HX Series SAN Configuration Guide https://sp.ts.fujitsu.com/dmsp/Publications/public/a3ca08733-a251-EN.pdf
- Setting the queue depth Changing the queue depth for QLogic, Emulex, and Brocade HBAs https://knowledge.broadcom.com/external/article?legacyId=1267

Notes for PRIMECLUSTER Configurations

The following PRIMECLUSTER functions and configurations are not supported.

- I/O fencing
- Mirroring between disk storage systems
- Optional products for PRIMECLUSTER GD (PRIMECLUSTER GD Snapshot and PRIMECLUSTER GD I/O Monitor Option)

Notes Related to the Ethernet Switch Setting

Target OS

VMware

Workaround

Configure the Ethernet switch by keeping the following points in mind.

- High availability is ensured by using two networks. Separate iSCSI traffic into different network segments.
- Hardware flow control for sending and receiving is enabled end-to-end.
- Priority flow control is disabled.
- Jumbo Frame is enabled when necessary.
- These settings must be performed for the servers, switches, and storage systems. Refer to each manual for details.

Notes Related to Linux iSCSI Connections

If a command is issued to a disk device that is connected to a server via iSCSI, response delays occur for the command and performance degradation problems may occur. As a connection configuration example, if a mixed network is used, such as an iSCSI network with a management LAN network, the occurrence of problems tends to increase.

This can be improved by disabling delayed ACK. However, depending on the type of Linux OS, disabling delayed ACK may not be possible. For information on how to disable it, refer to the Linux OS manual.

Notes Related to Access Volumes

Volumes referred to as access volumes are automatically created for the ETERNUS AB2100, ETER-NUS AB5100, ETERNUS HB1100/HB1200/HB2100/HB2200/HB2300, and ETERNUS HB5100/HB5200. Although access volumes are necessary volumes when the automatic host creation and in-band management functions are used, those functions are not supported by Fujitsu.

Delete LUN mapping for the access volumes. To delete LUN mapping, perform [Storage] > [Hosts] > [Unassign Volumes] from SANtricity System Manager, or execute the "remove lunmapping" command from SMcli.

For details, refer to "ETERNUS AB/HB series SANtricity commands: Commands A-Z". https://storage-system.fujitsu.com/manual/en/abhb-cli/index.html

Notes Related to iSCSI Connections of VMware ESXi Servers

For iSCSI connected storage systems, if operations such as file copy are performed, read or write performance problems may occur in the VMware ESXi server. For the workaround, refer to <u>"Notes Related to iSCSI Connections of VMware ESXi Servers" (page 18)</u>.

Notes Related to the Jumbo Frame Setting

Target OS

VMware

- Workaround
 - To enable Jumbo Frame, all the connected devices must support Jumbo Frame. Set an appropriate value for the various parameters (such as MTU size) of the connected devices.
 - For the Jumbo Frame setting method of devices such as LAN cards and Ethernet switches, refer to the manuals of VMware ESXi and the various devices. To reflect the setting, the server may require a restart.
 - The MTU sizes supported by the ETERNUS AB/HB are between 1,500 to 9,000 bytes. (Default MTU size: 1,500 bytes/frame)

Notes Related to the Ethernet Switch Setting

Target OS

VMware, Windows, and Linux

Workaround

Configure the Ethernet switch by keeping the following points in mind.

- High availability is ensured by using two networks. Separate iSCSI traffic into different network segments.
- Hardware flow control is enabled for the servers and switches. In addition, priority flow control is disabled.
- Jumbo Frame is enabled when necessary. To enable Jumbo Frame, it must be set for the servers, switches, and storage systems.

For the storage systems, refer to the following manual to set an appropriate MTU value. https://storage-system.fujitsu.com/manual/en/abhb/sm-hardware/configure-iscsi-ports-hardware.html

Notes Related to FC Connections of VMware ESXi Server

Target OS

VMware

Phenomenon

If NVMe support is enabled during an FC connection, duplicate WWPNs may be displayed.

```
Workaround
```

During an FC connection, disabling NVMe support is recommended. For details on how to disable NVMe support, refer to the following Broadcom website.

https://knowledge.broadcom.com/external/article?legacyId=84325

• For the lpfc Driver

- Execution example 1

esxcli system module parameters set -m lpfc -p "lpfc_enable_fc4_type=1 lpfc0_lun_queue_depth=8"

When changing the value of the driver parameter "lpfcX_lun_queue_depth", disable NVMe support at the same time. Even if NVMe support is already disabled and the "lpfcX_lun_queue_depth" value is changed later, disable NVMe support every time.

- Execution example 2

```
# esxcli system module parameters set -m lpfc -p lpfc_enable_fc4_type=1 (*1)
# esxcli system module parameters set -a -m lpfc -p lpfc0_lun_queue_depth=8 (*2)
```

*1: Disable NVMe support.

- *2: Change the value of the driver parameter "lpfcX_lun_queue_depth". By specifying the "-a" option, the "lpfcX_lun_queue_depth" value is changed but the NVMe support remains disabled.
- For the qlnativefc Driver
 - Execution example 1

```
# esxcli system module parameters set -m qlnativefc -p "ql2xnvmesupport=0
ql2xmaxqdepth=8"
```

When changing the value of the driver parameter "ql2xmaxqdepth", disable NVMe support at the same time. Even if NVMe support is already disabled and the "ql2xmaxqdepth" value is changed later, disable NVMe support every time.

- Execution example 2

```
# esxcli system module parameters set -m qlnativefc -p ql2xnvmesupport=0 (*1)
# esxcli system module parameters set -a -m qlnativefc -p ql2xmaxqdepth=8 (*2)
```

- *1: Disable NVMe support.
- *2: Change the value of the driver parameter "ql2xmaxqdepth". By specifying the "-a" option, the "ql2xmaxqdepth" value is changed but the NVMe support remains disabled.

Notes Related to VMware ClusteredVMDK

The ETERNUS AB/HB does not support VMware ClusteredVMDK.

Notes Related to the Frequent I/O Errors in the VMware Guest OS Environment

Target OS

VMware

- vSphere 8.0
- vSphere 7.0

Phenomenon

In the VMware Guest OS, frequent I/O errors occur in the storage system. If I/O errors such as system errors and file system errors occur frequently, in rare cases it may cause a kernel panic, and the VMware Guest OS may be stopped as a result.

Cause

Disk timeout value for VMware Guest OS may be incorrect. These phenomena may occur when a storage system is suspended for a short period of time (such as a path failover) during normal operation, and when the suspend time exceeds the disk timeout value of the VMware Guest OS. Workaround

If an incorrect disk timeout value is specified for VMware Guest OS, change (manually increase) the disk timeout value to avoid or reduce errors. This may prevent the VMware Guest OS from stopping due to a kernel panic.

Refer to the following sections to change settings.

- "Notes Related to the Timeout Values in the Linux Guest OS Environment on VMware" (page 31)
- <u>"Notes Related to the Timeout Values in the Windows Guest OS Environment on VMware" (page 32)</u>
- <u>"Notes Related to the Timeout Values in the Solaris (x86) Guest OS Environment on VMware"</u> (page 32)

Notes Related to the Timeout Values in the Linux Guest OS Environment on VMware

If RDM virtual disks are connected to the Linux Guest OS environment, set the timeout values to 40 seconds or longer.

Setting Example for Red Hat Enterprise Linux 8

Create the /etc/udev/rules.d/99-rdm-scsi-udev.rules file and add the following lines.

```
ACTION=="add", SUBSYSTEMS=="scsi", ATTRS{vendor}=="FUJITSU ",
ATTRS{model}=="ETERNUS_AHB", ENV{DEVTYPE}=="disk", RUN+="/bin/sh -c 'echo 40 >/
sys$DEVPATH/device/timeout'"
```

Setting Example for Red Hat Enterprise Linux 7

Create the /etc/udev/rules.d/99-rdm-scsi-udev.rules file and add the following lines.

```
ACTION=="add", SUBSYSTEMS=="scsi", ATTRS{vendor}=="FUJITSU ",
ATTRS{model}=="ETERNUS AHB", RUN+="/bin/sh -c 'echo 40 >/sys$DEVPATH/timeout'"
```

If RDM is not used for LUNs that are recognized by the Guest OS, refer to the following Broadcom website to set a timeout value.

https://knowledge.broadcom.com/external/article?legacyId=1009465

If the timeout value is not changed, the Guest OS detects a timeout faster than the host and problems such as an I/O error or unusable LUN error may occur.

For vSphere 8.0 and vSphere 7.0, install the open vmware-tools that are provided by each Linux guest OS vendor. For the installation procedure, refer to the manuals provided by each OS vendor.

Notes Related to the Timeout Values in the Windows Guest OS Environment on VMware

To set the disk I/O timeout in a Windows Guest OS environment, modify and set the following registry key. After the modification, the virtual machine must be rebooted.

[HKEY_LOCAL_MACHINE\\SYSTEM\\CurrentControlSet\\Services\\Disk] \TimeOutValue\

Setting Example

When specifying 180 seconds, add the following line.

\TimeOutValue\=dword:00000b4

Notes Related to the Timeout Values in the Solaris (x86) Guest OS Environment on VMware

In addition to the configuration of the disk I/O timeout, the bus retry and timeout settings must also be configured. For the disk timeout configuration, add the following line to the specified file.

```
/etc/system
set sd:sd_io_time=180
```

For the bus retry and timeout settings, the entries must be added. This entry differs depending on the vendor and model of the storage system. The following is an example of the added entries.

Setting Example for Solaris 10 U7 and Earlier

Setting for /kernel/drv/sd.conf

```
sd-config-list=
    "VMware Virtual disk ","netapp-sd-config",
    "FUJITSU ETERNUS_AHB ","netapp-sd-config";
netapp-sd-config=1,0x9c01,32,0,0,0,0,0,0,0,0,0,40,40,40,40,0,0,8,0,0;
```

Setting Example for Solaris 10 U8 and Later

Setting for /kernel/drv/sd.conf

```
sd-config-list=
  "VMware Virtual disk ","retries-timeout:5,retries-notready:40,retries-
busy:40,retries-reset:40";
  "FUJITSU ETERNUS_AHB ","retries-timeout:5,retries-notready:40,retries-
busy:40,retries-reset:40";
```

Note the blank padding in the vendor and device information. The vendor must be up to eight characters and the product ID must be up to 16 characters. After the configuration of these files, the virtual machine must be restarted to activate them. To confirm that the settings are enabled, use the following commands.

```
echo \"*sd_state::walk softstate|::print struct sd_lun\" | mdb -k > /tmp/sd_state.out
grep un_cmd_timeout /tmp/sd_state.out
grep un_busy_retry_count /tmp/sd_state.out
grep un_notready_retry_count /tmp/sd_state.out
grep un_reset_retry_count /tmp/sd_state.out
```

Notes Related to Path Selection Policy on VMware

If the Path Selection Policy is set to "Most Recently Used (VMware)", change "Path Selection Policy" of all storage devices (LUN) to "Round Robin (VMware)". Commands can be used to check and set it.

Check Command

#esxcli storage nmp satp rule list -s VMW_SATP_ALUA

Setting Command

```
#esxcli storage nmp satp rule add -s VMW_SATP_ALUA -V FUJITSU -M ETERNUS_AHB -c
tpgs on -P VMW PSP RR -e "Fujitsu Eternus arrays with ALUA support"
```

Notes Related to Enabling Auto Load Balancing (ALB) on VMware

Target OS

VMware

Phenomenon

In a VMware standard Native Multipathing Plug-in (NMP) environment, the path disconnects during an owner change when the Auto Load Balancing (ALB) function is operating while Auto Load Balancing is enabled in the ETERNUS AB/HB.

Cause

This is the operation specification for the combination of NMP and ALB.

Workaround

By applying the VMware Multi-Pathing plug-in for ETERNUS AB/HB, the path disconnection that occurs during an owner change when the ALB function is operating can be avoided.

Notes Related to Applying VMware Multi-Pathing plug-in for ETERNUS AB/HB

Target OS

VMware

Note

Check the support status at the following website.

https://www.fujitsu.com/global/support/products/computing/storage/download/vmware-mp-plug-in-abhb.html

Intended Use

When the ETERNUS AB/HB is added to the configuration, applying VMware Multi-Pathing plug-in for ETERNUS AB/HB is recommended to manage the non-response state due to a slowdown of the VMware ESXi host when intermittent faults occur in the path.

Use the latest supported version of the module for the VMware ESXi version being used.

The functional overview and functional enhancement details of VMware Multi-Pathing plug-in for ETERNUS AB/HB are described below.

Functional Overview

VMware Multi-Pathing plug-in for ETERNUS AB/HB is a sub plug-in of the VMware standard Native Multipathing Plug-in (NMP) used to configure multipath connections with ETERNUS storage systems.

It is also used as a Storage Array Type Plug-in (SATP) to perform error handling controls that correspond to ETERNUS storage systems.

Details about Functional Enhancements

In addition to the normal multipath functions, the path switching function that triggered in (1) to (3) below is supported.

This may reduce phenomena such as host becoming unresponsive because the path is not switched, so applying VMware Multi-Pathing plug-in for ETERNUS AB/HB is recommended.

- Switching the path when it is unresponsive Paths are switched when the I/O is unresponsive.
- (2) Enhanced diagnosis of dead paths

Paths are recovered after confirming that normal response continues for at least 20 minutes during the diagnosis.

By preventing rapid recovery of the paths with the intermittent faults, the system slowdown time can be reduced.

In an environment that does not use VMware Multi-Pathing plug-in for ETERNUS AB/HB, paths are recovered when the diagnosis succeeds just a single time.

(3) Blocking unstable paths

If the path status changes from "online" to "dead" six times within three hours after the first status transition, the path is recognized as being unstable and the status is changed to "fataldead". The "fataldead" state is not recovered with a diagnosis, but can be recovered by executing a command (*1) manually. This can prevent the continued slowdown state even if (2) cannot manage the paths with the intermittent fault.

In an environment that does not use VMware Multi-Pathing plug-in for ETERNUS AB/HB, no functions are available to detect unstable paths.

*1: The command is described in Software Information (readme.txt), which is included in the downloaded module.

For procedure to download this software, refer to the following website (contact your Fujitsu sales representative in advance).

VMware Multi-Pathing plug-in for ETERNUS AB/HB Download

https://www.fujitsu.com/global/support/products/computing/storage/download/vmware-mp-plug-in-abhb.html

For details about this software, such as the installation procedure, refer to Software Information (readme.txt).

Notes Related to the Installation of Windows Unified Host Utilities 7.1 to Windows Server 2019

Phenomenon

If MPIO (OS standard multipath driver) is not enabled, installation of Windows Unified Host Utilities 7.1 to Windows Server 2019 may fail.

Workaround

Even for single path configurations, install SANtricity Windows DSM and enable the multipath function.

Notes Related to Disk Timeouts on Virtual Machines Running on Hyper-V

To set the disk I/O timeout in a virtual machine that is running on Hyper-V, modify and set the following registry key. The disk timeout must be set to a minimum of 180 seconds.

[HKEY_LOCAL_MACHINE\\SYSTEM\\CurrentControlSet\\Services\\Disk] \TimeOutValue\

Setting Example

When specifying 180 seconds, add the following line.

\TimeOutValue\=dword:00000b4

Notes Related to Upgrading the SANtricity OS Software in Hyper-V Environments for Windows Server 2016 and Later

Target Interfaces

FC (vFC), iSCSI, and SAS

Phenomenon

If the SANtricity OS software upgrade is executed, virtual machines that have virtual disks mapped through Hyper-V may lose I/O access. However, commands sent to the physical path are usually held by Windows Server (OS) for 75 seconds.

Workaround

The workaround is to stop the virtual machine before the SANtricity OS software upgrade. It is restored if the virtual machine is restarted.

Notes Related to Connections with a Windows Server

Target Environments

- Windows Server (including Hyper-V and Windows Server used with Guest OS in a virtual environment)
- ETERNUS AB/HB
- FC/iSCSI/SAS/NVMe
- Direct connection or connection via a switch
- SAN connections (Localboot/SANboot)

Phenomenon

If Windows Server and the ETERNUS AB/HB are connected, and when Windows Server is rebooted after the SANtricity OS software is applied to the storage system, the status of the disks on Windows Server may become offline.

Checking the Disk Status

Use the following procedure to check the disk status on Windows Server.

Procedure **>>**

- 1 Click [Start] and select [Management Tool] > [Computer Management].
- **2** Open [Disk Management] in the left pane to check the disk state.
Cause

Windows Server uses the edition number of SANtricity OS provided by the storage system as a disk ID (instance ID). This occurs according to the specifications of Windows Server. When the OS is started, if the instance ID of the disk has been changed, the OS recognizes the disk as a new disk.

In addition, the disk status is set at system startup. The status that is set varies depending on the path configuration.

- For single path configurations The disk status is determined according to the SAN Policy settings.
- For multipath configurations The disk status (online or offline) before configuring the multipath is taken over regardless of the SAN Policy settings.

For the edition number of SANtricity OS of the ETERNUS AB/HB, the version that has been changed by updating SANtricity OS is returned. This changes the ID information of disks and causes this phenomenon.

Workaround

The occurrence condition and the workaround differ depending on the path configuration of Windows Server.

To prevent the disk in single-path configurations from going offline after the SANtricity OS software is applied, temporarily change the SAN Policy setting before applying the SANtricity OS software. For multipath configurations, there is no workaround. The procedure in <u>"Recovery Method After Problems Occur" (page 38)</u> must be performed to recover from the offline status.

The workaround for each configuration is described below.

• For Single Path Configurations

The offline status can be avoided by changing the SAN Policy setting to "Online All" only when upgrading the SANtricity OS software. If operations are possible with the SAN Policy setting set to "Online All", <u>Step 4</u> is not required.

The following describes the workaround.

Procedure

- 1 Check the current SAN Policy settings.
 - 1-1 Execute the "diskpart" command in the command prompt.
 - 1-2 The prompt changes as shown below. Enter "san" and press the [Enter] key. Execution example

DISKPART> san

- 1-3 One of the following SAN Policies appears.
 - Offline Shared
 - Offline All
 - Online All
- 1-4 Record the current setting value. The recorded value is used in <u>Step 4</u> to restore the SAN Policy setting.
- **2** Change the SAN Policy setting.
 - 2-1 Confirm that the prompt is "DISKPART", enter "san policy=onlineall" and press the [Enter] key.

Execution example

```
DISKPART> san policy=onlineall
```

- 2-2 To apply the changed SAN Policy settings, reboot Windows Server.
- 2-3 Execute the "diskpart" command in the command prompt again and confirm that the SAN Policy is set to "Online All". Execution example

```
DISKPART> san
SAN Policy : Online All
```

- **3** Upgrade the SANtricity OS software.
 - 3-1 Upgrade the SANtricity OS software in the ETERNUS AB/HB.
 - 3-2 To get OS to recognize the new instance ID, reboot Windows Server.
- 4 Restore the SAN Policy setting.
 - 4-1 Restore the SAN Policy setting to the previous value. Execution example

DISKPART> san policy=Offline Shared

- 4-2 To apply the SAN Policy setting, reboot Windows Server.
- 4-3 Execute the "diskpart" command again in the command prompt and confirm that the previous value is specified for the SAN Policy setting. Execution example

```
DISKPART> san
SAN Policy : Offline Shared
```

• For Multipath Configurations

When the multipathing of an online disk is set up during the configuration of the environment, the multipath disk starts up in online status after the SANtricity OS software is upgraded. This is because the disk status immediately prior to configuration of the multipath is inherited. When the multipathing of an offline disk is set up, the multipath disk starts up in offline status after the SANtricity OS software is upgraded. There are no measures that can be taken (such as a setting change) to prevent the disk from going offline after the environment is configured. Perform the procedure described in <u>"Recovery Method After Problems Occur" (page 38)</u> if the disk status is offline after the SANtricity OS software upgrade.

Recovery Method After Problems Occur

When the OS Can Be Started Up

Manually change the offline disks to online by following the procedure below.

Procedure

- 1 Click [Start] and select [Management Tool] > [Computer Management].
- 2 Select each offline disk in [Disk Management], then right-click the selected disk to change the status to online.

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When the OS Cannot Be Started Up

If the Active Directory database is located in a disk other than the OS area, the OS may not be able to start up because the disk is offline and the OS cannot access the Active Directory database.

In this case, the disk can be recovered by starting the OS in the Directory Services Restore Mode and changing the disk status to online.

The procedure for recovering is as follows:

Procedure

- **1** Start the server.
- 2 Press the [F8] key on the server start-up screen.
- **3** The Advanced Boot Options screen appears.
- 4 Select Directory Services Restore Mode.
- **5** Log in as Administrator after the OS starts.
- **6** Select [Management Tool] > [Computer Management].
- 7 Select each offline disk in [Disk Management], then right-click the selected disk to change the status to online.
- 8 Restart the OS.

Notes Related to Windows Server iSCSI Connections (Including Hyper-V Environments)

If a command is issued to a disk device that is connected to a server via iSCSI, response delays occur for the command and performance degradation problems may occur. This can be improved by disabling delayed ACK. For information on how to disable it, refer to the Windows Server manual.

Notes Related to the Disk Driver for Oracle Solaris

For FC and iSCSI connections in Solaris 11.4, problems may occur depending on the disk driver that is used. For details, refer to <u>"Notes Related to the Disk Driver for Oracle Solaris" (page 23)</u>.

Notes Related to Automatic Load Balancing of Oracle Solaris

Oracle Solaris does not support Automatic Load Balancing. Therefore, the Automatic Load Balancing function does not work even though it is enabled by default. However, when using a multipath diagnostic program, make sure to disable Automatic Load Balancing.

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Notes Related to the Volume Relocation of Oracle Solaris

Phenomenon

Even if a volume redistribution is performed from SANtricity System Manager, the preferred controller owner may not return for some volumes.

Impact on the Business

- In Recovery Guru of SANtricity System Manager, "Volume Not On Preferred Path" is displayed.
- An equivalent I/O performance prior to the occurrence of the phenomenon may not be obtained.

Details of the Phenomenon

If the <u>"Environment"</u> and <u>"Occurrence Conditions"</u> described later are satisfied, the Access State (*1) on the preferred path side does not return to "active optimized" using the Solaris standard Multipath (MPxIO).

