ETERNUS
Disk storage systems

Server Connection Guide
(iSCSI)

for Linux (Red Hat Enterprise Linux)
Preface

This document briefly explains the operations that need to be performed by the user in order to connect an ETERNUS2000 model 100 or 200, ETERNUS4000 model 300, 400, 500, or 600, or ETERNUS8000 model 700, 800, 900, 1100, 1200, 2100, or 2200 Disk storage system to a server running Red Hat Enterprise Linux via an iSCSI interface.

This document should be used in conjunction with any other applicable user manuals, such as those for the ETERNUS2000 model 100 or 200, ETERNUS4000 model 300, 400, 500, or 600, or ETERNUS8000 model 700, 800, 900, 1100, 1200, 2100, or 2200 Disk storage system, server, OS used, adapters, drivers, etc.

This document references the following documents:

- Server Support Matrix
- ETERNUS Disk storage systems Server Connection Guide (iSCSI) ETERNUS Disk Storage System Settings for ETERNUS2000
- ETERNUS Disk storage systems Server Connection Guide (iSCSI) ETERNUS Disk Storage System Settings for ETERNUS4000, ETERNUS8000
- ETERNUSmgr Install Guide
- ETERNUSmgr User Guide

Also, note that in this document the ETERNUS2000 models 100 and 200, ETERNUS4000 models 300, 400, 500, and 600, and ETERNUS8000 models 700, 800, 900, 1100, 1200, 2100, and 2200 Disk storage systems are collectively referred to as ETERNUS Disk storage systems.

The Contents and Structure of this Manual

This document is composed of the following nine chapters.

- Chapter 1 Workflow
  This describes how to connect the ETERNUS Disk storage systems to a server.

- Chapter 2 Checking the Server Environment
  This describes which servers can be connected to ETERNUS Disk storage systems.

- Chapter 3 Notes
  This describes issues that should be noted when connecting the ETERNUS Disk storage systems and server.

- Chapter 4 Setting Up the Linux Server
  This describes how to install and set up the Linux server.
- Chapter 5  Installing and Setting Up ETERNUSmgr
  This describes how to install ETERNUSmgr.

- Chapter 6  Setting Up the ETERNUS Disk Storage Systems
  This describes how to set up the ETERNUS Disk storage systems.

- Chapter 7  ETERNUS Disk Storage System Logical Unit Recognition
  This describes how to recognize the ETERNUS Disk storage system LUNs from server.

- Chapter 8  Setting Up Device-Mapper Multipathing
  This describes what to be set in order to create multipath environment.

- Chapter 9  Checking the Device-Mapper Multipaths
  This describes how to check the device and path status after setting the device-mapper multi-path.

Safe Use of this Product

- Using this manual
  This manual contains important information to ensure the safe use of this product. Be sure to thoroughly read and understand its contents before using the product. After reading, store this manual in a safe place for future reference.
  FUJITSU has made every effort to ensure the safety of the users and other personnel, and to prevent property damage. When using this product, carefully follow the instructions described in this manual.

Acknowledgments

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Naming Conventions

■ Product Names

"RHEL" or "RHEL 5" refers to the following product:
- Red Hat Enterprise Linux v.5

■ Other names

- "iSCSI port" or "Channel Adapter" (CA) refers to the iSCSI interface module used in the ETERNUS Disk storage systems to connect to the server.
- "LAN card" refers to the iSCSI interface module normally used in the server. A "Network Interface Card" (NIC), "LAN adapter", or "LAN board" may be used instead, depending on the server.
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Chapter 1   Workflow

This chapter describes how to connect the ETERNUS Disk storage systems to a server. The workflow is shown below.

Required Documents

• ETERNUS Disk storage systems Server Connection Guide (iSCSI) for Linux (Red Hat Enterprise Linux) (This manual)
• Server Support Matrix
• ETERNUS Disk storage systems Server Connection Guide (iSCSI) ETERNUS Disk Storage System Settings for ETERNUS2000
• ETERNUS Disk storage systems Server Connection Guide (iSCSI) ETERNUS Disk Storage System Settings for ETERNUS4000, ETERNUS8000
• ETERNUSmgr Install Guide
• ETERNUSmgr User Guide
• Other manuals provided with each product (server, Multipath Driver, and LAN card)

Workflow

1

Set Up the Linux Server

Set up the OS, hardware, software, and iSCSI environment.

Refer

• “Chapter 4 Setting Up the Linux Server” (page 13)
Install ETERNUSmgr and Set Up the ETERNUS Disk Storage System

If ETERNUSmgr is to be used, install it and set up the ETERNUS Disk storage system.