If this phenomenon occurs, "Volume Not On Preferred Path" is displayed in RecoveryGuru of SANtricity System Manager.

- *1: The Access State can be confirmed with the following command.
 - Example:

```
# mpathadm show lu /dev/rdsk/c0t6D039EA00018A6CB00001B17621FF20Bd0s0
Logical Unit: /dev/rdsk/c0t6D039EA00018A6CB00001B17621FF20Bd0s2
       mpath-support: libmpscsi_vhci.so
       Vendor: FUJITSU
       Product: ETERNUS AHB
       Revision: 0871
           (omitted)
       Target Port Groups:
              ID: 1
              Explicit Failover: yes
              Access State: active not optimized
              Target Ports:
                      Name: 2015d039ea18a991
                      Relative ID: 32769
              ID: 0
              Explicit Failover: yes
              Access State: active optimized
              Target Ports:
                      Name: 2014d039ea18a991
                      Relative ID: 1
```

Environment

Occurs when all the following conditions are satisfied.

- (1) An ETERNUS AB/HB series is connected. (*1)
- (2) The storage system in (1) is connected using the Solaris standard Multipath (MPxIO).
- (3) The Multipath Diagnostic Program is being used. (*2)

*1: To check whether the server is connected to the ETERNUS AB/HB series, use the following command. If it is connected to the ETERNUS AB/HB series, "ETERNUS_AHB" is displayed in "Product:".

```
# mpathadm show lu /dev/rdsk/c0t6D039EA00018A6CB00001B17621FF20Bd0s0
Logical Unit: /dev/rdsk/c0t6D039EA00018A6CB00001B17621FF20Bd0s2
mpath-support: libmpscsi_vhci.so
Vendor: FUJITSU
Product: ETERNUS AHB
```

*2: To check whether the Multipath Diagnostic Program is being used, use the following command. It is in use if "fjsvpdiagAHBX" processes are displayed using grep.

```
# ps -ef|grep fjsvpdiagAHBX
root 27408 27407 0 15:53:50 0:00 /opt/FJSVpdiag/bin/fjsvpdiagAHBX
root 27407 1 0 15:53:50 0:00 /opt/FJSVpdiag/bin/fjsvpdiagAHBX
```

Occurrence Conditions

When a volume redistribution is performed from SANtricity System Manager.

Cause

If "Redistribute volumes" is performed from SANtricity System Manager of the ETERRNUS AB/HB series, a sense notification is sent to the server from the ETERNUS AB/HB. In an environment in which the Multipath Diagnostic Program is not running, the MPxIO receives the sense for the I/O it issued and switches the path status. However, if the Multipath Diagnostic Program is running, the sense may be received for the diagnostic I/O that is issued by the program without notifying the sense to the MPxIO and the state cannot return to the Access State.

Workaround

How to Prevent Problems from Occurring

Before the redistribution, stop the diagnostic program. Execution example:

Procedure

1 Confirm that a redistribution can be performed.

In SANtricity System Manager, make sure [Preferred Owner] and [Current Owner] are different.

	Preferred Owner	Current Owner
Volume01	Controller A	Controller B
Volume02	Controller A	Controller B

If the volumes in [Preferred Owner] and [Current Owner] are different as in the above table, a redistribution can be performed. For information on how to perform the operation in SANtricity System Manager, check the manuals such as the online help.

- **2** Stop the Multipath Diagnostic Program.
 - 2-1 Execute the following command as the root user.

/opt/FJSVpdiag/etc/S99pdiagAHBX stop

2-2 Make sure there are no resident processes (/opt/FJSVpdiag/bin/fjsvpdiagAHBX) running. Example:

```
# ps -ef | grep fjsvpdiagAHBX
```

- **3** Execute "Redistribution" from SANtricity System Manager. For information on how to perform the operation in SANtricity System Manager, check the manuals such as the online help.
- 4 Confirm the Access State. Confirm that the Access State on the preferred path is "active optimized" for all the volumes.
 - 4-1 Confirm the Access State with the "mpathadm" command.

Execution example for mpathadm:

```
# mpathadm show lu /dev/rdsk/c0t6D039EA00018A6CB00001B17621FF20Bd0s0
Logical Unit: /dev/rdsk/c0t6D039EA00018A6CB00001B17621FF20Bd0s2
   mpath-support: libmpscsi_vhci.so
   Vendor: FUJITSU
   Product: ETERNUS AHB
   Revision: 0871
       (omitted)
   Target Port Groups:
         ID: 1
         Explicit Failover: yes
         Access State: active not optimized (*1)
         Target Ports:
                 Name: 2015d039ea18a991 (*2)
                 Relative ID: 32769
         ID: 0
         Explicit Failover: yes
         Access State: active optimized (*3)
         Target Ports:
                 Name: 2014d039ea18a991 (*4)
                 Relative ID: 1
```

In the above example, the "active optimized" (*3) port of the logical unit "/dev/rdsk/ c0t6D039EA00018A6CB00001B17621FF20Bd0s2" is the target port whose ID is "0" and Name is "2014d039ea18a991" (*4). Use SANtricity System Manager to confirm that this path is [Preferred Owner] and [Current Owner].

- *1: Path notation on the controller side that does not have preferred ownership
- *2: World Wide Port Identifier on the controller side that does not have preferred ownership
- *3: Path notation on the controller side that has preferred ownership
- *4: World Wide Port Identifier on the controller side that has preferred ownership
- 4-2 Check which controller side is the active optimized (*5) path.

Click the following in order in [Hardware] of SANtricity System Manager.

Show front of shelf > Controller A or Controller B > View settings > Host interfaces > Show more settings

In the displayed [Fibre Channel host ports], scroll right to World Wide Port Identifier and search for Target Ports: Name (*6).

- *5: The controller side that has preferred ownership
- *6: World Wide Port Identifier on the controller side that has preferred ownership
- 4-3 Open the [Volume Settings] screen of Logical Unit.

In Storage > Volumes, select the corresponding volume, and click View/Edit Settings to open Volume Settings.

If the volume name that corresponds to Logical Unit is not known, find it with the following procedure.

In Storage > Volumes, select the volumes in order from the top, and click View/Edit Settings to open Volume Settings. Find the volume that matches both the World-Wide Identifier (WWID) of the [Volume Settings] screen (excluding ":") and the Logical Unit shown by the "mpathadm" command (excluding /dev/rdsk/c0t and d0s2).

If Logical Unit and World-Wide identifier (WWID) are displayed as below, it is the corresponding volume. Example:

```
Logical Unit: /dev/rdsk/c0t6D039EA00018A6CB00001B17621FF20Bd0s2
World-Wide Identifier (WWID) : 6D:03:9E:A0:00:18:A6:CB:00:00:1B:17:62:1F:F2:0B
```

- 4-4 In [Controller ownership] of [Advanced] on the [Volume Settings] screen, confirm that both preferred owner and current owner match the controller in <u>Step 4-2</u>. If they differ, "Redistribute volumes" may have failed.
 However, it may take 10 to 15 minutes before the latest Access State applied if there is no I/O access. Wait 15 minutes and try again from <u>Step 4</u> (Confirm the Access State).
- **5** Start the Multipath Diagnostic Program.
 - 5-1 Execute the following command as the root user.

/opt/FJSVpdiag/etc/S99pdiagAHBX

5-2 Confirm that the resident processes (/opt/FJSVpdiag/bin/fjsvpdiagAHBX) are running.

```
# ps -ef | grep fjsvpdiagAHBX
root 10303 10302 0 17:53:52 ? 0:00 /opt/FJSVpdiag/bin/fjsvpdiagAHBX
root 10302 1 0 17:53:52 ? 0:00 /opt/FJSVpdiag/bin/fjsvpdiagAHBX
```

Recovery Method After Problems Occur

Refer to <u>"How to Prevent Problems from Occurring"</u>, and perform the volume relocation again.

Notes Related to Configurations Where a Server Is Connected to a Single Controller Only

For configurations where a server is connected to a single controller only, errors are output (by Recovery Guru). However, only errors are output and there is no effect on the operation of the storage system.

Phenomenon

The following errors are output.

- Host Redundancy Lost
- Host Multipath Driver Incorrect
- Volume Not On Preferred Path

Workaround

To prevent the errors from being output, set the Automatic Load Balancing to disable and the host connectivity report to disable.

Notes Related to the Maximum Number of Commands That Can Be Processed Simultaneously (Queue Depth)

Workaround

The maximum number of commands that can be processed simultaneously (Queue Depth) is 2,048 per controller. Set this value on the server side so that the maximum value is not exceeded. For the setting method, refer to the server manual.

Notes Related to LAN Environments

Phenomenon

Environments where the iSCSI LAN is not configured with a dedicated network have the following effects.

- Processing delays may occur on mutual networks due to traffic conflicts.
- In terms of security, problems such as SAN data leakage may occur.

Workaround

Configure the iSCSI LAN so that it is on a dedicated network by separating the IP address segment from the business LAN and the administration LAN (such as separating the paths physically or in the VLAN).

Notes Related to Server Connections for Oracle Solaris

If a load consolidation occurs in the controllers that control the volumes in the server connected to the ETERNUS AB/HB, the preferred controller owner may not be automatically returned.

The following example conditions show when a load consolidation occurs:

- When servers and switches fail
- When the connected cables fail or are disconnected
- When a path is switched from the server
- When SANtricity OS is upgraded
- Target OS
 - Oracle Solaris
- Phenomenon

The following phenomena occur.

- The "Volume Not On Preferred Path" message appears in Recovery Guru of SANtricity System Manager.
- If there are some volumes whose preferred controller owner has not been returned, an equivalent I/O performance prior to the occurrence of the phenomenon may not be obtained.

Impact on the Business

The data access performance may be reduced.

Environment

Server	OS
SPARC Enterprise SPARC Servers	Solaris

Occurrence Conditions

This phenomenon occurs when multipath is configured and the controller that controls volumes in an Oracle Solaris environment is load-consolidated.

Cause

This occurs due to the specified behavior in the ETERNUS AB/HB series when Oracle Solaris standard multipath driver (MPxIO) is used.

Workaround

How to Prevent Problems from Occurring

There is no workaround.

Recovery Method After Problems Occur

Execute the "Redistribute volumes" function on SANtricity System Manager of the ETERNUS AB/ HB.

Perform the following procedure.

Procedure

- 1 Access SANtricity System Manager and select Storage > Volumes.
- 2 Select More > Redistribute volumes.
- **3** In the [Redistribute volumes] screen, enter "redistribute" and execute the command.

- 444

Note

- For the descriptions about each function, the checking method of the setting, and the details about the procedure, refer to the online help at the following URL.
 - For SANtricity OS version 11.70.3
 Fujitsu manual site (https://www.fujitsu.com/global/support/products/computing/storage/ manuals-list.html)

Select "SANtricity 11.7 System Manager (CA08871-192)" and follow the sections described below.

Volumes and workloads > Manage volumes > Redistribute volumes

- For SANtricity OS versions 11.70.2 and earlier

From SANtricity System Manager, select Help > Help Contents, and follow the descriptions below.

- Storage > Volumes > How tos > Manage volumes > Redistribute volumes
- When using Oracle Solaris, also check <u>"Notes Related to the Volume Relocation of Oracle Solaris" (page 40)</u>.

Notes for PRIMECLUSTER Configurations

The following PRIMECLUSTER functions and configurations are not supported.

- I/O fencing
- Mirroring between disk storage systems
- Optional products for PRIMECLUSTER GD (PRIMECLUSTER GD Snapshot and PRIMECLUSTER GD I/O Monitor Option)

Notes for Redundant Path Configurations

To configure multiple host interfaces that exist in a server with redundant paths, both controllers must be connected and configured with the same number of paths in "Host Settings" to maintain controller redundancy.

If the controllers used for host access paths are not evenly distributed, the following errors are output.

- Host Redundancy Lost
- Host Multipath Driver Incorrect
- Volume Not On Preferred Path

Notes Related to Hosts and Host Clusters

The ETERNUS AB/HB does not support the following.

- Automatic creation of hosts
- In-band management

Notes Related to iSCSI 25Gbps/10Gbps Connections

Target Storage System

The ETERNUS AB/HB where 25Gbps/10Gbps iSCSI host interface cards (HICs) are installed

Caution

Onboard iSCSI ports are excluded.

Other Target Components

- 25Gbps/10Gbps iSCSI switches
- 25Gbps/10Gbps iSCSI converged network adapters (CNAs) or 25Gbps/10Gbps iSCSI network interface cards (NICs)

Phenomenon

The 25Gbps/10Gbps iSCSI host interface card (HIC) in the ETERNUS AB/HB may not connect to the host via iSCSI connections.

Cause

The 25Gbps/10Gbps iSCSI host interface card (HIC) in the ETERNUS AB/HB does not support auto negotiation or the Forward Error Correction (FEC) (*1) of the auto negotiation. *1: The FEC mode is disabled by default.

Workaround

 Specify the communication speed of the 25Gbps/10Gbps iSCSI host interface card (HIC) as the required fixed value using SANtricity System Manager of the ETERNUS AB/HB. To do so, perform the following procedure.

Procedure

- 1 Access SANtricity System Manager and select Settings > System.
- 2 Select iSCSI settings > Configure iSCSI ports.
- **3** Select Controller A or Controller B and click [Next].
- 4 Select an interface (such as "HIC 1, Port 0c") on the host interface card (HIC) and click [Next].
- **5** From the [Configured ethernet port speed] drop-down list, select "25Gbps" or "10Gbps". Confirm that communication speed for each port is the same value. Note that setting a different speed for each port is not allowed.
- 6 Click [Next].
- 7 Configure the IPv4 network settings as required and click [Next].
- 8 Configure the IPv6 network settings as required and click [Finish].

• In the iSCSI switch settings, fix the port speed (25Gbps or 10Gbps) and disable the Forward Error Correction (FEC) mode. The procedure to disable the FEC mode varies depending on the switch. Refer to the manuals for the switches to be used.

Notes Related to the Configuration of IP Addresses

Target SANtricity OS

SANtricity 11.60.2 to 11.80

Caution

Support for SANtricity 11.60.x has ended.

Phenomenon

If an arbitrary IP address is assigned to the iSCSI network settings or the management port for the storage system network, an error message is output to SANtricity System Manager and the IP address may not be set.

"The operation cannot complete because of an incorrect parameter in the command sent to the controller. Please retry the operation. If this message persists, contact your Technical Support Representitive. (API 4)"

Cause

SANtricity OS has reserved IP addresses for internal operations. These addresses cannot be assigned as arbitrary IP addresses for the storage system, such as for the iSCSI and management ports.

The following IP addresses cannot be assigned.

- SANtricity 11.60.2 to 11.70.5
 - IPv4 address 192.0.0.0/17 (192.0.0.0 to 192.0.127.255)
 - IPv6 address fd94:29f8:cf58::/48

SANtricity 11.80 and Later

- IPv4 address 192.0.0.0/22 (192.0.0.1 to 192.0.3.255)
- IPv6 address fd94:29f8:cf58:1::2/48

Workaround

Assign an IP address other than the IP addresses that cannot be assigned.

Storage System Configuration Change for the Administrator Due to HBA Replacement

For an HBA replacement due to an HBA configuration change or HBA failure, addition or deletion work of the WWN (hereinafter referred to as the "host port") in SANtricity System Manager is required.

In addition, when configuring Fabric, changing of the zone setting in the switch may be required. Whether or not the configuration change is required depends on the zone setting method.

Advance Preparation

Before performing the work, check the following information.

- The hostname of the change target HBA
- The WWN assigned to the host port of the change target HBA
- The label attached to the host port of the change target HBA
- The WWN of the new HBA

HBA Replacement

Perform the HBA replacement according to the HBA replacement procedure of the server. Make sure to refer to the server manual to perform the replacement work.

Host Settings

After the HBA replacement, perform the setting changes in the host settings.

- Delete the host port to be replaced on the target host.
- Add a new HBA host port to the target host.

If zoning is set on the server and storage system, when a host port is being added, the new HBA host port that is displayed can be selected.

Connection Confirmation of the Server and Storage System

Make sure the disks are recognized by the OS in the same way as before the replacement.

- For RHEL
 - Check the disks with #multipath -ll.
- For VMware
 - Check the device from the storage adapter of vCenter.
- For Windows
 Check the disks from Disk Management.

Notes When a Marvel (Qlogic) Made FC HBA Is Used

Phenomenon

In a SAN Boot configuration, if the access path to the LUN where the OS is installed is only on the controller side that is not displayed in [Current Owner], the OS may fail to boot.

• Example of a system state where this phenomenon has occurred If the controller (Ctrl) that owns OS LUN#0 is A, the access path between HBA 0 and Ctrl A is disconnected for some reason.



Target

The SAN Boot configuration when the PY-FC412/411, PY-FC342/341, or PY-FC322/321 is used.

Cause

Because the LUN in the path on the controller side that is not displayed in [Current Owner] is not recognized by the UEFI of PRIMERGY, PRIMERGY cannot access the LUN in the path on the controller side that is not displayed in [Current Owner].

However, because the OS recognizes the LUN from [Current Owner] and non [Current Owner] controller paths, once the OS is started, a redundant configuration can be created without any problems.

Workaround

When booting the server, make sure the access path of the LUN where the OS is installed is connected to a controller displayed in [Current Owner].

[Current Owner] can be changed from SANtricity System Manager of the ETERNUS AB/HB.

· System state where this phenomenon does not occur Both access paths are normal



• If the controller (Ctrl) that owns OS LUN#0 is A, the path between HBA 0 and Ctrl A is normal



Example of a Possible Occurrence

In a multipath configuration that includes both controllers, if the path on the controller side (or the [Current Owner] for the OS LUN) is disconnected, this phenomenon occurs because only the path on the non [Current Owner] side has access to the LUN.

Therefore, this event will not occur during startup, or when the system, such as the path, is normal.

Impact on the Systems that Are Operating

Impact to the system after startup has not been confirmed.

5. Setup

NVMe-oF Setup (ETERNUS AX/AC/HX)

ETERNUS AX/AC/HX

Host OS	Setup procedure
RHEL	Refer to "NVMe-oF Host Configurations" at the following URL.
SUSE	https://docs.netapp.com/us-en/ontap-sanhost/index.html
Oracle Linux	
VMware ESXi	
Windows	

FCP and iSCSI Setup (ETERNUS AX/AC/HX)

ETERNUS AX/AC/HX

Host OS	Setup procedure
RHEL	Refer to "FCP and iSCSI Host Configurations" at the following
SUSE	URL. https://docs.petapp.com/us-en/ontap-saphost/index.html
Oracle Linux	https://docs.netapp.com/os-en/ontap-sannos/index.ntmt
VMware ESXi	
Citrix	
Veritas	
CentOS	
Windows	
AIX and PowerVM/VIOS	
HP-UX	
Solaris	

ETERNUS AX/AC/HX Setup Procedure

Configuration Diagram (Common to Linux, VMware, Windows)

The following shows a connection configuration example.

FC Connection

Note

For FC connections, Direct Attach is not supported.

- Configuration diagram (2-node server, switch connection)



- Configuration diagram (1-node server, switch connection)



- iSCSI Connection
 - Configuration diagram (2-node server, switch connection)



- Configuration diagram (1-node server, switch connection)



- Configuration diagram (2-node server, direct connection)



- Configuration diagram (1-node server, direct connection)



Linux (FC Connections)

- (1) Connecting the Linux server and the ETERNUS AX/AC/HX Use an FC cable to connect the Linux server (HBA port) and the ETERNUS AX/AC/HX (HIC port) directly or via a switch.
- (2) Setting and checking the Multipath Software
 - For RHEL 9/8/7 or Oracle Linux
 - Preparations

The device-mapper multipath uses the Red Hat Package Manager (RPM). Check that the "device-mapper multipath" package is installed. If it is not installed, install it before setting the multipaths. Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file. Create a configuration file as follows.

```
Procedure
```

Execute the "mpathconf" command.
 Executing this command registers multipath daemon in Services and creates the configuration file (/etc/multipath.conf).

```
# mpathconf --enable
```

If the configuration file is not created when command above is executed, copy the "/usr/ share/doc/device-mapper-multipath-X.X.X/multipath.conf" file in the "/etc" directory and then execute the "mpathconf --enable" command again.

2 If any internal disks or other devices are to be excluded from the multipath configuration, specify the device names in the "blacklist" section. If required, refer to the Red Hat website for details. Also refer to the Red Hat website for reference purposes when Oracle Linux is used.

```
blacklist {
}
```

3 Confirm that the following description is present.

- *1: For "user_friendly_names", "no" can be specified as necessary for middleware or applications.
- *2: Add the "queue_without_daemon no" line for iSCSI connections.
- *3: If there is a "find_multipaths yes" line, add a "#" to the beginning of the line to comment out the line.

Caution

Enter a space between "defaults" and "{".

4 Add the following lines at the end of the file. Example: ETERNUS AX/AC/HX

```
devices {
       device {
                                    "NETAPP"
              vendor
                                    "LUN C-Mode"
             product
                                    - group_by_prio
              path_grouping_policy
                                    yes
              detect_prio
              prio
                                     - rdac
              path_checker
                                    - rdac
              hardware_handler
                                   - 1 rdac"
              failback
                                    immediate
              teatures - 2 pg_init_retries 50
no_path_retry - 30
              retain_attached_hw_handler yes
              product_blacklist - Universal Xport
              }
       }
```

Caution

- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".

Enabling the device-mapper multipath

Enable the device-mapper multipath.

Execute the following command. Check that the multipathd can be started normally after executing the command.

systemctl start multipathd.service

If multipathd is already running, perform a reload.

systemctl reload multipathd.service

Rebooting the Linux Server

Reboot the Linux server.

- For SLES 11 or Later
 - Preparations

The device-mapper multipath uses the Red Hat Package Manager (RPM). If the RPM versions are not listed in the Server Support Matrix, use the RPM supplied as standard in the OS. Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file. Create a configuration file as follows.

```
Procedure
```

1 Copy the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file in the "/etc" directory.

```
#cp/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic /
etc/multipath.conf
```

If the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file does not exist, create the "/etc/multipath.conf" file according to <u>Step 2</u>.

Add the following lines to the file.Add the following lines at the end of the "defaults" section.

```
defaults {
    user_friendly_names yes
    }
```

Add the following lines at the end of the "devices" section. Example: ETERNUS AX/AC/HX

```
devices {
        device {
                                          "NETAPP"
                vendor
                                         "LUN C-Mode"
                product
                path_grouping_policy
                                        group_by_prio
                detect_prio
                                          yes
                prio
                                         rdac
                path_checker
                                         rdac
                hardware handler
                                         "1 rdac"
                failback
                                        immediate
                                         "2 pg_init_retries 50"
                features
                no_path_retry
                                         20
                retain attached hw handler yes
        }
```

Caution

- · Enter a space between "defaults" and "{".
- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".
- For SLES 12 or later, if any internal disks are to be excluded from the multipath configuration, make sure to specify the device names in the "blacklist" section.



Enabling the device-mapper multipath

Enable the device-mapper multipath. This section describes the procedure for SUSE Linux Enterprise Server 12 and later.

```
1 Create an initial RAM disk image file to match the kernel being used.
Refer to manuals supplied with the Fibre Channel cards for details.
```

2 Execute the following command.

```
# systemctl enable multipathd.service
# systemctl start multipathd.service
```



Procedure >> -

Reboot the Linux server.

Caution

For SLES 15, the OS may not start when the system is rebooted after multipathing is configured. In this case, recreate the initial RAM disk.

Checking the device-mapper multipath

- Checking the post device-mapper multipath devices Execute the following command to perform various checks on the devices after the device-mapper multipath has been enabled.

ls -l /dev/mapper/

- Checking the device-mapper multipath status Execute the following command to check the path status. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

multipath -ll

(3) Setting the FC switch

When the server and the ETERNUS AX/AC/HX are connected via a switch, set the zoning of the FC switch.

(4) Installing the driver

Install the appropriate driver for the Fibre Channel card being used. However, if the Linux standard Multipath Driver is used, installation is not required.

(5) Setting the ETERNUS AX/AC/HX

Perform the SAN connection (SAN management) settings for ONTAP. For the setting method, refer to the following manual. https://storage-system.fujitsu.com/manual/en/axhx/introduction-concepts/index.html

(6) Recognizing Linux volumes

Use Linux commands to confirm that the volumes in the ETERNUS AX/AC/HX are recognized by OS.

Linux (iSCSI Connections)

- (1) Connecting the server and the ETERNUS AX/AC/HX Use a LAN cable (such as an optical cable) to connect the Linux server (NIC port) and the ETER-NUS AX/AC/HX (HIC port) directly or via a switch.
- (2) Setting and checking the Multipath Software
 - For RHEL 9/8/7 or Oracle Linux
 - Preparations

The device-mapper multipath uses the Red Hat Package Manager (RPM). Check that the "device-mapper multipath" package is installed. If it is not installed, install it before setting the multipaths.

Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file. Create a configuration file as follows.

Procedure

1 Execute the "mpathconf" command. Executing this command registers multipath daemon in Services and creates the configuration file (/etc/multipath.conf).

mpathconf --enable

If the configuration file is not created when the command above is executed, copy the "/usr/share/doc/device-mapper-multipath-X.X.X/multipath.conf" file in the "/etc" directory and then execute the "mpathconf --enable" command again.

2 If any internal disks or other devices are to be excluded from the multipath configuration, specify the device names in the "blacklist" section. If required, refer to the Red Hat website for details. Also refer to the Red Hat website for reference purposes when Oracle Linux is used.

```
blacklist {
}
```

3 Confirm that the following description is present.

- *1: For "user_friendly_names", "no" can be specified as necessary for middleware or applications.
- *2: Add the "queue_without_daemon no" line for iSCSI connections.
- *3: If there is a "find_multipaths yes" line, add a "#" to the beginning of the line to comment out the line.

Caution

Enter a space between "defaults" and "{".

4 Add the following lines at the end of the file. Example: ETERNUS AX/AC/HX

```
devices {
        device {
                                       "NETAPP"
               vendor
                                      "LUN C-Mode"
               product
                                      - group_by_prio
               path_grouping_policy
               detect_prio
                                      yes
               prio
                                        - rdac
               path checker
                                       - rdac
               hardware_handler
                                       - 1 rdac"
                                       immediate
               failback
               features
                                        - 2 pg init retries 50
                                       - 30
               no_path_retry
               retain_attached_hw_handler yes
               product blacklist
                                        - Universal Xport
        }
```

Caution

- · Enter a space between "devices" and "{".
- Enter a space between "device" and "{".

• Enabling the device-mapper multipath

Enable the device-mapper multipath.

Execute the following command. Check that the multipathd can be started normally after executing the command.

systemctl start multipathd.service

If the multipathd is already started, reload it.

systemctl reload multipathd.service

Rebooting the Linux Server

Reboot the Linux server.

shutdown -r now

- Checking the device-mapper multipath
 - Checking the post device-mapper multipath devices Execute the following command to perform various checks on the devices after the device-mapper multipath has been enabled.

ls -l /dev/mapper/

- Checking the device-mapper multipath status Execute the following command to check the path status. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

```
# multipath -11
```

- For SLES 11 or Later
 - Preparations

The device-mapper multipath uses the Red Hat Package Manager (RPM). If the RPM versions are not listed in the Server Support Matrix, use the RPM supplied as standard in the OS.

Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file. Create a configuration file as follows.

```
Procedure >>
```

1 Copy the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file in the "/etc" directory.

```
#cp/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic /
etc/multipath.conf
```

If the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file does not exist, create the "/etc/multipath.conf" file according to <u>Step 2</u>.

Add the following lines to the file.Add the following lines at the end of the "defaults" section.

```
defaults {
    user_friendly_names yes
    }
```

Add the following lines at the end of the "devices" section. Example: ETERNUS AX/AC/HX

devices {	
device {	
vendor	"NETAPP"
product	"LUN C-Mode"
path_grouping_policy	group_by_prio
detect_prio	yes
prio	rdac
path_checker	rdac
hardware_handler	"1 rdac"
failback	immediate
features	"2 pg_init_retries 50"
no_path_retry	20
retain_attached_hw_handler	yes
}	
}	

Caution

- Enter a space between "defaults" and "{".
- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".
- For SLES 12 or later, if any internal disks are to be excluded from the multipath configuration, make sure to specify the device names in the "blacklist" section.



Enabling the device-mapper multipath

Enable the device-mapper multipath. This section describes the procedure for SUSE Linux Enterprise Server 12 and later.

```
1 Create an initial RAM disk image file to match the kernel being used.
Refer to manuals supplied with the Fibre Channel cards for details.
```

2 Execute the following command.

```
# systemctl enable multipathd.service
# systemctl start multipathd.service
```

Rebooting the Linux Server

Procedure >> -

Reboot the Linux server.

Caution

For SLES 15, the OS may not start when the system is rebooted after multipathing is configured. In this case, recreate the initial RAM disk.

Checking the device-mapper multipath

Checking the post device-mapper multipath devices
 Execute the following command to perform various checks on the devices after the device-mapper multipath has been enabled.

```
# ls -l /dev/mapper/
```

- Checking the device-mapper multipath status Execute the following command to check the path status. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

```
# multipath -11
```

(3) Setting the Ethernet Switch

If the server and the ETERNUS AX/AC/HX are connected via a switch, set the LAN for iSCSI using a function such as VLAN. The recommended configuration of the LAN for iSCSI is a dedicated network, which uses an IP address segment that is separate from the business LAN or the management LAN.

In addition, check the following points.

- Two or more networks (one-to-one network for controller A and controller B) are used to ensure high availability and iSCSI traffic is separated into different network segments.
- End-to-end flow control is enabled.
- Jumbo Frame is enabled when necessary.
- These settings must be performed for the servers, switches, and storage systems. Refer to each manual for details.

Caution

Port channels and LACP are not supported by the switch port of the controller. Host side LACP is not recommended. Using multipath can give the same or better benefits.

(4) Setting the ETERNUS AX/AC/HX network

Specify an IP address for the HIC port. For the setting method, refer to the following manual. https://storage-system.fujitsu.com/manual/en/axhx/introduction-concepts/index.html

(5) Setting the Linux server

- For RHEL or Oracle Linux
 - Preparations
 - Installing the iscsi-initiator-utils Use the Red Hat Package Manager (RPM) to set up the iSCSI environment of the Linux server. Confirm that the following RPM is installed. If it is not installed, install it.

iscsi-initiator-utils-____ (*1)

*1: Enter the architecture name and the information following it for the underlined portion.

Installation execution example

```
# rpm -ivh iscsi-initiator-utils-6.2.0.865-0.8.el5.x86_64.rpm
```

Setting Up Automatic iSCSI Service

The iSCSI service must be set to automatically activate when the Linux server starts up. Add the following line to the end of the "/etc/iscsi/iscsid.conf" file.

node.conn[0].startup = automatic

• Setting Up the Network

Set the IP information (IP address and subnet mask) of the LAN card.

Caution

- The LAN card should be set to use the same subnet as that set for the ETERNUS AX/AC/ HX that is being connected to.
- For RHEL 7, leave the default gateway unspecified and set "Automatic" to OFF for the DNS and Routes settings. For details on how to perform these settings, refer to the Red Hat manuals.
- Checking the iSCSI Initiator Name

Check the iSCSI initiator name. Check that the unique iSCSI initiator name is described as the default in the "/etc/iscsi/initiatorname.iscsi" file.

Set a unique iSCSI initiator name if one is not already set.

This iSCSI initiator name should be used for the ETERNUS AX/AC/HX settings.

Starting the iSCSI Service

Start the iSCSI service. Execute the following command to start the service.

Execute the following command to stop the iSCSI service.

```
# /etc/init.d/iscsi stop
```

Caution

The iSCSI service does not need to be started for RHEL 7 or RHEL 6.

For SLES

Preparations

Installing the open-iscsi package

Use the Red Hat Package Manager (RPM) to set up the iSCSI environment of the Linux server. Confirm that the following RPM is installed. If it is not installed, install it.

```
For SLES 10 SP2
open-iscsi-2.0.707-0.44.____ (*1)
```

Installation execution example

```
# rpm -ivh open-iscsi-2.0.707-0.19. .rpm (*1)
```

*1: Enter the architecture name and the information following it for the underlined portion.

• Setting Up Automatic iSCSI Service

YaST is used to set up the iSCSI service. Refer to the Novell website for details of the setup procedure.

Procedure

- 1 Start YaST and then run the iSCSI Initiator in Miscellaneous or Network Services. The iSCSI Initiator Overview window appears.
- 2 Check the iSCSI Initiator Overview window.
 - For SLES 15 SP1 or later
 - Open the [Service] tab and in Service Configuration, select "Keep current State" in "After writing configuration", and "Start on boot" in "After Reboot".
 - For other cases Open the [Service] tab and select the [When Booting] checkbox.



Setting up the Network

Set the IP information (IP address and subnet mask) of the LAN card.

Caution

The LAN card should be set to use the same subnet as that set for the ETERNUS AX/AC/ HX that is being connected to.

Checking the iSCSI Initiator Name

Check the iSCSI initiator name. Check that the unique iSCSI initiator name is described as the default in the "/etc/iscsi/initiatorname.iscsi" file. Set a unique iSCSI initiator name if one is not already set. This iSCSI initiator name should be used for the ETERNUS AX/AC/HX settings.

(6) Setting the ETERNUS AX/AC/HX

Perform the SAN connection (SAN management) settings for ONTAP. For the setting method, refer to the following manual. https://storage-system.fujitsu.com/manual/en/axhx/introduction-concepts/index.html

(7) Recognizing Linux volumes

Use Linux commands to confirm that the volumes in the ETERNUS AX/AC/HX are recognized by OS.

VMware (FC Connections)

- (1) Connecting the server and the ETERNUS AX/AC/HX Use an FC cable to connect the server (HBA port) and the ETERNUS AX/AC/HX (HIC port) directly or via a switch.
- (2) Setting the FC switch

When the server and the ETERNUS AX/AC/HX are connected via a switch, set the zoning of the FC switch.

(3) Installing the driver

Installation of the driver is not required if an OS media of a Fujitsu custom image or the OS standard driver is used.

(4) Setting the ETERNUS AX/AC/HX

Perform the SAN connection (SAN management) settings for ONTAP. For the setting method, refer to the following manual. https://storage-system.fujitsu.com/manual/en/axhx/introduction-concepts/index.html

(5) Recognizing VMware volumes

Log in to vCenter or VMware ESXi to confirm that the volumes in the ETERNUS AX/AC/HX are recognized by OS. This setting can also be checked using the VMware command line.

(6) Setting and checking the Multipath software

Additional settings are not required if the VMware standard Native Multipathing Plug-in (NMP) is used. For details about tuning the software, refer to the documents for VMware.

(7) Scanning the device

Scan the device using vCenter or VMware ESXi as required.

(8) Checking LUNs

Check [Path Selection Policy] for all the LUNs in the ETERNUS AX/AC/HX. If [Path Selection Policy] is set to [Most Recently Used (VMware)], changing [Path Selection Policy] to [Round Robin (VMware)] is recommended.

Note

The vSphere command line can also be used to change the [Path Selection Policy] settings. For more details, refer to the following Broadcom website. https://knowledge.broadcom.com/external/article?legacyId=2000552

VMware (iSCSI Connections)

(1) Connecting the server and the ETERNUS AX/AC/HX

Use a LAN cable (such as an optical cable) to connect the server (NIC port) and the ETERNUS AX/AC/HX (HIC port) directly or via a switch.

(2) Setting the Ethernet switch

If the server and the ETERNUS AX/AC/HX are connected via a switch, set the LAN for iSCSI using a function such as VLAN. The recommended configuration of the LAN for iSCSI is a dedicated network, which uses an IP address segment that is separate from the business LAN or the management LAN.

- (3) Setting the ETERNUS AX/AC/HX network Specify an IP address for the HIC port.
- (4) Setting VMware

Note

The displayed screen differs depending on factors such as the version.

• Checking the LAN Cards

Procedure

- 1 Log in to the vSphere Web Client and select in order, [Hosts and Clusters] > target host.
- Select in order, the [Manage] tab > [Networking] > [Physical adapters].
 "vmnic4" and "vmnic5" are used in the following example.

Settings	Networking	Storage	Alarm	Definitions	Tags	Permi	ssions			
•			Phys	ical adapte	rs					
Virtua	al switches		2	<u>@</u> 🗗 •				Q Filter		•
VMke	rnel adapters		Devi	ce	Actual S	peed	Configur	ed Speed	Switch	
Physi	cal adapters		Intel	Corporatio	n 1350 G	igabit N	letwork (Connection		
TCP/II	P configuratio	n	1.00	vmnic4	1000 1	Лb	Auto n	egotiate		
Advar	nced			vmnic5	1000 1	Лb	Auto n	egotiate		
			Intel	Corporatio	n 82575	EB Giga	abit Netw	ork Connec	tion	
			and a	vmnic0	1000 1	Лb	Auto n	egotiate	vSwitch0	2
				vmnic1	Down		Auto n	egotiate		*
			4		::					•

Creating the Virtual Switches

Add two virtual switches (vSwitch) for iSCSI to VMware ESXi. Add a "vmnic" and a "VMkernel" for each vSwitch.

Perform the following procedure to each vmnic that configures iSCSI SAN.

When Using vSphere Standard Switches



- 1 Log in to the vSphere Web Client and select in order, [Hosts and Clusters] > target host.
- 2 Select in order, the [Manage] tab > [Networking] > [Virtual switches].
- 3 Select [Add host networking] in the right pane.



- 4 If the [Add Networking] pop-up window is displayed, add the network by following the displayed instructions.
 - 4-1 Select [VMkernel Network Adapter] and click the [Next] button.
 - 4-2 Select [New Standard switch] and click the [Next] button.

- 4-3 Select the target NIC from [Active adapters] using [Add adapters] in the right pane and click the [Next] button.
- 4-4 Configure the port as required and click the [Next] button.
- 4-5 Set the IP address and subnet mask of [VMkernel], and click the [Next] button.
- 4-6 Confirm the settings and click the [Finish] button.
- 5 Repeat <u>Step 3</u> to add Virtual Switch vSwitch2.
- 6 Confirm that a Virtual Switch and a VMkernel are set for each vmnic.

Settings Networking Stora	ge Aarm Definitions Tags Permissions	
	Virtual switches	
Virtual switches	9 @ # 5 / X 0	
VMkernel adapters	Switch	Discovered Issues
Physical adapters	T vSwitch0	744
TCP/IP configuration	1 vSwitch1	-
	VMkernel VLAN ID: VMkernel Ports (1) vmi-1: 102 169 10 20	Physical Adapters Imm vmnic4 1000 Full

When Using vSphere Distributed Switches

Procedure >> -

- 1 Create a vSphere Distributed Switch.
 - 1-1 Log in to the vSphere Web Client and select in order, [Home] > [Networking].
 - 1-2 Right-click [Datacenter] in the left pane and select in order, [Distributed Switch] > [New Distributed Switch].

0 (0		
2		
s - Datacenter		1
lost		1
Cluster		
Folder	,	
buted Switch		늘 New Distributed Switch
	is - Datacenter Host Cluster Folder ibuted Switch	Is - Datacenter Host Cluster Folder Folder

- < < <

- 2 If the setting pop-up window is displayed, set a vSphere Distributed Switch by following the displayed instructions.
 - 2-1 Enter a vDS name and click the [Next] button.
 - 2-2 Select an appropriate vSphere Distributed Switch version for each host version and click the [Next] button.
 - 2-3 Set the number of physical ports and the port group names that are used, and click the [Next] button.
 - 2-4 Confirm the settings and click the [Finish] button.
- 3 Confirm that [DSwitch] has been created under [Datacenter].



- 4 If multiple vSphere Distributed Switches are required, repeat <u>Step 1-2</u>.
- 5 Set a VMkernel in vSphere Distributed Switch for each host.
 - 5-1 Log in to the vSphere Web Client and select in order, [Home] > [Networking].
 - 5-2 Move to [Datacenter] and click [DSwitch].
 - 5-3 Select in order, the [Manage] tab > [Settings] > [Topology].
 - 5-4 Click [Add hosts to this distributed switch..].



- 5-5 Select [Add host and manage host networking(advanced)] and click the [Next] button.
- 5-6 Click [New hosts..], select the host to use the DSwitch, and click the [OK] button.
- 5-7 Click the [Next] button.
- 5-8 Select [Manage physical adapters] and [Manage VMkernel adapters], and then click the [Next] button.

6 Select the target vmnic and click [Assign uplink].

1 Select task 2 Select hosts	Manage physical network adapters Add or remove physical network adapt	ters to this distributed switch.		
3 Select network adapter tasks	Assign uplink Cunassign ada	pter 👍 Reset changes 🚯 New	settings	
4 Manage physical network	Host/Physical Network Adapters	1 A In Use by Switch	Uplink	Uplink Port Group
Manage VMkernel network	- 192.168.77.30			
5 adapters	On this switch			
6 Analyze impact	 On other switches/unclaimed 			
7 Ready to complete	💓 vmnic0	vSwitch0	4	-
	vmnic1	-		-
	vmnic2	-		-
	vmnic3	-	+	-
	对 vmnic4	-	4	H
	winic5		2	2

- 7 Click [OK] in the pop-up window.
- 8 Confirm that the selected vmnic has been set for [Uplink Port Group] and click the [Next] button.

Add and Manage Hosts				(?
 1 Select task 2 Select hosts 	Manage physical network adapters Add or remove physical network adapters	to this distributed switch.		
✓ 3 Select network adapter tasks	🔄 Assign uplink 💥 Unassign adapter	Reset changes 👩 Vie	w settings	
4 Manage physical network adapters	Host/Physical Network Adapters	1 A In Use by Switch	Uplink	Uplink Port Group
5 Manage VMkernel network adapters	 I 192.168.77.30 On this switch 			
6 Analyze impact	vmnic5 (Assigned)	-	Uplink 1	DSwitch-DVUplinks-62
7 Ready to complete	 On other switches/unclaimed 			
	vmnic0	vSwitch0		-
	vmnic1	++	-	-
	winic2		-	-
	vmnic3		-	-
	🛤 vmnic4	-	1. The second se	7

9 Select [On this switch] and click [New adapter].

 1 Select task 2 Select hosts 	Manage VMkernel network adapters Manage and assign VMkernel network	s k adapters to the distributed switch	l.	
3 Select network adapter tasks	2. Askign port grou 👍 New adap	er Edit adapter 💥 Remove	n Reset changes 👩 View set	
 Manage physical petwork 				
4 adapters	Host/VMierriel Network Adapters	1 A In Use by Switch	Source Port Group	Oestination Port Group
4 adapters 5 Manage VMkernel network	+ toxt/VMierrel Network Adapters	1 A In Use by Switch	Source Port Group	Oestination Port Group
4 adapters 5 Manage VMkernel network adapters	+ 192.168.77.30 On this switch	1 A In Use by Switch	Source Port Group	Oestimation Port Group
adapters S Manage VMkernel network adapters 6 Analyze impact	Host/VMerriel Network Adapters	1 🛦 In Use by Switch	Source Port Group	Destination Port Group

- 10 Perform the settings in the VMkernel configuration pop-up window.
 - 10-1 Select the DPortGroup that was created with [Browser] by selecting [Select an existing network].
 - 10-2 Configure the port as required and click the [Next] button.
 - 10-3 Set the IP address and click the [Next] button.
11 Confirm that "DSwitch" and "DPortGroup" have been set for vmk1 in [On this switch], and then click the [Next] button.

 1 Select task 2 Select hosts 3 Select network adapter tasks 	Manage VMkernel network adapters Manage and assign VMkernel network	adapters to the distributed switch	🕐 Reset changes 🚯 View set	tings
4 Manage physical network adapters	Host/VMiemel Network Adapters	1 A In Use by Switch	Source Port Group	Destination Port Group
5 Manage VMkernel network adapters	 192.168.77.30 On this switch 			
6 Analyze impact	vmkt (new)	DSwitch	-	DPortGroup
7 Ready to complete				
	📷 vmk0	vSwitch0	Management Network	Do not migrate

- 12 Confirm that "No impact" is displayed for [Overall impact status] and click the [Next] button.
- 13 Confirm the settings and click the [Finish] button.
- 14 Confirm that the VMkernel port has been created by clicking the [Manage] tab > [Networking] > [Virtual switches] from the vSphere Web Client.

attings Networking Stora	ge Alarm Definitions Tags Permissions	
Virtual switches	Virtual switches	
VMkernel adapters	Switch	Discovered Issues
Physical adapters	C DSwitch	-
TCP/IP configuration	1 vSwitch0	
	Assigned port groups filter applied, showing:	≗ 1/1
	Assigned port groups filter applied, showing:	≥ 1/1 ▼ DSwitch-DVUplinks-62 6
	Assigned port groups filter applied, showing:	 ≥ 1/1 ✓ DSwitch-DVUplinks-62 ✓ Dplink 1 (1 NIC Adapter)

(5) Setting the Software Initiator Enable Software Initiator in VMware ESXi.