- "Chapter 5 Installing and Setting Up ETERNUSmgr" (page 17)
- "Chapter 6 Setting Up the ETERNUS Disk Storage Systems" (page 18)
- Installing ETERNUSmgr
  - "ETERNUSmgr Install Guide"
- Checking the setup and maintenance operations
  - "ETERNUSmgr User Guide"
- Setting up the ETERNUS Disk storage system
  - "ETERNUS Disk storage systems Server Connection Guide (iSCSI) ETERNUS Disk Storage System Settings for ETERNUS2000"
  - "ETERNUS Disk storage systems Server Connection Guide (iSCSI) ETERNUS Disk Storage System Settings for ETERNUS4000, ETERNUS8000"

Set the Server to Recognize the Logical Units

Set up the server so that it can recognize the ETERNUS Disk storage systems' LUN (logical units).

- "Chapter 7 ETERNUS Disk Storage System Logical Unit Recognition" (page 19)

Set Up the device-mapper multipath

Set up the device-mapper multipath.

- "Chapter 8 Setting Up Device-Mapper Multipathing" (page 21)

Check the device-mapper multipath

Check the device after the device-mapper multipath is set up.

- "Chapter 9 Checking the Device-Mapper Multipaths" (page 23)
Chapter 2   Checking the Server Environment

Refer to the "Server Support Matrix" to check the server environment.

2.1 Hardware

Refer to the "Server Support Matrix".

2.2 Basic Software

Refer to the "Server Support Matrix".

2.3 LAN Cards

Refer to the "Server Support Matrix".

2.4 Multipath Driver

Refer to the "Server Support Matrix".
Chapter 3   Notes

3.1 Server Startup and Power Supply Control Notes

Before turning the server on, check that the ETERNUS Disk storage systems and LAN switches are all "Ready".
If the server is turned on and they are not "Ready", the server will not be able to recognize the ETERNUS Disk storage systems.
Also, when the ETERNUS Disk storage system power supply is being controlled by a connected server, make sure that the ETERNUS Disk storage system does not shut down before the connected servers. Similarly, the LAN switches must also be turned off after the connected servers have been shut down.
If turned off, data writes from the running server cannot be saved to the ETERNUS Disk storage systems, and already saved data may also be affected.

3.2 RHEL Notes

For details involving RHEL, refer to the Red Hat web-site and any documentation available.
3.3 LAN Switch Connection Notes

- As with an FC-SAN, because of the large data flows (traffic volumes) the iSCSI LAN is assumed to be a dedicated LAN separate from the business and management LANs, and constructed with its own LAN switch.
- The iSCSI connection LAN should only contain 1000BASE-T compatible devices.
- iSCSI LAN redundancy is achieved by the use of multipaths.
- For IP network security reasons too, it is useful to separate the iSCSI LAN (for data transfers) and management LAN (for administration) to prevent cross-access between them (use of VLAN to separate the LAN segments is recommended).

Example LAN switch connection configuration

*1: In this system configuration, multipaths provide redundant connections between the servers and storage system. LAN switches #1 and #2 provide physical separation of the network paths.

*2: A separate LAN segment is provided in the LAN switch (using the switch VLAN function) for each grouping of business servers and disk storage systems (equivalent to the FC zones).
Chapter 4  Setting Up the Linux Server

4.1  Preparation

4.1.1  Installing the iscsi-initiator-utils

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

<table>
<thead>
<tr>
<th>Installation execution example</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>rpm -ivh iscsi-initiator-utils-6.2.0.865-0.8.e15.&lt;Architecture_name&gt; or later</code></td>
</tr>
</tbody>
</table>

4.1.2  Preparing the device-mapper multipath setup

Use the following Red Hat Package Manager (RPM) to set up the device-mapper multipaths. If this RPM is not installed, install it.

<table>
<thead>
<tr>
<th>Installation execution example</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>rpm -ivh device-mapper-multipath-0.4.7-8.e15.&lt;Architecture_name&gt; or later</code></td>
</tr>
</tbody>
</table>

4.2 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/iscsicd.conf" file:

```
node.conn[0].startup = automatic
```

4.3 Setting Up CHAP Authentication

If CHAP authentication is to be used, set it up according to the procedures that follow. If CHAP authentication is not required, these procedures are not required. There are two types of CHAP authentication: unidirectional and bidirectional. For both types, the appropriate CHAP authentication setting is required for the ETERNUS Disk storage system.