Procedure >> -

- 1 Log in to the vSphere Client and select in order, [Hosts and Clusters] > target host.
- 2 Select in order, the [Manage] tab > [Storage] > [Storage Adapters].
- **3** Select the [iSCSI Software Adapter] item.
- 4 Check the iSCSI name that is displayed in [Adapter Details].

- **5** Select the [Targets] tab in [Adapter Details].
- **6** Click the [Add] button in [Dynamic Discovery].
- 7 Enter the IP address for the iSCSI port of the connected ETERNUS AX/AC/HX in the [iSCSI Server] column, confirm that the port is set to "3260" (default), and click the [OK] button.
- **8** Confirm that the IP address for the iSCSI port of the ETERNUS AX/AC/HX is displayed as follows.

ttings Networking Storage	Alarm Definitions Tage	Permiss	sions		
	Storage Adapters				
Storage Adapters	+ 60 0 0	•		Q Filter	•
Storage Devices	Adapter	Туре	Status	Identifier	
Host Cache Configuration	🐼 vmhba2	SCSI	Unkn		
Protocol Endpoints	iSCSI Software Adap	ter			
	💽 vmhba34	ISCSI	Online	ign.1998-01.com.vmware:n300s6-10-69ea3022	
	4	н			
				8468	
	Adapter Details				
	Properties Device	s Paths	Targets	Network Port Binding Advanced Options	
	Dynamic Discovery	Static D	Discovery		
			Add	Remove Authentication Advanced	
	ISCSI server				
	192.168.10.129:32	60			
	100 100 00 100 00				

9 If the connected ETERNUS AX/AC/HX uses multiple iSCSI ports, repeat the IP address addition process for each iSCSI port. (Repeat <u>Step 6</u> through <u>Step 8</u>.)

(6) Checking the LUNs

The following procedure describes how to check LUN recognition using the vSphere Client. Log in to VMware ESXi from the vSphere Client, and then check whether the devices are recognized.



- 1 Log in to the vSphere Web Client and select in order, [Hosts and Clusters] > target host.
- 2 Select in order, [Manage] > [Storage] > [Storage Adapters].
- **3** Select [Rescan...].

Note

After selecting [Rescan...], the VMware ESXi should attempt to recognize the ETERNUS AX/AC/HX storage systems' LUNs again.

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4 Select the iSCSI Software Adapter (vmhba34 in this example) from the [Storage Adapters] area.

Getting Started Summary Monitor Manage Related Objects Settings Networking Storage Alarm Definitions Tags Permissions 44 Storage Adapters Storage Adapters + 🔂 💄 💆 **D**-Q Filter -Storage Devices . Adapter Type Status Identifier Host Cache Configuration 🚱 vmhba2 SCSI Unkn... Protocol Endpoints **ISCSI Software Adapter** ISCSI Online iqn.1998-01.com.vmware:nx300s6-10-69ea3 Vmhba34 Adapter Details Properties Devices Paths Targets Network Port Binding Advanced Options 🔯 🛃 📖 🥝 💿 🖪 🛃 🍙 🗸 🔍 🔍 Q Filter -Name Type Capacity Ope FUJITSU ISCSI Disk (naa.6000b5d0006a000006a0b... disk 100.00 GB Atta FUJITSU ISCSI DIsk (naa.6000b5d0006a000006a0b... disk 200.00 GB Atta FUJITSU ISCSI Disk (naa.6000b5d0006a000006a0b... disk 5.00 GB Atta FUJITSU ISCSI Disk (naa.6000b5d0006a000006a0b... disk 5.00 GB Atta 11 • 4

In the [Devices] tab in the [Adapter Details] area, the recognized devices are shown as follows.

5 Check [Path Selection Policy] for all the LUNs in the ETERNUS AX/AC/HX. If [Path Selection Policy] is set to [Most Recently Used (VMware)], changing [Path Selection Policy] to [Round Robin (VMware)] is recommended.

Settings Networking Storage	Alarm Definitions Tags Per	nission	s					
Storage Adapters	Storage Devices	0	•	•	Q	Filter		•
Storage Devices	Name	Туре	Capac	Operation	Hardware Acc	Drive T	Transport	
Host Cache Configuration	Local LSI Disk (naa.6003	disk	136	Attached	Not suppo	HDD	Parallel	
Protocol Endpoints	Local TEAC CD-ROM (m	cdr		Attached	Not suppo	HDD	Block A	
	FUJITSU ISCSI Disk (naa	disk	5.00	Attached	Supported	HDD	ISCSI	
	FUJITSU ISCSI Disk (naa	disk	200	Attached	Supported	HDD	iSCSI	
	FUJITSU ISCSI Disk (naa	disk	5.00	Attached	Supported	HDD	ISCSI	
	Device Details			-				
	Properties Paths							
	Logical Partitions 0							•
	Multipathing Policies					Edit Multip	athing	
	Path Selection Policy	Rou	nd Robin	(VMware)	>			
	Storage Array Type Boll	VHV	SATE	ALLIA				

Note

The vSphere command line can also be used to change the [Path Selection Policy] settings. For more details, refer to the following Broadcom website. https://knowledge.broadcom.com/external/article?legacyId=2000552

6 For a multipath configuration, confirm that the paths of all the LUNs in the ETERNUS AX/ AC/HX are configured with multipath.

When paths for a LUN are configured with multipath, multiple runtime names and targets are displayed in [Paths].

Windows (FC Connections)

- (1) Connecting the server and the ETERNUS AX/AC/HX Use an FC cable to connect the server (HBA port) and the ETERNUS AX/AC/HX (HIC port) directly or via a switch.
- (2) Setting the FC switch

When the server and the ETERNUS AX/AC/HX are connected via a switch, set the zoning of the FC switch.

(3) Installing the driver

The driver installation is not required if the OS standard driver is used.

- (4) Setting the ETERNUS AX/AC/HX Perform the SAN connection (SAN management) settings for ONTAP. For the setting method, refer to the following manual. https://storage-system.fujitsu.com/manual/en/axhx/introduction-concepts/index.html
- (5) Recognizing Windows volumes

Use a tool such as Device Manager to check the volume recognition.

(6) Setting and checking the Multipath software

If the Windows host has multiple paths to the storage system, installation of the MPIO software and a setup of the multipath are required. If there is no MPIO software, each path is recognized by the operating system as different disks and may result in data corruption. MPIO software provides a single disk to the operating system for all the paths and the device specific module (DSM) manages path failovers.

Using the OS standard multipath driver (MSDSM) is recommended. For details, refer to the Windows Unified Host Utilities document. https://docs.netapp.com/us-en/ontap-sanhost/hu_wuhu_71_rn.html

Windows (iSCSI Connections)

(1) Connecting the Server and the ETERNUS AX/AC/HX

Use a LAN cable (such as an optical cable) to connect the server (NIC port) and the ETERNUS AX/AC/HX (HIC port) directly or via a switch.

(2) Setting the Ethernet switch

If the server and the ETERNUS AX/AC/HX are connected via a switch, set the LAN for iSCSI using a function such as VLAN. The recommended configuration of the LAN for iSCSI is a dedicated network, which uses an IP address segment that is separate from the business LAN or the management LAN.

The driver installation is not required if the OS standard driver is used.

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(3) Setting the ETERNUS AX/AC/HX

Perform the SAN connection (SAN management) settings for ONTAP. For the setting method, refer to the following manual. https://storage-system.fujitsu.com/manual/en/axhx/introduction-concepts/index.html

(4) Setting Windows

Use the iSCSI Initiator to set the iSCSI initiator parameters.

Note

The displayed screen differs depending on the Windows Server version.

Procedure ►►► —

- **1** Start the iSCSI Initiator.
- 2 Click the [Configuration] tab.
- To change the iSCSI name, click the [Change] button. The current iSCSI name is displayed in [Initiator Name].
 When using the default iSCSI name displayed in [Initiator Name], also click the [Change] button. This allows you to continue to use the above iSCSI name even after changing the "computer name" of the server.
- 4 Enter the iSCSI name and click the [OK] button. The [iSCSI Initiator Properties] window will appear.
- **5** Click the [Discovery] tab and then click the [Discover Portal] button.
- **6** In the [IP address or DNS name] field, enter the IP address of the ETERNUS AX/AC/HX iSCSI port that is to be connected to, and click the [Advanced] button.

Caution

Enter the address set for the TCP/IP settings of the ETERNUS AX/AC/HX side iSCSI port as the IP address of the ETERNUS AX/AC/HX.

The [Advanced Settings] window appears.

- 7 Click the [General] tab.
- 8 Select "Microsoft iSCSI Initiator" for [Local adapter] and set the Initiator server IP address in [Initiator IP] under [Connect using]. Then, click the [OK] button. The settings of CHAP authentication can also be made. For details of the settings, refer to "OS CHAP Authentication Settings for iSCSI Connections (for Linux, VMware, and Windows)" (page 86).
- **9** Click the [OK] button.
- **10** Click the [Targets] tab.
- **11** Check the connection and click the [Connect] button. If the connection is successful, the ETERNUS AX/AC/HX iSCSI name should appear in [Discovered targets] and the [Status] should be "Inactive".

Caution

Even if the connection is correctly made, the ETERNUS AX/AC/HX iSCSI name may not appear in [Discovered targets]. Perform the following steps.

- Check that the cables are connected correctly.
- Click the [Refresh] button.
- **12** Select the [Add this connection to the list of Favorite Targets.] checkbox and click the [Advanced] button.
- **13** Select "Microsoft iSCSI Initiator" for [Local adapter]. Next, set the Initiator server IP address and the ETERNUS AX/AC/HX IP address/port number (for example, 192.168.10.150 / 3260), in [Initiator IP] and [Target portal IP] respectively under [Connect using]. Then, click the [OK] button.
- 14 Click the [OK] button. If the logon is successful, the [Status] of the ETERNUS AX/AC/HX iSCSI name displayed in the [Targets] tab window should change to "Connected".



(5) Setting and Checking the Multipath Software

If the Windows host has multiple paths to the storage system, installation of the MPIO software and a setup of the multipath are required. If there is no MPIO software, each path is recognized by the operating system as different disks and may result in data corruption. MPIO software provides a single disk to the operating system for all the paths and the device specific module (DSM) manages path failovers.

Using the OS standard multipath driver (MSDSM) is recommended. For details, refer to the Windows Unified Host Utilities document. https://docs.netapp.com/us-en/ontap-sanhost/hu_wuhu_71_rn.html

Disk Setup Procedure for a Guest OS with NVMe-oF Connections

Target OS

VMware

Preparations

The setup procedure differs between the ETERNUS AX/AC/HX and the ETERNUS AB/HB. Configure VMware ESXi and NVMe over FC for the ETERNUS AX/AC/HX or ETERNUS AB/HB as follows.

ETERNUS AX/AC/HX

NVMe-oF Host Configuration for ESXi 7.x with ONTAP https://docs.netapp.com/us-en/ontap-sanhost/nvme_esxi_7.html#supportability

• ETERNUS AB/HB

Perform NVMe over FC-specific tasks https://sp.ts.fujitsu.com/dmsp/Publications/public/a3ca08733-a106-EN.pdf

Disk Assignment for the Guest OS

This section describes how to assign disks to a Guest OS. The following procedure is an example that uses RHEL for the Guest OS.

For RHEL

Procedure **>>** ----

1 Select a Guest OS.

Image: Section of the Section of th	≡ v\$phere Olent Q	
 Between the stageweet in stagew		
VM Nathesse Instal 9 Ohr 400-01 9 Mercery 5 806-05 memory active 0 Mercery 6 806-05 memory active 0 Mercery 5 806-05 memory active 0 Mercery 6 806-05 memory active	Constraints, 2 Constrai	United to the weat of the other of the other of the other other of the other o
V Recent Table: 5 CPA 4 CPA(p) Cuttors Address Addr	VM Handware	Notes
> Servicy E 68.0.36 memory active Cutotic Addition > Version Adapted Vision Addition > Version Adapted Vision Addition > Version Adapted Vision Addition fractioner > Version Adapted Vision Addition > Version Adapted Vision Addition fractioner > Version Adapted Vision Addition fractioner > Version Adapted Addition fractioner Name	s CPU A CPUIN	
y med dik1 N 08 Mail Wate y Helmony abgres 1 VV Helmony digits Mail	3 Memory 🔲 8 08.0 08 memory active	Custom Attributes
V Refer 1 VM selection (disconnected); CDDVV/d dive; 1 Disconnected; Disconnected; BMB VMD divers; Disconnected; DoPer Additional margineses	> Herd dok 1 Wildle	Amilute Value
V Recent Table; Abient Decomposition Additional metabolismic Decomposition Decomposition <td>) Network adapter 1 VM Network (disconnected)</td> <td></td>) Network adapter 1 VM Network (disconnected)	
3 Miles part BMB VMD dense Decise act the inflat regime P() bus that provider support for the which regime P() bus that provider support for the which regime P() BL V Recent Tables Dense	CD/DVD drive 1 Disconnected	
Vitil Series Decision the influence PO built for provides support for the Vitual reaction communication reactions Elic 0 Other Additional matchese Elic Increase	s Video card II MI	
V Recent Table 00wr Additional methodes 10m.	VH3 device Device and the industries PO but that provides support for the VH43 device Vehicle support for the Vehicle supports of vehicles	no meno de calego
V Recent Table Aberts) Other Additional Hardware	DL.
V Recent Table Aberts		111 ++++
	V Recent Tasks Alaims	
Takhane T beget T mask	Tak Name T Target T Data T Datas T other T Calcul T Datas T State	a T Examplement True T Server
Beconfigue crual meth. 🗿 malles 🛞 Completed SYSTEMISION/PLUTSULGCA. Errs: 04/202022 10/701 - 04/202022 10/701 - 04/202022 10/701 - 04/202022	Reconfigure vitual math. () mathe () Completed SYSTEM251.147 PLUTSULOCA. Sims 06/2021	222, 1017-01 - D8/30/2022, 1017-07 - vcenter/foult-system281/32yhgtsulacel

2 Select ACTIONS > Edit Settings.

😑 vSphere Client 🔍						
	Dermany Montor Confi	-@ /@ gure Per	Actions - rheites Power Ouest os	Snapahots Updates		
 Veniterrout systematic insplainuoce El caracerte, 2 El caracerte, 5 El caracerte, 5 Roboter to systematical insplainuocal 	Persented Off	Guest ofs Compatibility VMware To	Snapshots Dopen Remate Consale Et, Algorite	0 Anapat)		OFU USASE O HZ MENCET USASE
Difacenter_prute	сконок нед соновля засмон немота соновля Ф	Address Paddress Past	Vir Toleten	204		B 16 GB
	VM Hardware		Template) Compatibility	^ 	Custon Attributes	~
	s Herrory s Herrory s hielwork adapter 1	Г	Export System Logs		attilue Wor	
	CD/DVD drive 1 S Video cant VidEi device	_	Mava ta folder. Retamé. Esti fisites.	s that provides support for the		No teria la dade
V Sarani Talice Alame) Other		Fags & Custom Attributes () & dd Permission. Atarms ()	hco	ER.	
Tax have T Terpet T I Reconfigure citual trach. () these ()	nasa 🕴 zeses 9 Completed		Benove from inventory Delete from Disk	T Openand T Start Tree CA. 5 mt 06/35/2023 06/35/2023	а 🔻 салантил типе 🔻 Телин 10/10/1 — Он(10/2002, 10/10/1 — ven/He/GUL2syther/20114/sythpts.incel	1
13 All v MareTails		_	eSAN ()			1 these

3 Select ADD NEW DEVICE > NVMe Controller.

		ADD NEW DEVICE
> CPU	4	Disks, Drives and Storag
> Memory	8 🗸 GB 🗸	Hard Disk
> Hard disk 1	16 <u>38</u> ~	Existing Hard Disk RDM Disk
> SCSI controller 0	VMware Paravirtual	Host USB Device
> Network adapter 1	VM Network 🤟	CD/DVD Drive
> CD/DVD drive 1	Datastore ISO File 🗸 🗸	NVMe Controller
> USB controller	USB 2.0	SATA CONTONE
> Video card	Specify custom settings \sim	USB Controller
> Security Devices	Not Configured	Other Devices
VMCI device		PCI Device
SATA controller 0	AHO	
> Other	Additional Hardware	Serial Port
		Network
		Network

4 Confirm that the NVMe is added.

		ADD NEW DEVICE
> CPU	4 ~	٩
Memory	8 v G8	~
> Hard disk 1	16 <u>GB</u> v	
SCSI controller 0	VMware Paravirtual	
Network adapter 1	VM Network 🥪	Connect
CD/DVD drive 1	Datastore ISO File 🗸 🗸	Connect
USB controller	USB 2.0	
> Video card	Specify custom settings ${\scriptstyle\checkmark}$	
New NVMe Controller		
> Security Devices	Not Configured	
VMCI device		
SATA controller 0	AHCI	
> Other	Additional Hardware	

5 Select ADD NEW DEVICE > Hard Disk.

		ADD NEW DEVIC
> CPU	4 🗸	Dirty Drive and Sta
> Memory	8 V GB V	Hard Disk
> Hard disk 1	16 08 v	Existing Hard Dis
> SCSI controller 0	VMware Paravirtual	Host USB Device
> Network adapter 1	VM Network 🧹	CD/DVD Drive
> CD/DVD drive 1	Datastore ISO File 🗸 🗸	NVMe Controller
> USB controller	USB 2.0	SATA Controller
> Video card	Specify custom settings \checkmark	USB Controller
New NVMe Controller		Other Devices
> Security Devices	Not Configured	PCI Device
VMCI device		Precision Clock
SATA controller 0	AHCI	Serial Port
> Other	Additional Hardware	Network

A new hard disk is added.

		ADD NEW DEVIC
CPU	4 🗸	C
Memory	8 ~	GB 🗸
Hard disk 1	16 08 v	
> New Hard disk *	16 GB 🗸	
> SCSI controller 0	VMware Paravirtual	
Network adapter 1	VM Network 🗸	Connect
CD/DVD drive 1	Datastore ISO File 🗸 🗸	Connect
USB controller	USB 2.0	
> Video card	Specify custom settings ${\scriptstyle\smile}$	
New NVMe Controller		
> Security Devices	Not Configured	
VMCI device		
SATA controller 0	AHCI	
> Other	Additional Hardware	

6 Check the detailed information about the added hard disk.

	ADD NEW DE	VICE
, CPU	<u>4</u> ~	٩
Memory	8 v GB v	
Hard disk 1	16 OB V	
New Hard disk *	<u>16</u> <u>68 v</u>	
Maximum Size	271.66 GB	
VM storage policy	Datastore Default ~	
Location	Store with the virtual machine $$	
Disk Provisioning	Thick Provision Lazy Zeroed 🗸 🗸	
Sharing	Unspecified ~	
Shares	Normal V 1000 V	
Limit - IOPs	Unlimited ~	
Disk Mode	Dependent v	
Virtual Device Node	SCSI controller 0 🛛 🗸 SCSI(0:1) New Hard disk 🗸	
SCSI controller 0	VMware Paravirtual	
Network adapter 1	VM Network 🗸 🖾 Connect.	
on in un deixe t		

7 From the Location pull-down menu, select "Browse".

	ADD NEW DEVICE *
CPU	<u>4 v</u> (1)
Memory	8 v <u>68 v</u>
Hard disk 1	16 08 v
New Hard disk *	<u>16</u> <u>68 v</u>
Maximum Size	271.66 GB
VM storage policy	Datastore Default v
Location	Store with the virtual machine $$
Disk Provisioning	Browse.
Sharing	
Shares	Normal V 1000 V
Limit - IOPs	Unlimited ~
Disk Mode	Dependent v
Virtual Device Node	SCSI controller 0 v SCSI(0:1) New Hard disk v
SCSI controller 0	VMware Paravirtual
Network adapter 1	VM Network 🤟 🖾 Connect
CD (DUD drive 1	Printer and Record

8 Select a datastore to be used for the NVMe volume and then click [OK].

e rollowing datastore tual machine configu	ration files and all o	of the virtual disks	n resource that y	ou selected, sele	ct the destinatio	on datastore for the
1 Storage Policy		Datas	store Default		~	
Disable Storage DR	5 for this virtual ma	chine				
Name Y	Storage ¥ Compatibility	Capacity Y	Provisioned Y	Free Y	Туре	Cluster
) 📋 🗇 datastore		299.75 GB	36.31 GB	271.66 GB	VMFS 6	
		151 TB	146 GB	15178	VMES 6	
🔋 🗐 vou	-	9.75 GB	1.41 GB	8.34 GB	VMFS 6	
) 🗐 VOL2		9.75 GB	1.41 GB	8.34 GB	VMFS 6	
N		0.55.00	001110	100.00	10.000	
1						ő items

- **9** Change the virtual device node.
 - 9-1 Change the "Virtual Device Node" parameter from SCSI controller to NVMe controller.

	ADD NEW DEVICE *
CPU	<u>4</u> ~ (1)
Memory	8 v GB v
Hard disk 1	<u>16</u> <u>68</u> ~
• New Hard disk *	<u> </u>
Maximum Size	8.34 OB
VM storage policy	Datastore Default ~
Location	VOL1 V
Disk Provisioning	Thick Provision Lazy Zeroed 🗸 🗸
Sharing	Unspecified V
Disk File	[VOL1]
Shares	Normal V 1000 V
Limit - IOPs	Unlimited V
Disk Mode	Dependent v
Virtual Device Node	SCSI controller 0 $$
SCSI controller 0	VMware Paravirtual
Network adapter 1	VM Network v Connect

9-2 Select "New NVMe Controller".

	ADD NEW DEVICES
CPU	<u>4</u> v (1)
Memory	8 v GB v
Hard disk 1	16 <u>GB v</u>
New Hard disk *	<u>8</u>
Maximum Size	8.34 GB
VM storage policy	Datastore Default ~
Location	VOL1 V
Disk Provisioning	Thick Provision Lazy Zeroed 🗸 🗸
Sharing	Unspecified V
Disk File	[V0L1]
Shares	Normal V 1000 V
Limit - IOPs	Unlimited 🗸
Disk Mode	Dependent v
Virtual Device Node	SCSI controller 0 🚽 SCSI(0:1) New Hard disk 🗸
SCSI controller 0	, IDE 0
	SCSI controller 0

9-3 Select "NVMe(0.0) New Hard disk" and click [OK].

	ADD NEW DEVICE Y
CPU	<u>4</u> ~ ()
Memory	8 v <u>GB v</u>
Hard disk 1	16 GB V
New Hard disk *	<u> </u>
Maximum Size	8.34 GB
VM storage policy	Datastore Default ~
Location	VOL1 ~
Disk Provisioning	Thick Provision Lazy Zeroed 🗸 🗸
Sharing	Unspecified ~
Disk File	[Vol1]
Shares	Normal V 1000 V
Limit - IOPs	Unlimited ~
Disk Mode	Dependent V
Virtual Device Node	New NVMe Controller V NVME(0:0) New Hard disk
SCSI controller 0	VMware Paravirtual
Network adapter 1	VM Network v 🖾 Connect

The changed settings are applied.

≡ v\$phere Client Q	C & Administrations and the	utisulocal y 🔒 🔿 y
Contraction of the second	C Bit rhe(B6) P C Image: Bit is access Summary Worksr Company Networks Snaphots Updates Personal Off Duest OD: Regines frequency (Ministry Company) Regines frequency (Ministry Company) Velocities Duest OD: Regines frequency (Ministry Company) Regines frequency (Ministry Company) Velocities Duest OD: Regines frequency (Ministry Company) Regines frequency (Ministry Company) Velocities Provide Company Net Company Regines frequency (Ministry Company) Velocities Regines frequency (Ministry Regines fre	Bail for 10 ace view Cru usace O Hz MeNorr Usace O B Stoade usace 24 GB
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10 Check the added "Hard disk 2".

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<u>n</u> 8 8 2	Summary Monitor Configure	Permissions Datastores Networks Snapshots Updates				
vcenter70u3.system25tiH4yfujitsulocal E Datacenter_2	LANGER REVOLTE (D) 🖉					
 B Datacenter_hx 	VM Hardware	VM Hardware		Notes		~
 m2540m4-tp.system251.iHyfujtsulocal met64 	> CPU	> CPU 4 CPU(s)				=
Datacenter_parte	> Memory	B GB, 0 GB memory active of de	Attribute	Value		
	↓ Hard disk 2	nd dink 2				
	Capacity	8.08				
	туре	Thick Provision Lazy Zeroed				. 11
	Location	VOLT (353 MB free)	-		No temp to do	alay
	 Network adapter 1 	VM NEDVOR (about nec lear)	Edt			
	CD/DVD drive 1	Disconnected				
	> Video card	8 MB	Tags			
	VMCI device	Device on the virtual machine PCI bus that provides support for the virtual machine communication interface	Assigned Teg	Category	Description	
	> Other	Additional Hardware				
	Competibility ESX(7.0 U2 and later (VM version 19)					
Y Recent Tasks Alarms	A-D fatfore					
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Reconfigure virtual mach. (2) theilds	O Completed Reconfigur	ing Virtual Machi. SYSTEM251/14Y/PUUTSULOCA. 6 ms 09/30/20	22, 10:28:13 09/30/2022, 10:2	8:15 . vcenter?0u3.system251.lidy/ujitsu	alocal	
DI Al 🗸 More Tasks						18en
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Although FC connections are available with the default (Auto) link speed setting, the expected link speed may not be obtained. To connect with the expected link speed, set a fixed value for the link speed in either the connection source or destination.

For example, when connecting an HBA port on the server to an FC switch port and the link speed of the HBA port is set to "Auto", set a fixed value for the link speed of the FC switch.

Caution

For the ETERNUS AX/AC/HX and the ETERNUS AB/HB, only "Auto" is available for the link speed of the FC port and cannot be specified with a fixed value.

44

OS CHAP Authentication Settings for iSCSI Connections (for Linux, VMware, and Windows)

Linux (for RHEL)

To use CHAP authentication, make sure to configure the following settings before establishing an iSCSI session between the initiator and the target.

Host Settings

For Unidirectional CHAP Authentication

Create the accounts used by the iSCSI initiator to connect to the target. Add the following lines to the "/etc/iscsi/iscsid.conf" file:

```
node.session.auth.authmethod = CHAP
node.session.auth.username = <(1)>
node.session.auth.password = <(2)>
discovery.sendtargets.auth.authmethod = CHAP
discovery.sendtargets.auth.username = <(1)>
discovery.sendtargets.auth.password = \langle (2) \rangle
```

Enter any username in (1) and any password in (2).

Caution

- Each "username" and "password" must match the ones that are set in the ETERNUS AB/HB.
- For details of the ETERNUS AB/HB settings, refer to the manual for SANtricity 11.7 System Manager.

https://sp.ts.fujitsu.com/dmsp/Publications/public/ca08871-192-EN.pdf

For Bidirectional CHAP Authentication

In addition to the unidirectional CHAP authentication accounts, additional accounts are required to enable the target to connect to the initiator.

Add the following lines to the "/etc/iscsi/iscsid.conf" file:

```
node.session.auth.authmethod = CHAP
node.session.auth.username = <(1)>
node.session.auth.password = <(2)>
node.session.auth.username in = <(1)>
node.session.auth.password_in = <(2)>
discovery.sendtargets.auth.authmethod = CHAP
discovery.sendtargets.auth.username = <(1)>
discovery.sendtargets.auth.password = <(2)>
discovery.sendtargets.auth.username in = <(1)>
discovery.sendtargets.auth.password in = <(2)>
```

Enter any username in (1) and any password in (2).

Caution

- The initiator accounts are shown below.
 - node.session.auth.username
 - node.session.auth.password
 - discovery.sendtargets.auth.username
 - discovery.sendtargets.auth.password
- The target accounts are shown below.
 - node.session.auth.username_in
 - node.session.auth.password_in
 - discovery.sendtargets.auth.username_in
 - discovery.sendtargets.auth.password_in

Every such initiator and target account must be assigned a unique name.

- Each "username" and "password" must match the ones that are set in the ETERNUS AB/HB.
- For details of the ETERNUS AB/HB settings, refer to the manual for SANtricity 11.7 System Manager.

https://sp.ts.fujitsu.com/dmsp/Publications/public/ca08871-192-EN.pdf

VMware

To set CHAP authentication, specify a CHAP name up to 511 characters and a CHAP secret up to 255 characters. For some adapters, the maximum number of available characters may be less than the value described here. For example, the maximum value of the QLogic adapter is up to 255 characters for the CHAP name and up to 100 characters for the CHAP secret.

Prerequisites

- Determine whether to configure a unidirectional CHAP or a bidirectional CHAP before setting the CHAP parameters for the software iSCSI or the dependent hardware iSCSI. Note that the independent hardware iSCSI adapter does not support bidirectional CHAP.
- Confirm the CHAP parameters specified in the storage system. The parameters to be specified must match the ones that are set in the storage system.
- Required privileges Host, Configuration, and Storage Partition Configuration



- **1** Access the iSCSI or iSER storage adapter.
 - 1-1 In the vSphere Client, access the VMware ESXi host.
 - 1-2 Click the [Configure] tab.
 - 1-3 In [Storage], click [Storage Adapters] and select the adapter (vmhba#) that is to be configured.
- 2 Click the [Properties] tab and then click [Edit] on the [Authentication] panel.

- **3** Specify the authentication method. To configure directional CHAP, select "Use bidirectional CHAP" under the following options.
 - None
 - Use unidirectional CHAP if required by target
 - Use unidirectional CHAP unless prohibited by target
 - Use unidirectional CHAP
 - Use bidirectional CHAP
- Specify the outgoing CHAP name.The name to be specified must match the one that is configured in the storage system.
 - To set the iSCSI adapter name as the CHAP name, select "Use initiator name".
 - To set the CHAP name that is different from the iSCSI initiator name, deselect "Use initiator name" and then specify the name in the [Name] textbox.
- **5** Enter the outgoing CHAP secret to be used as part of the authentication. Make sure to use the secret that matches the one entered in the storage system.
- **6** To configure bidirectional CHAP, specify the CHAP certification to be received. Set different secrets for outgoing CHAP and incoming CHAP.
- **7** Click [OK].
- 8 Rescan the iSCSI adapter.

Windows

Use the following procedure to set CHAP authentication.

Note

The displayed screen differs depending on the Windows Server version.

• For Unidirectional CHAP

Procedure

- **1** Start the iSCSI Initiator.
- 2 Click the [Discovery] tab.
- **3** Click the [Discover Portal] button. The [Discover Target Portal] window will appear.
- 4 In the [IP address or DNS name] field, enter the IP address of the ETERNUS AB/HB iSCSI port that is to be connected to, and click the [Advanced] button. The [Advanced Settings] window appears.
- **5** Specify the following items and click the [OK] button.
 - Connect using
 - Local adapter
 - Microsoft iSCSI Initiator
 - Initiator IP
 - Initiator server IP address
 - Enable CHAP log on Select the checkbox

- CHAP log on information
 - Name
 - Target secret

Caution

The [Name] and [Target secret] set here must match the [CHAP User ID] and [CHAP Password] set for the ETERNUS AB/HB. For details on the confirmation method, refer to the manual for SANtricity System Manager.

- **6** Click the [OK] button.
- 7 Click the [Targets] tab.
- 8 Check the connection and click the [Connect] button. When CHAP authentication is complete and the connection is successful, the ETERNUS AB/HB iSCSI name should appear in [Discovered targets] and the [Status] should be "Inactive".

Note

The above iSCSI name is an example.

Caution

Even if CHAP authentication is working, the ETERNUS AB/HB iSCSI name sometimes fails to appear in [Discovered targets]. Clicking the [Refresh] button may help.

The [Connect To Target] window appears.

- **9** Select the [Add this connection to the list of Favorite Targets.] checkbox and click the [Advanced] button.
- **10** Confirm that the following items are set and then click the [OK] button.
 - Connect using
 - Local adapter
 - Microsoft iSCSI Initiator
 - Initiator IP
 - Initiator server IP address
 - Target portal IP
 - IP address/port number of the ETERNUS AB/HB
 - (Example: 192.168.10.150 / 3260)
 - Enable CHAP log on
 - The checkbox is selected
 - CHAP log on information
 - Name
 - Target secret
- **11** Click the [OK] button.
- **12** If the logon is successful, the [Status] of the ETERNUS AB/HB iSCSI name displayed in [Discovered targets] of the [Targets] tab should change to "Connected".

For Bidirectional CHAP



- **1** Start the iSCSI Initiator.
- **2** Select the [Configuration] tab and click the [CHAP] button.
- **3** Enter the password under [Initiator CHAP secret] and then click the [OK] button. [Initiator CHAP secret] must be specified with 12 to 16 alphanumeric characters. Clicking the [OK] button makes the password specified in [Initiator CHAP secret] disappear.

Caution

The password under [Initiator CHAP secret] must match the [New Password] of the CHAP authentication setting for the iSCSI port parameters of the ETERNUS AB/HB.

- 4 Click the [Discovery] tab.
- 5 Click the [Discover Portal] button. The [Discover Target Portal] window will appear.
- 6 In the [IP address or DNS name] field, enter the IP address of the ETERNUS AB/HB iSCSI port that is to be connected to, and click the [Advanced] button. The [Advanced Settings] window appears.
- 7 Specify the following items and click the [OK] button.
 - Connect using
 - Local adapter
 - Microsoft iSCSI Initiator
 - Initiator IP
 - Initiator server IP address
 - Enable CHAP log on
 - Select the checkbox
 - CHAP log on information
 - Set a different password from the password that was set for [Initiator CHAP secret] in <u>Step 3</u>.
 - Name
 - Target secret
 - Perform mutual authentication Select the checkbox

Caution

The [Name] and [Target secret] set here must match the [CHAP User ID] and [CHAP Password] set for the ETERNUS AB/HB. For details on the confirmation method, refer to the manual for SANtricity System Manager.

- 8 Click the [OK] button.
- **9** Click the [Targets] tab.

10 Check the connection and click the [Connect] button.

When bidirectional CHAP authentication is complete and the connection is successful, the ETERNUS AB/HB iSCSI name should appear in [Discovered targets] and the [Status] should be "Inactive".

Note

The above iSCSI name is an example.

Caution

Even if bidirectional CHAP authentication is working, the ETERNUS AB/HB iSCSI name sometimes fails to appear in [Discovered targets]. Clicking the [Refresh] button may help.

The [Connect To Target] window appears.

- **11** Select the [Add this connection to the list of Favorite Targets.] checkbox and click the [Advanced] button.
- **12** Confirm and specify the following items and then click the [OK] button.
 - 12-1 Confirm that the following items are set.
 - Connect using
 - Local adapter
 - Microsoft iSCSI Initiator
 - Initiator IP
 Initiator server IP address
 - Target portal IP IP address/port number of the ETERNUS AB/HB (Example: 192.168.10.150 / 3260)
 - 12-2 Set the following items.
 - Enable CHAP log on
 - The checkbox is selected
 - CHAP log on information
 Set the same name and password as the ones that were set in <u>Step 7</u>.
 Name
 - Target secret
 - Perform mutual authentication Select the checkbox
- **13** Click the [OK] button.
- 14 If the logon is successful, the [Status] of the ETERNUS AB/HB iSCSI name displayed in [Discovered targets] of the [Targets] tab should change to "Connected".



6. Supplement to the Express Configuration Guide for Linux, VMware, and Windows

Configuration Diagram (Common to Linux, VMware, Windows)

The following shows connection configuration examples.

FC Connection



- Configuration diagram (2-node server, switch connection)



- Configuration diagram (1-node server, switch connection)

- Configuration diagram (2-node server, direct connection)



- Configuration diagram (1-node server, direct connection)



iSCSI Connection

- Configuration diagram (2-node server, switch connection)







- Configuration diagram (2-node server, direct connection)



- Configuration diagram (1-node server, direct connection)



Linux (FC Connections)

Connecting the Server and the ETERNUS AB/HB

Use an FC cable to connect the Linux server (HBA port) and the ETERNUS AB/HB (HIC port) directly or via a switch.

Setting and Checking the Multipath Software

For RHEL 9/8/7 or Oracle Linux

Preparations

The device-mapper multipath uses the Red Hat Package Manager (RPM). Check that the "device-mapper multipath" package is installed. If it is not installed, install it before setting the multipaths.

Editing "/etc/multipath.conf"

If the OS version is RHEL 8.4 or later, or Oracle Linux 8.4 or later, the default multipath settings are used. Therefore, the multipath.conf configuration file does not need to be configured. If the OS version is RHEL 7.x, RHEL 8.1 to 8.3, Oracle Linux 7.x, or Oracle Linux 8.1 to 8.3, the multipath settings for the ETERNUS AB/HB series are not configured by default. Therefore, a device-mapper multipath configuration file must be configured. Create a configuration file as follows.

Procedure

 Execute the "mpathconf" command.
 Executing this command registers multipath daemon in Services and creates the configuration file (/etc/multipath.conf). # mpathconf --enable

If the configuration file is not created when command above is executed, copy the "/usr/ share/doc/device-mapper-multipath-X.X.X/multipath.conf" file in the "/etc" directory and then execute the "mpathconf --enable" command again.

2 If any internal disks or other devices are to be excluded from the multipath configuration, specify the device names in the "blacklist" section.

If required, refer to the Red Hat website for details. Also refer to the Red Hat website for reference purposes when Oracle Linux is used.

```
blacklist {
}
```

3 Confirm that the following description is present.

- *1: For "user_friendly_names", "no" can be specified as necessary for middleware or applications.
- *2: Add the "queue_without_daemon no" line for iSCSI connections.
- *3: If there is a "find_multipaths yes" line, add a "#" to the beginning of the line to comment out the line.

```
Caution
```

Enter a space between "defaults" and "{".

4 Add the following lines at the end of the file. Example: ETERNUS AB/HB

```
devices {
        device {
                                             "(LSI|FUJITSU)"
                vendor
                                             "ETERNUS AHB"
                product
                path_grouping_policy
                                             group_by_prio
                detect_prio
                                             ves
                prio
                                             rdac
                path checker
                                             rdac
                                             "1 rdac"
                hardware handler
                failback
                                             immediate
                                             "2 pg_init_retries 50"
                features
                no path retry
                                             30
                retain attached hw handler yes
                product_blacklist
                                             "Universal Xport"
                }
        }
```

Caution

- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".

444

Enabling the device-mapper multipath

Enable the device-mapper multipath.

Execute the following command. Check that the device-mapper multipath can be started normally after executing the command.

systemctl start multipathd.service

If the device-mapper multipath is already started, reload it.

```
# systemctl reload multipathd.service
```

Rebooting the Linux Server

Reboot the Linux server.

For SLES 11 or later

Preparations

The device-mapper multipath uses the Red Hat Package Manager (RPM). If the RPM versions are not listed in the Server Support Matrix, use the RPM supplied as standard in the OS.

Editing "/etc/multipath.conf"

If the OS version is SLES 15.3 or later, the default multipath settings are used. Therefore, the multipath.conf configuration file does not need to be configured.

If the OS version is SLES 15.1 to 15.2, the multipath settings for the ETERNUS AB/HB series are not configured by default. Therefore, a device-mapper multipath configuration file must be configured. Create a configuration file as follows.

Procedure

1 Copy the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file to "/etc".

```
#cp/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic /etc/mul-
tipath.conf
```

If the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file does not exist, create the "/etc/multipath.conf" file according to <u>Step 2</u>.

2 Add the following lines to the file.

Add the following lines at the end of the "defaults" section.

```
defaults {
    user_friendly_names yes
    }
```

Add the following lines at the end of the "devices" section. Example: ETERNUS AB/HB

devices {		
device	{	
	vendor	"(LSI FUJITSU)"
	product	"ETERNUS_AHB"
	path_grouping_policy	group_by_prio
	detect_prio	yes
	prio	rdac
	path_checker	rdac
	hardware_handler	"1 rdac"
	failback	immediate
	features	"2 pg_init_retries 50"
	no_path_retry	30
	retain_attached_hw_handler	yes
	product_blacklist	"Universal Xport"
	}	
}		

Caution

- Enter a space between "defaults" and "{".
- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".
- For SLES 12 or later, if any internal disks are to be excluded from the multipath configuration, make sure to specify the device names in the "blacklist" section.



Enabling the device-mapper multipath

Enable the device-mapper multipath. This section describes the procedure for SUSE Linux Enterprise Server 12 and later.

Procedure >> -

- 1 Create an initial RAM disk image file to match the kernel being used. Refer to manuals supplied with the Fibre Channel cards for details.
- **2** Execute the following command.

systemctl enable multipathd.service
systemctl start multipathd.service

Rebooting the Linux Server

Reboot the Linux server.

Caution

For SLES 15, the OS may not start when the system is rebooted after multipathing is configured. In this case, recreate the initial RAM disk.

- Checking the device-mapper multipath
 - Checking the Post device-mapper multipath Devices

Execute the following command to perform various checks on the devices after the device-mapper multipath has been enabled.

ls -l /dev/mapper/

Checking the device-mapper multipath Status

Execute the following command to check the path status. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

```
# multipath -11
```

Setting the FC Switch

When the server and the ETERNUS AB/HB are connected via a switch, set the zoning of the FC switch.

Installing the Driver

Install the appropriate driver for the Fibre Channel card being used. However, if the Linux standard Multipath Driver is used, installation is not required.

Setting Up the Fibre Channel Card Driver

For the Fujitsu Emulex Fibre Channel Card

Procedure >>>

- 1 Use an editor such as "vi" to add the setting values to the configuration file.
 - Configuration file

OS	Configuration file
Red Hat Enterprise Linux 9	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Red Hat Enterprise Linux 8	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
SUSE Linux Enterprise Server 15	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Oracle Linux 9 UEK	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Oracle Linux 9	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Oracle Linux 8 UEK	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Oracle Linux 8	A file under /etc/modprobe.d/ (the file exten- sion is .conf)

OS	Configuration file
Red Hat Enterprise Linux 9 T10-DIF	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N lpfc_enable_bg=1 lpfc_prot_mask=25 lpfc_prot_guard=2 (*1) lpfc_max_luns=N (*2)
Red Hat Enterprise Linux 9	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N lpfc_max_luns=N (*2)
Red Hat Enterprise Linux 8 T10-DIF	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N lpfc_enable_bg=1 lpfc_prot_mask=25 lpfc_prot_guard=2 (*1) lpfc_max_luns=N (*2)
Red Hat Enterprise Linux 8	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N lpfc_max_luns=N (*2)
SUSE Linux Enterprise Server 15	options scsi_mod max_luns=512 (*3) options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N lpfc_max_luns=N (*2)
Oracle Linux 9 UEK T10-DIF	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N lpfc_enable_bg=1 lpfc_prot_mask=25 lpfc_prot_guard=2 (*1)
Oracle Linux 9 UEK	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N
Oracle Linux 9	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N
Oracle Linux 8 UEK T10-DIF	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N lpfc_enable_bg=1 lpfc_prot_mask=25 lpfc_prot_guard=2 (*1)
Oracle Linux 8 UEK	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N
Oracle Linux 8	options lpfc lpfc_lun_queue_depth=N lpfc_link_speed=N lpfc_topology=N

Setting details
 In the following

stables "N" indicates the value of the driv

*1: Set a single line without inserting a new line.

*2: Set the number of LUNs to be recognized only if the number of LUNs exceeds 256.

*3: Set the number of LUNs to be recognized if the number of LUNs exceeds 512.