4.3.1 Setting Up Unidirectional CHAP Authentication

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

```
node.session.auth.authmethod = CHAP
node.session.auth.username = <username>
node.session.auth.password = <password>
discovery.sendtargets.auth.authmethod = CHAP
discovery.sendtargets.auth.username = <username>
discovery.sendtargets.auth.password = <password>
```

Caution: The actual "username" and "password" must match those of the server set in the ETERNUS Disk storage system. For details of the ETERNUS Disk storage system settings, refer to "Chapter 7 ETERNUS Disk Storage System Logical Unit Recognition" (page 19).
4.3.2 Setting Up 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 = <username>
node.session.auth.password = <password>
node.session.auth.username_in = <username>
node.session.auth.password_in = <password>
discovery.sendtargets.auth.authmethod = CHAP
discovery.sendtargets.auth.username = <username>
discovery.sendtargets.auth.password = <password>
discovery.sendtargets.auth.username_in = <username>
discovery.sendtargets.auth.password_in = <password>
```

- "node.session.auth.username", "node.session.auth.password", "discovery.sendtargets.auth.username", and "discovery.sendtargets.auth.password" are initiator accounts.
- "node.session.auth.username_in", "node.session.auth.password_in", "discovery.sendtargets.auth.username_in", and "discovery.sendtargets.auth.password_in" are target accounts.
  Every such initiator and target account must be assigned a unique name.
- The Initiator "username" and "password" must match those of the server set in the ETERNUS Disk storage system. The Target "username" and "password" must match those of the ETERNUS Disk storage system port set in the ETERNUS Disk storage system. For details of the ETERNUS Disk storage system settings, refer to "Chapter 7 ETERNUS Disk Storage System Logical Unit Recognition" (page 19).

4.4 Setting Up the Network Environment

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 Disk storage system that is being connected to. For details of the ETERNUS Disk storage system settings, refer to "Chapter 7 ETERNUS Disk Storage System Logical Unit Recognition" (page 19).
4.5 Checking the iSCSI Initiator Name

Check which iSCSI initiator name is described as the default in the "/etc/iscsi/initiatorname.iscsi" file.
This iSCSI initiator name should be used for the ETERNUS Disk storage system settings.

4.6 Starting the iSCSI Service

Execute the following command to activate the iSCSI service.

```
# service iscsid start
Turning off network shutdown. Starting iSCSI daemon: [ OK ]
[ OK ]
```

Execute the following command to shutdown the iSCSI service.

```
# service iscsid stop
Stopping iSCSI daemon: [ OK ]
```
Chapter 5 Installing and Setting Up ETERNUSmgr

If ETERNUSmgr is to be used, install it according to the directions given in the "ETERNUSmgr Install Guide". After the installation, set up ETERNUSmgr following the instructions in the "ETERNUSmgr User Guide".
Chapter 6   Setting Up the ETERNUS Disk Storage Systems

Set up the ETERNUS Disk storage systems using ETERNUSmgr.

ETERNUS Disk storage systems' setup can be performed independently of server setup. For details on how to perform these settings, refer to the "ETERNUS Disk storage systems Server Connection Guide (iSCSI) ETERNUS Disk Storage System Settings for ETERNUS2000" or "ETERNUS Disk storage systems Server Connection Guide (iSCSI) ETERNUS Disk Storage System Settings for ETERNUS4000, ETERNUS8000", and "ETERNUSmgr User Guide".
Chapter 7  ETERNUS Disk Storage System Logical Unit Recognition

Connect the ETERNUS Disk storage system to the server with a LAN cable. After connecting, reboot the Linux server and check that the Linux server recognizes the ETERNUS Disk storage system LUNs.

7.1 Connecting to the Target

Connect to the target ETERNUS Disk storage system and check its iSCSI name. Execute the following command to check that the iSCSI name of the ETERNUS Disk storage system is displayed correctly:

```
# iscsiadm -m discovery -t sendtargets -p "ETERNUS_Disk_storage_system_iSCSI-CA_port_IP_address":3260
```

Command execution example

```
# iscsiadm -m discovery -t sendtargets -p 172.16.254.1:3260
172.16.254.1:3260,1 iqn.2000-09.com.fujitsu:....... 
```

The iSCSI name "iqn.2000-09.com.fujitsu:....... " should be seen.

7.2 Logging in to the Target

Use the iSCSI name from "7.1 Connecting to the Target" (page 19) to log in to the target. Execute the following command to log in:

```
# iscsiadm -m node -T "ETERNUS_Disk_storage_system_iQN" -p "ETERNUS_Disk_storage_system_iSCSI-CA_port_IP_address":3260 -l
```
7.3 Rebooting the Linux Server

Reboot the Linux server.

Execution example