• Driver parameter settings

Driver parameter	Setting value
lpfc_lun_queue_depth=	Arbitrary (*1)
lpfc_link_speed=	0 (Auto negotiate) (*2)
lpfc_topology=	 For direct connections: 4 For switch connections: 2 When a direct connection is used and the LinkSpeed is 16Gbit/s or more, select "2".
lpfc_enable_bg= (*3)	1
lpfc_prot_mask= (*3)	25
lpfc_prot_guard= (*3)	2
lpfc_max_luns=	Arbitrary (*4)

*1: Set a value within 2,048 for each controller.

- *2: A fixed value can be set.
- *3: Set only if T10-DIF is used.
- *4: Set the number of LUNs only if the number of LUNs exceeds 256.
- **2** Create an initial RAM disk.

Create an initial RAM disk image file to match the kernel being used. Refer to the Emulex Fibre Channel card manual for details on the creation method.

3 Restart the OS.

When the Fibre Channel card requires a non-standard driver, use the "modinfo lpfc" command to confirm that the correct version of the Fibre Channel card driver is installed after rebooting the OS. If T10-DIF is used in Oracle Linux 9 UEK or Oracle Linux 8 UEK, make sure "Enabling DIF Type 1 protection, Enabling DIX T10-DIF-TYPE1-IP protection" is output for each LUN in Syslog.

4 Configure SAN Boot.

For a SAN Boot environment, check the support status in "Server Support Matrix" and configure it by referring to the manuals of the servers, OSs, and Fibre Channel cards to be used.

In addition, if "Server Support Matrix" cannot be referred to, contact "Inquiries about Storage Systems ETERNUS" from the following website.

https://www.fujitsu.com/global/products/computing/storage/contact-us/

Configuration Procedure in UEFI

Procedure >> -

- Turn on the server, and start the [UEFI BIOS setup] menu.
 To display the menu, refer to the User's Guide for the server.
- **2** Select the Fibre Channel card port to be used for SAN Boot and press the [Enter] key.
- **3** Select "Set Boot from SAN" and press the [Enter] key.
- **4** Select "Enable" and press the [Enter] key.
- **5** Select "Configure HBA and Boot Parameters" and press the [Enter] key.

- **6** Select [Commit Changes] and press the [Enter] key.
- 7 Return to the Fibre Channel card ports menu by pressing the [Esc] key.
- 8 Select "Add Boot Device" and press the [Enter] key.
- **9** Select "FUJITSU ETERNUS_AHB" and press the [Enter] key.
- **10** Select "LUN:****" where the OS is installed and press the [Enter] key. The WWN of the FC port on the ETERNUS AB/HB that is connected to the HBA port is displayed at the top of the screen.
- **11** Select "Commit Changes" and press the [Enter] key.
- **12** Return to the Fibre Channel card ports menu by pressing the [Esc] key.
- **13** Select "Change Boot Device Order" and press the [Enter] key.
- **14** In "Boot Device Order", confirm that the connection destination FC port WWN of the ETERNUS AB/HB that is displayed in <u>Step 10</u> is registered.
- **15** Return to the [UEFI BIOS setup] menu by pressing the [Esc] key.
- **16** Save the settings in the [UEFI BIOS setup] menu and then reboot. For details, refer to the User's Guide for the server.



For the Fujitsu QLogic Fibre Channel Card

Procedure ►►► —

Use an editor such as "vi" to add the setting values to the configuration file.
Configuration file

OS	Configuration file
Red Hat Enterprise Linux 9	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Red Hat Enterprise Linux 8	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
SUSE Linux Enterprise Server 15	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Oracle Linux 9 UEK	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Oracle Linux 9	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Oracle Linux 8 UEK	A file under /etc/modprobe.d/ (the file exten- sion is .conf)
Oracle Linux 8	A file under /etc/modprobe.d/ (the file exten- sion is .conf)

Setting details

In the following tables, "N" indicates the value of the driver parameter setting.

OS	Configuration file
Red Hat Enterprise Linux 9 T10-DIF	options qla2xxx ql2xmaxqdepth=N ql2xenabledif=2 ql2xenablehba_err_chk=2 (*1)
Red Hat Enterprise Linux 9	options qla2xxx ql2xmaxqdepth=N
Red Hat Enterprise Linux 8 T10-DIF	options qla2xxx ql2xmaxqdepth=N ql2xenabledif=2 ql2xenablehba_err_chk=2 (*1)
Red Hat Enterprise Linux 8	options qla2xxx ql2xmaxqdepth=N
SUSE Linux Enterprise Server 15	options scsi_mod max_luns=N (*2) options qla2xxx ql2xmaxqdepth=N
Oracle Linux 9 UEK T10-DIF	options qla2xxx ql2xmaxqdepth=N ql2xenabledif=2 ql2xenablehba_err_chk=2 (*1)
Oracle Linux 9 UEK	options qla2xxx ql2xmaxqdepth=N
Oracle Linux 9	options qla2xxx ql2xmaxqdepth=N
Oracle Linux 8 UEK T10-DIF	options qla2xxx ql2xmaxqdepth=N ql2xenabledif=2 ql2xenablehba_err_chk=2 (*1)
Oracle Linux 8 UEK	options qla2xxx ql2xmaxqdepth=N
Oracle Linux 8	options qla2xxx ql2xmaxqdepth=N

*1: Set a single line without inserting a new line.

*2: Set the number of LUNs to be recognized if the number of LUNs exceeds 512.

• Driver parameter settings

Driver parameter	Setting value
ql2xfailover=	0
ql2xmaxqdepth=	Arbitrary (*1)
ql2xtgtemul=	0
ql2xenabledif= (*2)	2
ql2xenablehba_err_chk= (*2)	2

*1: Set a value within 2,048 for each controller.

*2: Set only if T10-DIF is used.

2 Create an initial RAM disk.

Create an initial RAM disk image file to match the kernel being used. Refer to the QLogic Fibre Channel card manual for details on the creation method.

3 Restart the OS.

After restarting the OS, use the "modinfo qla2xxx" command to confirm that the correct version of the Fibre Channel card driver is installed.

4 Configure SAN Boot.

For a SAN Boot environment, check the support status in "Server Support Matrix" and configure it by referring to the manuals of the servers, OSs, and Fibre Channel cards to be used.

In addition, if "Server Support Matrix" cannot be referred to, contact "Inquiries about Storage Systems ETERNUS" from the following website.

https://www.fujitsu.com/global/products/computing/storage/contact-us/

• Configuration Procedure in UEFI

Procedure >> -

- Turn on the server, and start the [UEFI BIOS setup] menu.
 To display the menu, refer to the User's Guide for the server.
- **2** Select the Fibre Channel card port to be used for SAN Boot and press the [Enter] key.
- **3** Select "Boot Settings" and press the [Enter] key.
- **4** Select "Adapter Driver" and press the [Enter] key.
- **5** Select "Enabled" and press the [Enter] key.
- **6** Select "WWN Database" and press the [Enter] key.
- 7 Select [Drive 0] and press the [Enter] key.
- **8** Select the WWN of the ETERNUS AB/HB FC port that is connected to this port and the LUN where the OS is installed, and press the [Enter] key.
- **9** Confirm that the WWN is selected and press the [ESC] key.
- **10** Press the [Esc] key twice to return to the [UEFI BIOS setup] menu.
- **11** Save the settings in the [UEFI BIOS setup] menu and then reboot. For details, refer to the User's Guide for the server.

Setting the ETERNUS AB/HB

Configure the following for the ETERNUS AB/HB.

- Create pools or volume groups
- Create volumes and workloads If hosts have already been created, they can be assigned when volumes are created.
- Create hosts and host clusters Select "Linux" for the host operating system type.
- Assign volumes to hosts and host clusters Refer to the following manual for the creation method. https://sp.ts.fujitsu.com/dmsp/Publications/public/ca08871-192-EN.pdf

Recognizing Linux Volumes

Use Linux commands to confirm that the volumes in the ETERNUS AB/HB are recognized by OS.

Linux (iSCSI Connections)

Connecting the Server and the ETERNUS AB/HB

Use a LAN cable (such as an optical cable) to connect the Linux server (NIC port) and the ETERNUS AB/HB (HIC port) directly or via a switch.

Setting and Checking the Multipath Software

For RHEL 9/8/7 or Oracle Linux

Preparations

The device-mapper multipath uses the Red Hat Package Manager (RPM). Check that the "device-mapper multipath" package is installed. If it is not installed, install it before setting the multipaths.

Editing "/etc/multipath.conf"

If the OS version is RHEL 8.4 or later, or Oracle Linux 8.4 or later, the default multipath settings are used. Therefore, the multipath.conf configuration file does not need to be configured. If the OS version is RHEL 7.x, RHEL 8.1 to 8.3, Oracle Linux 7.x, or Oracle Linux 8.1 to 8.3, the multipath settings for the ETERNUS AB/HB series are not configured by default. Therefore, a device-mapper multipath configuration file must be configured. Create a configuration file as follows.

Procedure

1 Execute the "mpathconf" command.

Executing this command registers multipath daemon in Services and creates the configuration file (/etc/multipath.conf).

mpathconf --enable

If the configuration file is not created when the command above is executed, copy the "/usr/ share/doc/device-mapper-multipath-X.X.X/multipath.conf" file in the "/etc" directory and then execute the "mpathconf --enable" command again.

2 If any internal disks or other devices are to be excluded from the multipath configuration, specify the device names in the "blacklist" section.

If required, refer to the Red Hat website for details. Also refer to the Red Hat website for reference purposes when Oracle Linux is used.

blacklist {
}

3 Confirm that the following description is present.

- *1: For "user_friendly_names", "no" can be specified as necessary for middleware or applications.
- *2: Add the "queue_without_daemon no" line for iSCSI connections.
- *3: If there is a "find_multipaths yes" line, add a "#" to the beginning of the line to comment out the line.

Caution

Enter a space between "defaults" and "{".

4 Add the following lines at the end of the file. Example: ETERNUS AB/HB

```
devices {
        device {
                vendor
                                              "(LSI|FUJITSU)"
                product
                                             "ETERNUS AHB"
                path_grouping_policy
                                             group by prio
                detect prio
                                             yes
                prio
                                              rdac
                path checker
                                              rdac
                                             "1 rdac"
                hardware_handler
                failback
                                             immediate
                                             "2 pg_init_retries 50"
                features
                no_path_retry
                                             30
                retain attached hw handler
                                             ves
                product blacklist
                                             "Universal Xport"
                 }
        }
```

Caution

- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".



Enabling the device-mapper multipath

Enable the device-mapper multipath.

Execute the following command. Check that the multipathd can be started normally after executing the command.

systemctl start multipathd.service

If the multipathd is already started, reload it.

systemctl reload multipathd.service

Rebooting the Linux Server

Reboot the Linux server.

```
# shutdown -r now
```

Checking the device-mapper multipath

• Checking the Post device-mapper multipath Devices

Execute the following command to perform various checks on the devices after the device-mapper multipath has been enabled.

ls -l /dev/mapper/

• Checking the device-mapper multipath Status

Execute the following command to check the path status. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

multipath -11

For SLES 11 or later

Preparations

The device-mapper multipath uses the Red Hat Package Manager (RPM). If the RPM versions are not listed in the Server Support Matrix, use the RPM supplied as standard in the OS.

Editing "/etc/multipath.conf"

If the OS version is SLES 15.3 or later, the default multipath settings are used. Therefore, the multipath.conf configuration file does not need to be configured.

If the OS version is SLES 15.1 to 15.2, the multipath settings for the ETERNUS AB/HB series are not configured by default. Therefore, a device-mapper multipath configuration file must be configured. Create a configuration file as follows.

Procedure ►►► --

1 Copy the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file to "/etc".

```
#cp/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic /etc/mul-
tipath.conf
```

If the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file does not exist, create the "/etc/multipath.conf" file according to <u>Step 2</u>.

2 Add the following lines to the file.

Add the following lines at the end of the "defaults" section.

```
defaults {
    user_friendly_names yes
    }
```
Example: ETERNUS AB/HB

Add the following lines at the end of the "devices" section.

devices { device { vendor "(LSI|FUJITSU)" product "ETERNUS AHB" path_grouping_policy group_by_prio detect prio yes prio rdac path checker rdac "1 rdac" hardware_handler immediate failback "2 pg_init_retries 50" features 30 no_path_retry retain_attached_hw_handler yes product blacklist "Universal Xport" } }

Caution

- Enter a space between "defaults" and "{".
- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".
- For SLES 12 or later, if any internal disks are to be excluded from the multipath configuration, make sure to specify the device names in the "blacklist" section.



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Enabling the device-mapper multipath

Enable the device-mapper multipath. This section describes the procedure for SUSE Linux Enterprise Server 12 and later.

Procedure >> -

- 1 Create an initial RAM disk image file to match the kernel being used. Refer to manuals supplied with the LAN cards for details.
- **2** Execute the following command.

systemctl enable multipathd.service
systemctl start multipathd.service

Rebooting the Linux Server

Reboot the Linux server.

Caution

For SLES 15, the OS may not start when the system is rebooted after multipathing is configured. In this case, recreate the initial RAM disk.

- Checking the device-mapper multipath
 - Checking the Post device-mapper multipath Devices

Execute the following command to perform various checks on the devices after the device-mapper multipath has been enabled.

ls -l /dev/mapper/

Checking the device-mapper multipath Status

Execute the following command to check the path status. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

multipath -11

Setting the Ethernet Switch

If the server and the ETERNUS AB/HB are connected via a switch, set the LAN for iSCSI using a function such as VLAN. The recommended configuration of the LAN for iSCSI is a dedicated network, which uses an IP address segment that is separate from the business LAN or the management LAN. In addition, check the following points.

- Two or more networks (one-to-one network for controller A and controller B) are used to ensure high availability and iSCSI traffic is separated into different network segments.
- Hardware flow control is enabled for the servers and switches. In addition, priority flow control is disabled.
- Jumbo Frame is enabled when necessary.

To enable Jumbo Frame, it must be set for the servers, switches, and storage systems. For the storage systems, refer to the following manual to set an appropriate MTU value. https://storage-system.fujitsu.com/manual/en/abhb/sm-hardware/configure-iscsi-portshardware.html

Caution

Port channels and LACP are not supported by the switch port of the controller. Host side LACP is not recommended. Using multipath can give the same or better benefits.

Setting the ETERNUS AB/HB Network

Specify an IP address for the HIC port.

Setting the Linux Server

For RHEL or Oracle Linux

Preparations

Installing the iscsi-initiator-utils

Use the Red Hat Package Manager (RPM) to set up the iSCSI environment of the Linux server. Confirm that the following RPM is installed. If it is not installed, install it.

iscsi-initiator-utils-____ (*1)

*1: Enter the architecture name and the information following it for the underlined portion.

Installation execution example

rpm -ivh iscsi-initiator-utils-6.2.0.865-0.8.el5.x86_64.rpm

Setting Up Automatic iSCSI Service

The iSCSI service must be set to automatically activate when the Linux server starts up. Add the following line to the end of the "/etc/iscsi/iscsid.conf" file.

node.conn[0].startup = automatic

Setting Up the Network

Set the IP information (IP address and subnet mask) of the LAN card.

Caution

- The LAN card should be set to use the same subnet as that set for the ETERNUS AB/HB that is being connected to.
- For RHEL 7, leave the default gateway unspecified and set "Automatic" to OFF for the DNS and Routes settings. For details on how to perform these settings, refer to the Red Hat manuals.

Checking the iSCSI Initiator Name

Check the iSCSI initiator name.

Check that the unique iSCSI initiator name is described as the default in the "/etc/iscsi/initiatorname.iscsi" file.

Set a unique iSCSI initiator name if one is not already set.

This iSCSI initiator name should be used for the ETERNUS AB/HB settings.

Starting the iSCSI Service

Start the iSCSI service. Execute the following command to start the service.

[OK]

Execute the following command to stop the iSCSI service.

/etc/init.d/iscsi stop

Caution

The iSCSI service does not need to be started for RHEL 7 or RHEL 6.

For SLES

- Preparations
 - Installing the open-iscsi Package

Use the Red Hat Package Manager (RPM) to set up the iSCSI environment of the Linux server. Confirm that the following RPM is installed. If it is not installed, install it.

For SLES 10 SP2

```
open-iscsi-2.0.707-0.44.____ (*1)
```

Installation execution example

rpm -ivh open-iscsi-2.0.707-0.19.____.rpm (*1)

*1: Enter the architecture name and the information following it for the underlined portion.

Setting Up Automatic iSCSI Service

YaST is used to set up the iSCSI service. Refer to the Novell website for details of the setup procedure.

Procedure >> -----

- 1 Start YaST and then run the iSCSI Initiator in Miscellaneous or Network Services. The iSCSI Initiator Overview window appears.
- **2** Check the iSCSI Initiator Overview window.
 - For SLES 15 SP1 or later
 Open the [Service] tab and in Service Configuration, select "Keep current State" in "After writing configuration", and "Start on boot" in "After Reboot".
 - For other cases
 Open the [Service] tab and select the [When Booting] checkbox.

Setting Up the Network

Set the IP information (IP address and subnet mask) of the LAN card.

Caution

The LAN card should be set to use the same subnet as that set for the ETERNUS AB/HB that is being connected to.

Checking the iSCSI Initiator Name

Check the iSCSI initiator name. Check that the unique iSCSI initiator name is described as the default in the "/etc/iscsi/initiatorname.iscsi" file. Set a unique iSCSI initiator name if one is not already set. This iSCSI initiator name should be used for the ETERNUS AB/HB settings.

Setting the ETERNUS AB/HB

Configure the following for the ETERNUS AB/HB.

- Create pools or volume groups
- Create volumes and workloads If hosts have already been created, they can be assigned when volumes are created.
- Create hosts and host clusters Select "Linux" for the host operating system type.
- Assign volumes to hosts and host clusters Refer to the following manual for the creation method. https://sp.ts.fujitsu.com/dmsp/Publications/public/ca08871-192-EN.pdf

Recognizing Linux Volumes

Use Linux commands to confirm that the volumes in the ETERNUS AB/HB are recognized by OS.

VMware (FC Connections)

Connecting the Server and the ETERNUS AB/HB

Use an FC cable to connect the server (HBA port) and the ETERNUS AB/HB (HIC port) directly or via a switch.

Setting the FC Switch

When the server and the ETERNUS AB/HB are connected via a switch, set the zoning of the FC switch.

Installing the Driver

Installation of the driver is not required if an OS media of a Fujitsu custom image or the OS standard driver is used.

Setting Up the Fibre Channel Card Driver

Setting Up SAN Boot

For a SAN Boot environment, check the support status in "Server Support Matrix" and configure it by referring to the manuals of the servers, OSs, and Fibre Channel cards to be used.

In addition, if "Server Support Matrix" cannot be referred to, contact "Inquiries about Storage Systems ETERNUS" from the following website. https://www.fujitsu.com/global/products/computing/storage/contact-us/

For Fujitsu Emulex Fibre Channel Cards

Configuration Procedure in UEFI

Procedure

- 1 Turn on the server, and start the [UEFI BIOS setup] menu. To display the menu, refer to the User's Guide for the server.
- 2 Select the Fibre Channel card port to be used for SAN Boot and press the [Enter] key.
- **3** Select "Set Boot from SAN" and press the [Enter] key.
- 4 Select "Enable" and press the [Enter] key.
- **5** Return to the [UEFI BIOS setup] menu by pressing the [Esc] key.
- **6** Save the settings in the [UEFI BIOS setup] menu and then reboot. For details, refer to the User's Guide for the server.

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- For the Fujitsu QLogic Fibre Channel Card
 - Configuration Procedure in UEFI

Procedure

- 1 Turn on the server, and start the [UEFI BIOS setup] menu. To display the menu, refer to the User's Guide for the server.
- 2 Select the Fibre Channel card port to be used for SAN Boot and press the [Enter] key.
- **3** Select "Boot Settings" and press the [Enter] key.
- 4 Select "Adapter Driver" and press the [Enter] key.
- **5** Select "Enabled" and press the [Enter] key.
- **6** Press the [Esc] key twice to return to the [UEFI BIOS setup] menu.
- 7 Save the settings in the [UEFI BIOS setup] menu and then reboot. For details, refer to the User's Guide for the server.

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Setting Up the Driver

Note

To change the Queue Depth setting, refer to the following Broadcom website. https://knowledge.broadcom.com/external/article?legacyId=1267

For Fujitsu Emulex Fibre Channel Cards

Caution

- During an FC connection, disabling NVMe support is recommended. When NVMe support is enabled, duplicate WWPNs may be displayed.
 For details on how to disable NVMe support, refer to the following Broadcom website. https://knowledge.broadcom.com/external/article?legacyId=84325
- In addition, the value of the driver parameter "lpfcX_lun_queue_depth" can be changed by executing the following command.
 - Execution example 1

esxcli system module parameters set -m lpfc -p "lpfc_enable_fc4_type=1 lpfc0_lun_queue_depth=8"

When changing the value of the driver parameter "lpfcX_lun_queue_depth", disable NVMe support at the same time. Even if NVMe support is already disabled and the "lpfcX_lun_queue_depth" value is changed later, disable NVMe support every time.

- Execution example 2

esxcli system module parameters set -m lpfc -p lpfc_enable_fc4_type=1 (*1)
esxcli system module parameters set -a -m lpfc -p lpfc0_lun_queue_depth=8 (*2)

- *1: Disable NVMe support.
- *2: Change the value of the driver parameter "lpfcX_lun_queue_depth". Depending on the "-a" option, the NVMe support disable setting remains "Enabled" and the "lpfcX_lun_queue_depth" value is changed.
- In the following example, the number of ports is "two" since "vmhba1" and "vmhba2" (two underlined portions) are displayed as the HBA names of the card.

```
# esxcfg-scsidevs -a | grep lpfc
vmhba1 lpfc link-up fc.20000000c98df7c4:1000000c98df7c4 (0:2:0.0) Emulex Corporation
LPe31000 16Gb Fibre Channel Host Adapter
vmhba2 lpfc link-up fc.2000000c98df7c5:1000000c98df7c5 (0:2:0.1) Emulex Corporation
LPe31000 16Gb Fibre Channel Host Adapter
```

Procedure >> -

 Record the module name for the Fibre Channel card that is loaded into VMware ESXi. The underlined portion indicates the loaded module name. In the following example, "lpfc" is the module name.

```
# esxcli system module list | grep lpfc
lpfc
true
true
```

Module names may vary depending on the Fibre Channel card that is used.

2 Check the number of ports on the Fibre Channel card. The number of HBA names for the Fibre Channel card that is displayed represents the number of ports. **3** Check the default value for the Fibre Channel card. Specify the module name for the Fibre Channel card that you recorded in <u>Step 1</u> and check the default value.

```
# esxcli system module parameters list -m lpfc | grep lpfc[0-1]_lun_queue_depth
lpfc0_lun_queue_depth int Max number of FCP commands we can queue to a specific
LUN
lpfc1_lun_queue_depth int Max number of FCP commands we can queue to a specific
LUN
```

[0-1] indicates that the number of ports is two.

4 Change the setting values of the parameter for the Fibre Channel card driver. For the Queue Depth setting value, check <u>"Notes Related to the Maximum Number of Commands That Can Be Processed Simultaneously (Queue Depth)" (page 44)</u>. Use the following command to change the setting values when the driver parameter name is "lpfcX_lun_queue_depth", the number of I/Os is "8", the module name is "lpfc", and the number of ports is "2".

```
# esxcli system module parameters set -p "lpfc0_lun_queue_depth=8 lpfc1_lun_
queue depth=8" -m lpfc
```

Input the number of I/Os ("8" in this example) for the driver parameter setting.

5 Reboot VMware ESXi.

reboot

6 After rebooting VMware ESXi, check the setting values.

```
# esxcli system module parameters list -m lpfc | grep lpfc[0-1]_lun_queue_depth
lpfc0_lun_queue_depth int 8 Max number of FCP commands we can queue to a
specific LUN
lpfc1_lun_queue_depth int 8 Max number of FCP commands we can queue to a
specific LUN
```

For the Fujitsu QLogic Fibre Channel Card

Caution

 During an FC connection, disabling NVMe support is recommended. When NVMe support is enabled, duplicate WWPNs may be displayed.
 For details on how to disable NVMe support, refer to the following Broadcom website.

https://knowledge.broadcom.com/external/article?legacyId=84325

- In addition, the value of the driver parameter "ql2xmaxqdepth" can be changed by executing the following command.
 - Execution example 1

```
# esxcli system module parameters set -m qlnativefc -p "ql2xnvmesupport=0
ql2xmaxqdepth=8"
```

When changing the value of the driver parameter "ql2xmaxqdepth", disable NVMe support at the same time. Even if NVMe support is already disabled and the "ql2xmaxqdepth" value is changed later, disable NVMe support every time.

- Execution example 2

```
# esxcli system module parameters set -m qlnativefc -p ql2xnvmesupport=0 (*1)
# esxcli system module parameters set -a -m qlnativefc -p ql2xmaxqdepth=8 (*2)
```

- *1: Disable NVMe support.
- *2: Change the value of the driver parameter "ql2xmaxqdepth". Depending on the "-a" option, the NVMe support disable setting remains "Enabled" and the "ql2xmaxqdepth" value is changed.

Procedure >> -

 Record the module name for the Fibre Channel card that is loaded into VMware ESXi. The underlined portion indicates the loaded module name. In the following example, "glnativefc" is the module name.

Module names may vary depending on the Fibre Channel card that is used.

2 Check the default value for the Fibre Channel card. Specify the module name for the Fibre Channel card that you recorded in <u>Step 1</u> and check the default value.

```
# esxcli system module parameters list -m qlnativefc | grep ql2xmaxqdepth
ql2xmaxqdepth int Maximum queue depth to report for target devices.
```

3 Change the setting values of the driver parameter for the Fibre Channel card. For the Queue Depth setting value, check <u>"Notes Related to the Maximum Number of Commands That Can Be Processed Simultaneously (Queue Depth)" (page 44)</u>. Use the following command to change the setting values when the driver parameter name is "ql2xmaxqdepth", the number of I/Os is "8", and the module name is "qlnativefc".

```
# esxcli system module parameters set -p ql2xmaxqdepth=8 -m qlnativefc
```

Caution

This option cannot be individually applied to each port on the Fibre Channel card. All ports on the target Fibre Channel card are configured with the same settings.

4 Reboot VMware ESXi.

reboot

5 After rebooting VMware ESXi, check the setting values.

```
# esxcli system module parameters list -m qlnativefc | grep ql2xmaxqdepth
ql2xmaxqdepth int 8 Maximum queue depth to report for target devices.
```

Checking the Maximum Command Queue Depth of the Fibre Channel Card

Confirm whether the configured driver parameters of the Fibre Channel card are applied to the LUN.

Procedure

1 Check the Device Max Queue Depth of the ETERNUS AB/HB LUN that is connected to VMware ESXi.

Note

- If the default driver value is specified for the Device Max Queue Depth even after the parameter was changed to the same value as the Queue Depth of the Fibre Channel card driver, the configuration may fail due to reasons such as invalid values. In that case, check the settings again.
- The value specified for the driver parameter and the Device Max Queue Depth may differ depending on the Fibre Channel card.
 Check "FUJITSU Fibre Channel Disk (naa.xxx)" and "Device Max Queue Depth" in the following example.

```
# esxcli storage core device list | grep -E '(Display Name:|Device Max
Queue Depth:) '
Display Name: Local LSI Disk (naa.60030057013345401a6af1560de849bc)
Has Settable Display Name: true
Device Max Queue Depth: 128
Display Name: FUJITSU Fibre Channel Disk
(naa.6000b5d0006a000006a0b9f01490000)
Has Settable Display Name: true
Device Max Queue Depth: 8
Display Name: FUJITSU Fibre Channel Disk
(naa.6000b5d0006a000006a0b9f014a0000)
Has Settable Display Name: true
Device Max Queue Depth: 8
Display Name: Local MATSHITA CD-ROM (mpx.vmhba32:C0:T0:L0)
Has Settable Display Name: false
Device Max Queue Depth: 1
```



Setting the ETERNUS AB/HB

Configure the following for the ETERNUS AB/HB.

- Create pools or volume groups
- Create volumes and workloads If hosts have already been created, they can be assigned when volumes are created.
- Create hosts and host clusters
 Select "VMware ESXi" for the host operating system type.
- Assign volumes to hosts and host clusters Refer to the following manual for the creation method. https://sp.ts.fujitsu.com/dmsp/Publications/public/ca08871-192-EN.pdf

Recognizing VMware Volumes

Log in to vCenter or VMware ESXi to confirm that the volumes in the ETERNUS AB/HB are recognized by OS. This setting can also be checked using the VMware command line.

Setting and Checking the Multipath Software

Additional settings are not required if the VMware standard Native Multipathing Plug-in (NMP) is used. For details about tuning the software, refer to the documents for VMware.

To use VMware Multi-Pathing plug-in for ETERNUS AB/HB, access the following URL and obtain modules and documents.

https://www.fujitsu.com/global/support/products/computing/storage/download/vmware-mp-plug-in.html

Scanning the Device

Scan the device using vCenter or VMware ESXi as required.

Checking LUNs

Check [Path Selection Policy] for all the LUNs in the ETERNUS AB/HB.

If [Path Selection Policy] is set to [Most Recently Used (VMware)], changing [Path Selection Policy] to [Round Robin (VMware)] is recommended.

Note

The vSphere command line can also be used to change the [Path Selection Policy] settings. For more details, refer to the following Broadcom website. https://knowledge.broadcom.com/external/article?legacyId=2000552

VMware (iSCSI Connections)

Connecting the Server and the ETERNUS AB/HB

Use a LAN cable (such as an optical cable) to connect the server (NIC port) and the ETERNUS AB/ HB (HIC port) directly or via a switch.

Setting the Ethernet Switch

If the server and the ETERNUS AB/HB are connected via a switch, set the LAN for iSCSI using a function such as VLAN. The recommended configuration of the LAN for iSCSI is a dedicated network, which uses an IP address segment that is separate from the business LAN or the management LAN. In addition, check the following points.

- Two or more networks (one-to-one network for controller A and controller B) are used to ensure high availability and iSCSI traffic is separated into different network segments.
- Hardware flow control is enabled for the servers and switches. In addition, priority flow control is disabled.
- Jumbo Frame is enabled when necessary.

To enable Jumbo Frame, it must be set for the servers, switches, and storage systems. For the storage systems, refer to the following manual to set an appropriate MTU value. https://storage-system.fujitsu.com/manual/en/abhb/sm-hardware/configure-iscsi-portshardware.html

Caution

Port channels and LACP are not supported by the switch port of the controller. Host side LACP is not recommended. Using multipath can give the same or better benefits.

Setting the ETERNUS AB/HB Network

Specify an IP address for the HIC port.

Setting VMware

Note

The displayed screen differs depending on factors such as the version.

Checking the LAN Cards

Procedure >> -

1 Log in to the vSphere Client and select in order, [Hosts and Clusters] > target host.

2 Select in order, the [Manage] tab > [Networking] > [Physical adapters]. "vmnic4" and "vmnic5" are used in the following example.





Add two virtual switches (vSwitch) for iSCSI to VMware ESXi. Add a "vmnic" and a "VMkernel" for each vSwitch.

Perform the following procedure to each vmnic that configures iSCSI SAN.

When Using vSphere Standard Switches

Procedure **>>**

- 1 Log in to the vSphere Client and select in order, [Hosts and Clusters] > target host.
- 2 Select in order, the [Manage] tab > [Networking] > [Virtual switches].
- **3** Select [Add host networking] in the right pane.

Settings	Networking	Storage	Alarm Definitions	Tags	Permissions
44			Virtual switches		
Virtua	l switches			-	XO
VMke	rnel adapters		Constant of the local data		
			Add host	netwo	orking

- **4** If the [Add Networking] pop-up window is displayed, add the network by following the displayed instructions.
 - 4-1 Select [VMkernel Network Adapter] and click the [Next] button.
 - 4-2 Select [New Standard switch] and click the [Next] button.
 - 4-3 Select the target NIC from [Active adapters] using [Add adapters] in the right pane and click the [Next] button.
 - 4-4 Configure the port as required and click the [Next] button.
 - 4-5 Set the IP address and subnet mask of [VMkernel], and click the [Next] button.
 - 4-6 Confirm the settings and click the [Finish] button.
- **5** Repeat <u>Step 4</u> to add Virtual Switch vSwitch2.
- **6** Confirm that a Virtual Switch and a VMkernel are set for each vmnic.

tlings Networking Storage	Alarm Definitions Tags Permissions	
	Virtual switches	
Virtual switches	2 @ 🕸 🖻 / X O	
VMkernel adapters	Switch	Discovered Issues
Physical adapters	1 vSwitch0	
TCP/IP configuration	at vSwitch1	
	/ ×	
	VMkernel O	Physical Adapters
	VLAN ID: * VMkernel Ports (1) vmk1: 192.168.10.29	

When Using vSphere Distributed Switches

Procedure

- **1** Create a vSphere Distributed Switch.
 - 1-1 Log in to the vSphere Client and select in order, [Home] > [Networking].
 - 1-2 Right-click [Datacenter] in the left pane and select in order, [Distributed Switch] > [New Distributed Switch].

Navigator		🐺 🧕 Netv	working
4 Home	× 3		
D			
🖌 🕜 vc-server-e2.fuji	tsu.com		
Datacenter	Actions - Datacenter		
M Netwo	Add Host		
	1 New Cluster		
	New Folder		•
			THE PARTY OF THE REPARTY OF THE PARTY OF THE

- **2** If the setting pop-up window is displayed, set a vSphere Distributed Switch by following the displayed instructions.
 - 2-1 Enter a vDS name and click the [Next] button.
 - 2-2 Select an appropriate vSphere Distributed Switch version for each host version and click the [Next] button.
 - 2-3 Set the number of physical ports and the port group names that are used, and click the [Next] button.
 - 2-4 Confirm the settings and click the [Finish] button.
- 3 Confirm that [DSwitch] has been created under [Datacenter].

mware vSphere Web Client _ त ≡	
Navigator I	DSwitch Actio
4 Home 🕨 🔊	Getting Started
	What is a Distrib A distributed swit switch across all allows virtual ma consistent netwo migrate across h
Switch-DVUplinks-55	Distributed virtua consists of three place at the data

4 If multiple vSphere Distributed Switches are required, repeat <u>Step 2</u>.

- **5** Set a VMkernel in vSphere Distributed Switch for each host.
 - 5-1 Log in to the vSphere Client and select in order, [Home] > [Networking].
 - 5-2 Move to [Datacenter] and click [DSwitch].
 - 5-3 Select in order, the [Manage] tab > [Settings] > [Topology].
 - 5-4 Click [Add hosts to this distributed switch..].

Settings	Alarm Definitions	Tags	Permissions	Network Protocol Profiles	Ports	Resource Allocation	
н			200	0	(over	iew)	💽 થ, ૦ન્નુ ્ર
Topol	ogy		LAN IC ada	hosts to this distributed rate physical or virtual ne pters.	l switc etwork	h and Itch-DVU Iplink 1	Jplinks-62 (0 NIC Adapters)
Privat NetFlo	te VLAN	ļ	Virtual Machi	ines (0)			
Port n Health	nirroring h check						

- 5-5 Select [Add host and manage host networking(advanced)] and click the [Next] button.
- 5-6 Click [New hosts..], select the host to use the DSwitch, and click the [OK] button.
- 5-7 Click the [Next] button.
- 5-8 Select [Manage physical adapters] and [Manage VMkernel adapters], and then click the [Next] button.
- **6** Select the target vmnic and click [Assign uplink].

Add and Manage Hosts				
 1 Select task 2 Select hosts 	Manage physical network adapters Add or remove physical network adapt	ers to this distributed switch.		
3 Select network adapter tasks	Assign uplink C Unassign adag	iter 🕐 Reset changes 🚯 View	settings	
4 Manage physical network	Host/Physical Network Adaptars	1 A In Use by Switch	Uplink	Uplink Port Group
, Manage VMkernel network	- 192.168.77.30			
³ adapters	On this switch			
6 Analyze impact	 On other switches/unclaimed 			
7 Ready to complete	ymnic0	vSwitch0	-	-
	vmnic1		-	-
	vmnic2			-
	ymnic3	-	-	-
	vmnic4	-		-
	vmnic5	-	-	

- 7 Click [OK] in the pop-up window.
- **8** Confirm that the selected vmnic has been set for [Uplink Port Group] and click the [Next] button.

🕞 Add and Manage Hosts					?
 1 Select task 2 Select hosts Select network adapter 	Manage physical network adapters Add or remove physical network adapters	to this distributed switch.			
tasks	Assign uplink 💥 Unassign adapter	Reset changes 🕧 View	settings		
4 Manage physical network	Host/Physical Network Adapters	1 A In Use by Switch	Uplink	Uplink Port Group	
Manage VMkernel petwork	→ 192.168.77.30				
5 adapters	✓ On this switch				
6 Analyze impact	vmnic5 (Assigned)	-	Uplink 1	DSwitch-DVUplinks-62	
7 Ready to complete	· On other switches/unclaimed				
	💓 vmnic0	vSwitch0		17	
	vmnic1	-	-	+	
	wnnic2	-			
	vmnic3	-	-	-	
	属 vmnic4	-		-	
	vmnic3		-	-	

9 Select [On this switch] and click [New adapter].

 1 Select task 2 Select hosts 	Manage VMkernel network adapters Manage and assign VMkernel network	k adapters to the distributed switch	l.	
3 Select network adapter tasks	2. Askign port grou 👍 New adap	er Edit adapter 💥 Remove	n Reset changes 👩 View set	
🗸 🔒 Manage physical network	Host/VMierriel Network Adapters	1 . In Use by Switch	Source Port Group	Destination Port Group
adapters				
adapters	- 192.168.77.30			
adapters 5 Manage VMkernel network adapters	- 192.168.77.30 On this switch			
 adapters 5 Manage VMkernel network adapters 6 Analyze impact 				

- **10** Perform the settings in the VMkernel configuration pop-up window.
 - 10-1 Select the DPortGroup that was created with [Browser] by selecting [Select an existing network].
 - 10-2 Configure the port as required and click the [Next] button.
 - 10-3 Set the IP address and click the [Next] button.
- **11** Confirm that "DSwitch" and "DPortGroup" have been set for vmk1 in [On this switch], and then click the [Next] button.

 1 Select task 2 Select hosts 3 Select network adapter tasks 	Manage VMkernel network adapters Manage and assign VMkernel network	adapters to the distributed switch	🕐 Reset changes 🚯 View set	tings
4 Manage physical network adapters 5 Manage VMkernel network adapters	Host/Villemei Network Adapters Tig 192.168.77.30 On this switch	1 k In Use by Switch	Source Port Group	Destination Port Group
6 Analyze impact 7 Ready to complete	vmkt (new) ← On other switches	DSwitch	ee .	DPortGroup
	间 vmk0	vSwitch0	Management Network	Do not migrate

- **12** Confirm that "No impact" is displayed for [Overall impact status] and click the [Next] button.
- **13** Confirm the settings and click the [Finish] button.

14 Confirm that the VMkernel port has been created by clicking the [Manage] tab > [Networking] > [Virtual switches] from the vSphere Client.

Settings Networking Stora	ge Alarm Definitions Tags Permissions	
	Virtual switches	
Virtual switches	12 Ge 🕅 🖥 🗙 🙃	
VMkernel adapters	Switch	Discovered Issues
Physical adapters	C DSwitch	-
TCP/IP configuration	1 vSwitch0	
	Distributed switch: DSwitch (no item select	ed)
	Assigned port groups filter applied, showing	(assigned port groups) V
	Assigned port groups filter applied, showin	ng: 2 1/1
	Assigned port groups filter applied, showin Control PortGroup VLAN ID: V VMkernel Ports (1) vmk1 : 192.168.20.30 Vidual Machines (0)	assigned poit groups) ↓ C ng: 2 1/1 ▼ DSwitch-DVUplinks-62 ► Tuplink 1 (1 NIC Adapter)

Setting the Software Initiator

Enable Software Initiator in VMware ESXi.

Procedure

- 1 Log in to the vSphere Client and select in order, [Hosts and Clusters] > target host.
- 2 Select in order, the [Manage] tab > [Storage] > [Storage Adapters].
- **3** Select the [iSCSI Software Adapter] item.
- 4 Check the iSCSI name that is displayed in [Adapter Details].
- 5 Select the [Targets] tab in [Adapter Details].
- **6** Click the [Add] button in [Dynamic Discovery].
- 7 Enter the IP address for the iSCSI port of the connected ETERNUS AB/HB in the [iSCSI Server] column, confirm that the port is set to "3260" (default), and click the [OK] button.

8 Confirm that the IP address for the iSCSI port of the ETERNUS AB/HB is displayed as follows.

ettings Networking Storage	Alarm Definitions	Tags 8	Permiss	ions		
4	Storage Adapters					
Storage Adapters	+ 68 🖳 🛛	0	•		Q Filter	•
Storage Devices	Adapter	T)	pe	Status	Identifier	
Host Cache Configuration	Vmhba2	S	CSI	Unkn		
Protocol Endpoints	ISC SI Software A	dapter				
	Vmhba34	is	SCSI	Online	ign.1998-01.com.vmware.m300s6-10-69ea3022	
	4		11			
					2005	
	Adapter Details					
	Properties De	vices	Paths	Targets	Network Port Binding Advanced Options	
	Dynamic Disc	overy	Static D	iscovery		
				Add	Remove Authentication Advanced	
	ISCSI server					
	192.168.10.12	9:3260				
	100 100 00 10	0.2260				

9 If the connected ETERNUS AB/HB uses multiple iSCSI ports, repeat the IP address addition process for each iSCSI port. (Repeat <u>Step 6</u> through <u>Step 8</u>.)

Checking the LUNs

The following procedure describes how to check LUN recognition using the vSphere Client. Log in to VMware ESXi from the vSphere Client, and then check whether the devices are recognized.

Procedure

- 1 Log in to the vSphere Client and select in order, [Hosts and Clusters] > target host.
- 2 Select in order, [Manage] > [Storage] > [Storage Adapters].
- **3** Select [Rescan...].

Note

After selecting [Rescan...], the VMware ESXi should attempt to recognize the ETERNUS AB/ HB storage systems' LUNs again. **4** Select the iSCSI Software Adapter (vmhba34 in this example) from the [Storage Adapters] area.

In the [Devices] tab in the [Adapter Details] area, the recognized devices are shown as follows.

ettings Networking Storage	Alarm Definitions Ta	gs Permis	sions					
•	Storage Adapters							
Storage Adapters	+ 🖬 💷 🖾	D -			(Q Filter		
Storage Devices	Adapter	Туре	Status	Identifier				
Host Cache Configuration	Vmhba2	SCSI	Unkn					
Protocol Endpoints	ISCSI Software Ada	ISCSI Software Adapter						
<	lo vmhba34	iSCSI	Online	ign.1998-01.co	m.vmwar	e:rx300s6-10-69ea3	022	
	4							
	Adapter Details			-				
	Adapter Details Properties Devic	es Paths	Targets	Network Port I	Binding	Advanced Options		
	Adapter Details Properties Devic	es Paths	Targets	Network Port I	Binding	Advanced Options	•	
	Adapter Details Properties Devic Rame	es Paths	Targets	Network Port I	Binding Q Type	Advanced Options Filter Capacity	• Ope	
	Adapter Details Properties Devic Region in the second seco	es Paths	Targets	Network Port I	Binding Q Type disk	Advanced Options Filter Capacity 100.00 GB	• Ope Atta	
	Adapter Details Properties Devic Review Name FUJITSU ISCSI D FUJITSU ISCSI D	es Paths	Targets	Network Port I Sa0000006a0b	Binding Q Type disk disk	Advanced Options Filter Capacity 100.00 GB 200.00 GB	Ope Atta Atta	
	Adapter Details Properties Devic Properties Devic Name FUJITSU ISCSI D FUJITSU ISCSI D FUJITSU ISCSI D FUJITSU ISCSI D	es Paths Paths (naa.600 (naa.600 (naa.600 (naa.600) (naa.600)	Targets	Network Port I Sa0000006a0b Sa0000006a0b	Binding Q Type disk disk disk	Advanced Options Filter Capacity 100.00 GB 200.00 GB 5.00 GB	Ope Atta Atta	
	Adapter Details Properties Devic Properties Devic Properties Devic Name FUJITSU ISCSI D	es Paths	Targets 2. (2) 00b5d0006 00b5d0006 00b5d0006 00b5d0006	Network Port I Sa0000006a0b Sa00000006a0b Sa00000006a0b Sa	Binding Q I Type disk disk disk disk	Advanced Options Filter Capacity Capacity 200.00 GB 5.00 GB 5.00 GB 5.00 GB	Ope Atta Atta Atta	

5 Check [Path Selection Policy] for all the LUNs in the ETERNUS AB/HB.
 If [Path Selection Policy] is set to [Most Recently Used (VMware)], changing [Path Selection Policy] to [Round Robin (VMware)] is recommended.