```
# shutdown -r now
```

7.4 Checking the Pre-Device-Mapper Multipathing LUNs

After rebooting, check that the Linux server recognizes the ETERNUS Disk storage system LUNs.

At boot up, Linux automatically recognizes all SCSI disks and assigns them successive device names starting from "sda". When assigning the device names, any internal SCSI disks are assigned first, followed by the assignment of the ETERNUS Disk storage systems' LUNs. For example, if there is one internal SCSI disk and three ETERNUS Disk storage system LUNs, SCSI device names are assigned as follows:

<table>
<thead>
<tr>
<th>SCSI device name</th>
<th>by-id name</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>dev/sda</td>
<td>/dev/disk/by-id/scsi-36003005700026cc011251e4b0b80ac59</td>
<td>Internal SCSI disk</td>
</tr>
<tr>
<td>/dev/sdb</td>
<td>/dev/disk/by-id/scsi-3600000e00d00000000100000000000000000</td>
<td>ETERNUS Disk storage systems' LUN</td>
</tr>
<tr>
<td>/dev/sdc</td>
<td>/dev/disk/by-id/scsi-3600000e00d000000001000000100000001000000020000</td>
<td></td>
</tr>
<tr>
<td>/dev/sdd</td>
<td>/dev/disk/by-id/scsi-3600000e00d0000000010000001000000020000</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 8  Setting Up Device-Mapper Multipathing

Set up the multipath environment.

8.1  Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file as follows.

- "/etc/multipath.conf"
  Comment out the following three lines in "/etc/multipath.conf".

```plaintext
# blacklist {
#   devnode "***"
# }
```

The blacklist section is used to specify any internal disks or other devices that are to be excluded from the multipath configuration. If required, refer to the Red Hat web-site for details.

Confirm that the following description is present.

```plaintext
## Use user friendly names, instead of using WWIDs as names.
defaults{
    user_friendly_names yes
}
```

Add the following lines at the end of the file.
(This example is for the ETERNUS2000)

```plaintext
devices {
    device {
        vendor                      "FUJITSU"
        product                     "E2000"
        prio_callout                "/sbin/mpath_prio_alua %d"
        path_grouping_policy        group_by_prio
        path_selector               "round-robin 0"
        failback                    immediate
        no_path_retry               10
    }
}
```

For the ETERNUS2000, specify "E2000" as the "product" option.
For the ETERNUS4000, specify "E4000" as the "product" option.
For the ETERNUS8000, specify "E8000" as the "product" option.
8.2 Enabling the Device-Mapper Multipaths

Execute the following command to enable the device-mapper multipaths.

```
# multipath -v 1
# chkconfig --add multipathd
# chkconfig multipathd on
# multipath
# /etc/init.d/multipathd start
```

8.3 Rebooting the Linux Server

Reboot the Linux server.

Execution example

```
# shutdown -r now
```
Chapter 9 Checking the Device-Mapper Multipaths

After device-mapper multipathing has been enabled, confirm the device-mapper multipath settings.

### 9.1 Checking the Device-Mapper Multipathing Devices

Check the device file created by the device-mapper multipath. Also check that the device file is linked to the "/dev/dm-X" file.

**Execution example**

```bash
# cd /dev/mpath
# ls -l
lrwxrwxrwx 1 root root 8 Feb 15 20:21 mpath0 -> ../dm-28
lrwxrwxrwx 1 root root 8 Feb 15 20:21 mpath1 -> ../dm-29
lrwxrwxrwx 1 root root 8 Feb 15 20:21 mpath10 -> ../dm-13
lrwxrwxrwx 1 root root 7 Feb 15 20:21 mpath247 -> ../dm-46
lrwxrwxrwx 1 root root 8 Feb 15 20:21 mpath248 -> ../dm-50
lrwxrwxrwx 1 root root 7 Feb 15 20:21 mpath249 -> ../dm-155
```

### 9.2 Checking the Device-Mapper Multipath Status

Check the path status using the "multipath -ll" command.

- When both paths are in normal status (This example is for the ETERNUS2000)

```bash
# multipath -ll
mpath2 (3600000e0d00000000000000f7e00010000) dm-1 FUJITSU,E2000
[size=10G][features=1 queue_if_no_path][hwhandler=0][rw]
  _ round-robin 0 [prio=50][active]
  _ 4:0:0:1 sde 8:64 [active][ready]
  _ 3:0:0:1 sdc 8:33 [active][ready]
  ...
```

The multipath consists of the block device names "sde" and "sdc". "mpath2" is created.

E2000 is displayed since the ETERNUS2000 is connected.

Two block device names are displayed for a two-path configuration.

When the path status is normal, ["active", "ready"] is displayed.
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