Settings Networking Storage	Alarm Definitions Tags Per	mission	S						
Storage Adapters	Storage Devices			Do -		Tiltor			
Storage Devices		Tree	C	Oneutica	United and	Drive T	Transat	Ť	
Host Cache Configuration	Local I SI Disk (naa 6003	dick	136	Attached	Not sunno	HDD	Parallal		
Protocol Endpoints	Local TEAC CD-ROM (m	cdr.	100	Attached	Not suppo	HDD	Block A		
	FUJITSU ISCSI Disk (naa	disk	5.00	Attached	Supported	HDD	ISCSI		
	FUJITSU ISCSI Disk (naa	disk	200	Attached	Supported	HDD	iSCSI		
	FUJITSU ISCSI Disk (naa	disk	5.00	Attached	Supported	HDD	ISCSI		
	Device Details								
	Properties Paths								
	► Logical Partitions 0							•	
	Multipathing Policies Edit Multipathing								
	Path Selection Policy Round Robin (VI/Iware)								
	Storage Array Type Policy VMW SATP ALUA								

Note

The vSphere command line can also be used to change the [Path Selection Policy] settings. For more details, refer to the following Broadcom website. https://knowledge.broadcom.com/external/article?legacyId=2000552

6 For a multipath configuration, confirm that the paths of all the LUNs in the ETER-NUS AB/HB are configured with multipath.

When paths for a LUN are configured with multipath, multiple runtime names and targets are displayed in [Paths].

Windows (FC Connections)

Connecting the Server and the ETERNUS AB/HB

Use an FC cable to connect the server (HBA port) and the ETERNUS AB/HB (HIC port) directly or via a switch.

Setting the FC Switch

When the server and the ETERNUS AB/HB are connected via a switch, set the zoning of the FC switch.

Installing the Driver

The driver installation is not required if the OS standard driver is used.

Setting the ETERNUS AB/HB

Configure the following for the ETERNUS AB/HB.

- Create pools or volume groups
- Create volumes and workloads If hosts have already been created, they can be assigned when volumes are created.
- Create hosts and host clusters Select "Windows" for the host operating system type.
- Assign volumes to hosts and host clusters Refer to the following manual for the creation method. https://sp.ts.fujitsu.com/dmsp/Publications/public/ca08871-192-EN.pdf

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Recognizing Windows Volumes

Use a tool such as Device Manager to check the volume recognition.

Setting and Checking the Multipath Software

Instead of the standard multipath driver (MSDSM), use of SANtricity Windows DSM is recommended. The software can be obtained from the DVD that is provided with the ETERNUS AB/HB.

In addition, refer to the following software manual. https://sp.ts.fujitsu.com/dmsp/Publications/public/p3ag-5532-EN.pdf

Windows (iSCSI Connections)

Connecting the Server and the ETERNUS AB/HB

Use a LAN cable (such as an optical cable) to connect the server (NIC port) and the ETERNUS AB/ HB (HIC port) directly or via a switch.

Setting the Ethernet Switch

If the server and the ETERNUS AB/HB are connected via a switch, set the LAN for iSCSI using a function such as VLAN. The recommended configuration of the LAN for iSCSI is a dedicated network, which uses an IP address segment that is separate from the business LAN or the management LAN. In addition, check the following points.

- Two or more networks (one-to-one network for controller A and controller B) are used to ensure high availability and iSCSI traffic is separated into different network segments.
- Hardware flow control is enabled for the servers and switches. In addition, priority flow control is disabled.
- Jumbo Frame is enabled when necessary.

To enable Jumbo Frame, it must be set for the servers, switches, and storage systems. For the storage systems, refer to the following manual to set an appropriate MTU value. https://storage-system.fujitsu.com/manual/en/abhb/sm-hardware/configure-iscsi-portshardware.html

Caution

Port channels and LACP are not supported by the switch port of the controller. Host side LACP is not recommended. Using multipath can give the same or better benefits.

Setting the ETERNUS AB/HB

Configure the following for the ETERNUS AB/HB.

- Create pools or volume groups
- Create volumes and workloads If hosts have already been created, they can be assigned when volumes are created.

- Create hosts and host clusters
 Select "Windows" for the host operating system type.
- Assign volumes to hosts and host clusters Refer to the following manual for the creation method. https://sp.ts.fujitsu.com/dmsp/Publications/public/ca08871-192-EN.pdf

Setting Windows

Use the iSCSI Initiator to set the iSCSI initiator parameters.

Note

The displayed screen differs depending on the Windows Server version.

Procedure >>> ----

- **1** Start the iSCSI Initiator.
- **2** Click the [Configuration] tab.
- **3** To change the iSCSI name, click the [Change] button.

The current iSCSI name is displayed in [Initiator Name]. When using the default iSCSI name displayed in [Initiator Name], also click the [Change] button. This allows you to continue to use the above iSCSI name even after changing the "computer name" of the server.

- 4 Enter the iSCSI name and click the [OK] button. The [iSCSI Initiator Properties] window will appear.
- **5** Click the [Discovery] tab and then click the [Discover Portal] button.
- **6** In the [IP address or DNS name] field, enter the IP address of the ETERNUS AB/HB iSCSI port that is to be connected to, and click the [Advanced] button.

Caution

Enter the address set for the TCP/IP settings of the ETERNUS AX/AC/HX side iSCSI port as the IP address of the ETERNUS AX/AC/HX.

The [Advanced Settings] window appears.

- 7 Click the [General] tab.
- 8 Select "Microsoft iSCSI Initiator" for [Local adapter] and set the Initiator server IP address in [Initiator IP] under [Connect using]. Then, click the [OK] button. The settings of CHAP authentication can also be made. For details of the settings, refer to <u>"OS CHAP Authentication Settings for iSCSI Connections (for Linux, VMware, and Windows)" (page 86)</u>.
- **9** Click the [OK] button.
- **10** Click the [Targets] tab.

11 Check the connection and click the [Connect] button.

If the connection is successful, the ETERNUS AB/HB iSCSI name should appear in [Discovered targets] and the [Status] should be "Inactive".

Caution

Even if the connection is correctly made, the ETERNUS AB/HB iSCSI name may not appear in [Discovered targets]. Perform the following steps.

- Check that the cables are connected correctly.
- Click the [Refresh] button.
- **12** Select the [Add this connection to the list of Favorite Targets.] checkbox and click the [Advanced] button.
- **13** Select "Microsoft iSCSI Initiator" for [Local adapter]. Next, set the Initiator server IP address and the ETERNUS AB/HB IP address/port number (for example, 192.168.10.150 / 3260), in [Initiator IP] and [Target portal IP] respectively under [Connect using]. Then, click the [OK] button.
- **14** Click the [OK] button.

If the logon is successful, the [Status] of the ETERNUS AB/HB iSCSI name displayed in the [Targets] tab window should change to "Connected".



Setting and Checking the Multipath Software

Instead of the standard multipath driver (MSDSM), use of SANtricity Windows DSM is recommended. The software can be obtained from the DVD that is provided with the ETERNUS AB/HB.

In addition, refer to the following software manual. https://sp.ts.fujitsu.com/dmsp/Publications/public/p3ag-5532-EN.pdf

7. SAN Boot Settings

When Using PRIMERGY

When configuring a SAN Boot environment, check the support status in "Server Support Matrix" and configure it by referring to the manuals of the servers, OSs, and Fibre Channel cards to be used.

For Emulex (Broadcom) Fibre Channel Cards

When Setting with UEFI A settings procedure example is shown below. Note If the setting screens shown differ, make sure the setting value are equivalent before setting them. Procedure >> -1 Power on the server and start the UEFI BIOS setup menu. For information on how to display the menu, refer to the User's Guide for the server. 2 Select the Fibre Channel card port to be used with SAN Boot and press the [Enter] key. 3 Select "Set Boot from SAN" and press the [Enter] key. Information Configuration Management Security Boot Exit <F1:Help> Set Boot from SAN Scan for Fibre Devices Add Boot Device <Disable> Add Boot Device Delete Boot Device Change Boot Device Order Configure HBA and Boot Parameters Set Emulex Adapter to Default Settings Display Adapter Info Legacy Only Configuration Settings Request RESET or RECONNECT to Make Changes Active Emulex Firmware Update Utility Emulex NUMe over FC Boot Settings

4 Select [Enable] and press the [Enter] key.



5 Select "Configure HBA and Boot Parameters" and press the [Enter] key.



6 Select [Commit Changes] and press the [Enter] key.



- 7 Press the [Esc] key to return to the Fibre Channel card port menu.
- 8 Select "Add Boot Device" and press the [Enter] key.

Information Configuration Management Se	curity I	Boot Exi	t	<f1:help></f1:help>
001: LPe35002-M2 PCIe16.0GT/s , x8				
LPe35002-M2 Port Name : 100000109BB8C34B				
Seg#: 00 Bus#: 0B Dev#: 00 Func#: 00				
Set Boot from SAN	<enable< th=""><th>e≻</th><th></th><th></th></enable<>	e≻		
Scan for Fibre Devices				
Add Boot Device				
 Delete Boot Device Change Post Device Onder 				
Configure HRA and Boot Parameters				
 Set Emulex Adapter to Default Settings 				
Display Adapter Info				
 Legacy Only Configuration Settings 				
 Request RESET or RECONNECT to Make Changes R Englase Firmulase Undate Utility 	ictive			
Emulex Firmware opdate officity Emulex NUMe over FC Boot Settings				

9 Select "FUJITSU ETERNUS_AHB" and press the [Enter] key.

Information Configuration Management Security Boot Exit	<f1:help></f1:help>
LPe35002-H2 Port Name : 100000109BB8C34B Here are the discovered targets:	
 ▶ Go to Configuration Main Menu ▶ 0001: FUJITSU ETERNUS_AHB 0000 	

10 Select the "LUN:****" where the OS is installed and press the [Enter] key. The FC port WWN of the ETERNUS AB/HB that is connected to the HBA port is displayed at the top of the screen.

Information Configuration Management Security Boot Exit (F1:He)	p>
UUN: 500000F0 DC000024	
Here are the discovered LUNs:	
► TIN-0000 Noda: Davishavs1 day	
► LIN:0001 Mode: Perinheral dev	
▶ LUN:0002 Mode: Peripheral dev	
▶ LUN:0003 Mode: Peripheral dev	
► LUN:0004 Mode: Peripheral dev	
► LUN:0005 Mode: Peripheral dev	
► LUN:0006 Mode: Peripheral dev	
► LUN:0007 Mode: Peripheral dev	
▶ LUN:0008 Mode: Peripheral dev	
LUN:0000 Node: Peripheral dev	
LUN:0010 Hode: Peripheral dev	
Fills Roll 2 Mode: Pertimbral dev	
LIN:0013 Mode: Perinheral dev	
▶ LUN:0014 Mode: Peripheral dev	
▶ LUN:0015 Mode: Peripheral dev	
► LUN:0016 Mode: Peripheral dev	
► LUN:0017 Mode: Peripheral dev	
▶ LUN:0018 Mode: Peripheral dev	
▶ LUN:0019 Mode: Peripheral dev	
► LUN:0020 Node: Peripheral dev	
LUN:0022 Mode: Peripheral dev	
LUN:0022 Hode: Peripheral dev LUN:0023 Mode: Peripheral dev	
► LIN:0024 Mode: Perinheral deu	

11 Select "Commit Changes" and press the [Enter] key.

Information Configuration Management Security Boot Exit	<f1:help></f1:help>
LUN:0000 Mode: Peripheral dev LPe35002-M2 Port Name : 100000109BBBC34B	
▶ Connit Changes ▶ Discard Changes	

- **12** Press the [Esc] key to return to the Fibre Channel card port menu.
- **13** Select "Change Boot Device Order" and press the [Enter] key.



14 For "Boot Device Order", confirm that the FC port WWN of the connection destination ETERNUS AB/HB displayed in <u>Step 10</u> is registered.



- **15** Press the [Esc] key to return to the UEFI BIOS setup menu.
- **16** Save the settings of the UEFI BIOS setup menu and reboot. For details, refer to the User's Guide for the server.

For QLogic (Cavium) Fibre Chanel Cards

When Setting with UEFI

A settings procedure example is shown below.

Note

If the setting screens shown differ, make sure the setting value are equivalent before setting them.

Procedure >> -

- Power on the server and start the UEFI BIOS setup menu.
 For information on how to display the menu, refer to the User's Guide for the server.
- **2** Select the Fibre Channel card port to be used with SAN Boot and press the [Enter] key.

3 Select "Boot Settings" and press the [Enter] key.



4 Select "Adapter Driver" and press the [Enter] key.



5 Select [Enabled] and press the [Enter] key.

Advanced	Aptio Setup Utility - Copyrigh	(C) 2019 American Megatrends, Inc.
Selective Login Selective Login Legacy HUS Selectable Root World Login Magter Driver Pabric Resigned Root LUN	Disabiled Disabiled Disabiled Disabiled Dashied Dashied Dashied	Used to enable the adapter driver. The driver must be enabled to host from a Fibre Channel disk. The system will host faster when the driver is disabled.
	Version 2.19.1268. Copyright	C) 2019 American Megatrends, Inc.

6 Select "WWN Database" and press the [Enter] key.



7 Select [Drive 0] and press the [Enter] key.

Information	Configuration	Management	Security	Boot Exi	it	<f1:help></f1:help>
Drive 0			<000	000000000000	00, 0000:->	
Drive 1			<000	000000000000000000000000000000000000000	00,0000:->	
Drive 2			<000	000000000000000000000000000000000000000	00, 0000:->	
Drive 3			<000	000000000000000000000000000000000000000	00,0000:->	

8 Select the FC port WWN of the ETERNUS AB/HB that is connected to this port and the LUN where the OS is installed, and press the [Enter] key.

Information	Configuration	Management	Security	Boot	Exit		<f1:help></f1:help>
Drive O			<0000	0000000	00000, 0	0000 : ->	
Drive 1			5000			0000:+	
Drive 2			5000	OOEODCO		0002:+	
Drive 3			5000 5000 5000 5000		000024, 0 000024, 0 000024, 0 000024, 0)004:+)005:+)006:+)007:+	
			5000	OOEODCO	000024, 0	+:800	

- Information Configuration Management Security Boot Exit <F1:Help> Drive 0 <500000E0DC000024, 0000:+> Drive 1 <00000000000000, 0000:-> <00000000000000, 0000:-> Drive 2 Drive 3 <00000000000000, 0000:->
- 9 Confirm that the WWN is selected and press the [Esc] key.

- **10** Press the [Esc] key twice to return to the UEFI BIOS setup menu.
- **11** Save the settings of the UEFI BIOS setup menu and reboot. For details, refer to the User's Guide for the server.

When Using PRIMEQUEST

When configuring a SAN Boot environment, check the support status in "Server Support Matrix" and reference the following manuals.

PRIMEQUEST 4000

In preparation

PRIMEQUEST 3000

FUJITSU Server PRIMEQUEST 3000 Series Design Guide https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfg-pq-3000-1st2ndgen-design-guideen.pdf

When Using Non-Fujitsu Servers

When configuring a SAN Boot environment, check the support status in "Server Support Matrix" and configure it by referring to the manuals of the servers, OSs, and Fibre Channel cards to be used. In addition, if "Server Support Matrix" cannot be referred to, contact "Inquiries about Storage Systems ETERNUS" from the following website.

https://www.fujitsu.com/global/products/computing/storage/contact-us/

To protect virtual machines using array-based replication or array-based replication with storage policy protection, a storage replication adapter (SRA) used by Site Recovery Manager must be installed.

For supported SRAs, refer to the VMware Compatibility Guide at the following URL. In addition, select [NetApp] for the partner name when searching.

The ETERNUS AX/AC/HX storage systems listed in [Array Model(s)] of the search results can be used.

 VMware Compatibility Guide https://www.vmware.com/resources/compatibility/search.php?deviceCategory=sra&details=1&partner=64&page=1&display_interval=10&sortColumn=Partner&sortOrder=Asc
9. Application of the Multipath Diagnostic Program

For environments with the Oracle Solaris standard multipath driver (MPxIO), the Multipath Diagnostic Program can be applied.

The Multipath Diagnostic Program performs regular diagnosis on the connection paths between the server and the ETERNUS AX/AC/HX or ETERNUS AB/HB, and issues a request to switch the paths if an error is detected.

For details on and to obtain the program, refer to the following URL:

https://extranet.ts.fujitsu.com/portal/sp/support/ps/Storage/ETERNUS-AB/AB2100/Pages/SoftwareToolsDocumentation.aspx

The following describes the phenomenon and details when an error occurs.

Phenomenon

The Oracle Solaris standard multipath driver (MPxIO) does not switch paths even when a timeout error occurs due to a transmission path failure. Therefore, the system may slow down.

Note

For a cluster system that is configured with PRIMECLUSTER, a system slowdown may cause a failover (node switching due to a panic).

Impact on the Business

The system slowdown may cause a delay in business or a failover (node switching due to a panic).

Environment

The following server environment is used and multipath is configured with MPxIO (*1).

Server	SPARC Enterprise	SPARC Servers
OS	Solaris 11.3, 11.4	

*1: To check whether the multipath has been configured with MPxIO, execute the "format" command and check whether the device path name is displayed with "scsi_vhci". If the path names are displayed with "scsi_vhci", multipath is configured with MPxIO. However, for

PRIMECLUSTER GD, because the path names cannot be checked with the "format" command, use the "luxadm" command instead.

(Execution example of the "format" command)

```
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c0t0d0 <FUJITSU-MBD2147RC-3701 cyl 14087 alt 2 hd 24 sec 848>
    /pci@0,60000/pci@0/pci@0/scsi@0/sd@0,0
1. c0t1d0 <FUJITSU-MBD2147RC-3701 cyl 14087 alt 2 hd 24 sec 848>
    /pci@0,600000/pci@0/pci@0/scsi@0/sd@1,0
2. c3t60000E00D00000000120c5000000000 <FUJITSU-ETERNUS_AHB-0000-2.13TB>
    /<u>scsi vhci</u>/ssd@g60000e00d0000000120c500000000
3. c3t600000E00D0000000120c50001000d0 <FUJITSU-ETERNUS_AHB-0000-2.13TB>
    /scsi_vhci/ssd@g60000e00d0000000120c500010000
4. c3t600000E00D0000000120c50002000d0 <FUJITSU-ETERNUS_AHB-0000-2.13TB>
    /scsi_vhci/ssd@g60000e00d0000000120c500010000
Specify disk (enter its number): ^C
```

(Execution example of the "luxadm" command)

```
# luxadm probe -p
No Network Array enclosures found in /dev/es
Found Fibre Channel device(s):
Node WWN:500000e0d4583200 Device Type:Disk device
  Logical Path:/dev/rdsk/c0t600000E00D110000001118320000000d0s2
  Physical Path:
   /devices/<u>scsi vhci</u>/ssd@g600000e00d1100000011183200000000:c,raw
Node WWN:500000e0d4583200 Device Type:Disk device
 Logical Path:/dev/rdsk/c0t600000E00D1100000011183200010000d0s2
  Physical Path:
   /devices/scsi vhci/ssd@g600000e00d1100000011183200010000:c,raw
Node WWN:500000e0d4583200 Device Type:Disk device
  Logical Path:/dev/rdsk/c0t600000E00D1100000011183200020000d0s2
  Physical Path:
  /devices/scsi vhci/ssd@g600000e00d1100000011183200020000:c,raw
Node WWN:500000e0d4583200 Device Type:Disk device
  Logical Path:/dev/rdsk/c0t600000E00D1100000011183200030000d0s2
  Physical Path:
   /devices/scsi vhci/ssd@g600000e00d1100000011183200030000:c,raw
```

Occurrence Conditions

A timeout error occurs due to a transmission path failure between the server and the storage systems (*2).

*2: If a timeout error occurs due to a transmission path failure, the following message appears in "/var/ adm/messages".

(Message example)

```
WARNING: /scsi_vhci (scsi_vhci0):
/scsi_vhci/ssd@g6000b5d0006a0000006a0f53000b0000 (ssd0):
Command Timeout on path fp4/ssd@w2141000b5d6a0f53,2
```

Cause

MPxIO does not switch paths even when a timeout error occurs due to transmission path failures. This is a specification of MPxIO.

- Workaround
 - How to Prevent Problems from Occurring

Install the Multipath Diagnostic Program when configuring a multipath with MPxIO in the ETER-NUS AX/AC/HX series or the ETERNUS AB/HB series.

To install the program, the ETERNUS storage system settings must be changed (or a version update of ONTAP or SANtricity OS may be required for some models). For details, refer to "Multipath Diagnostic Program User's Guide".

The Multipath Diagnostic Program is available at the following URL:

https://extranet.ts.fujitsu.com/portal/sp/support/ps/Storage/ETERNUS-AB/AB2100/Pages/SoftwareToolsDocumentation.aspx

If the Multipath Diagnostic Program is applied, the failed paths are blocked when a timeout error occurs due to hardware failure on the transmission paths.

Because this result in a path switching, I/O execution does not take time and a system slowdown is prevented. The following shows the supported OSs of the Multipath Diagnostic Program.

- Oracle Solaris 10 08/07 or later + PTF R12021 or later (143643-05 or later)
- Oracle Solaris 11 11/11 or later

Note that there are no workarounds to prevent this problem if the MPxIO multipath configuration is used with storage devices other than ETERNUS storage systems. If this problem occurs in these storage devices, consider installing the multipath software recommended by each storage vendor.

Recovery Method After Problems Occur

Contact Fujitsu Support.

Fujitsu Storage ETERNUS AX/AC/HX series, ETERNUS AB/HB series Supplement to the Express Configuration Guide -Common for Linux[®], VMware[®], Windows[®], and Oracle Solaris-

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