ETERNUS
Disk storage systems

Server Connection Guide
(Fibre Channel)

for Linux device-mapper multipath
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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 Linux and using the device-mapper multipath via a Fibre Channel 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, Fibre Channel cards, drivers, etc.

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.

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The Contents and Structure of this Manual

This document is composed of the following four chapters.

• Chapter 1  Workflow
  This describes how to connect the ETERNUS Disk storage system to a server.

• Chapter 2  For Red Hat Enterprise Linux 5
  This describes how to set up a multipath environment, and the points to be checked after set up when the server is running RHEL5.

• Chapter 3  For SUSE Linux Enterprise Server 11
  This describes how to set up a multipath environment, and the points to be checked after set up when the server is running SLES11.

• Chapter 4  For SUSE Linux Enterprise Server 10
  This describes how to set up a multipath environment, and the points to be checked after set up when the server is running SLES10.
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

OS names

- "RHEL5" represents the following product.
  - Red Hat Enterprise Linux v.5
- "SLES11" represents the following products.
  - SUSE Linux Enterprise Server 11 for x86
  - SUSE Linux Enterprise Server 11 for EM64T
  - SUSE Linux Enterprise Server 11 for Itanium Processor Family
- "SLES10" represents the following products.
  - SUSE Linux Enterprise Server 10 for x86
  - SUSE Linux Enterprise Server 10 for EM64T
  - SUSE Linux Enterprise Server 10 for Itanium Processor Family
### Other Names

- "Channel Adapter" (CA) refers to the Fibre Channel interface modules used in the ETERNUS Disk storage systems to connect to the servers.
- "Fibre Channel card" refers to the Fibre Channel interface modules normally used in the servers. A "Host Bus Adapter" (HBA) or "Channel Adapter" (CA) may be used instead, depending on the server.
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Chapter 1  Workflow

The workflow is shown below.
Perform the following steps when connecting an ETERNUS Disk storage system to a Linux server using the device-mapper multipath.

Workflow

1. device-mapper multipath Setup
   Set up the device-mapper multipath.
   - For RHEL5
     • "2.1 Setting Up the device-mapper multipath" (page 8)
   - For SLES11
     • "3.1 Setting Up the device-mapper multipath" (page 12)
   - For SLES10
     • "4.1 Setting Up the device-mapper multipath" (page 16)

2. device-mapper multipath Check
   Check the device after the device-mapper multipath is set up.
   - For RHEL5
     • "2.2 Checking the device-mapper multipath" (page 10)
   - For SLES11
     • "3.2 Checking the device-mapper multipath" (page 14)
   - For SLES10
     • "4.2 Checking the device-mapper multipath" (page 18)
This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running RHEL5.

2.1 Setting Up the device-mapper multipath

Set up the multipath environment.

2.1.1 Preparation

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

2.1.2 Editing "/etc/multipath.conf"

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

Procedure

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

```bash
# 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.

2. Confirm that the following description is present.

```bash
## Use user friendly names, instead of using WWIDs as names.
defaults{
  user_friendly_names yes
}
```
3 Add the following lines at the end of the file.
(This example is for the ETERNUS2000)

```
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 ETERNUS4000, specify "E4000" as the "product" option.
For the ETERNUS8000, specify "E8000" as the "product" option.

End of procedure

2.1.3 Enabling the device-mapper multipath

Enable the device-mapper multipath, using the following commands.

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

2.1.4 Rebooting the Linux Server

Reboot the Linux server.

Example

```
# shutdown -r now
```
2.2 Checking the device-mapper multipath

After they have been enabled, confirm the device-mapper multipath settings.

2.2.1 Recognizing the Post device-mapper multipath LUNs

Check the device file created by the device-mapper multipath.

Example:

```bash
# cd /dev/mapper
# ls -l
rwx------ 1 root root 10, 63 Oct 17 17:41 control
brw-rw---- 1 root disk 253, 0 Oct 17 17:41 mpath0
brw-rw---- 1 root disk 253, 1 Oct 17 17:41 mpath1
brw-rw---- 1 root disk 253, 10 Oct 17 17:41 mpath10
brw-rw---- 1 root disk 253, 99 Oct 17 17:41 mpath100

# multipath -ll
mpath2 (3600000e00d00000000000f7e00010000) 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]
  \_ round-robin 0 [prio=10][enabled]
  \_ 3:0:0:1 sdc 8:32 [active][ready]
```

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

"E2000" is displayed since the ETERNUS2000 is connected.

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

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

2.2.2 Checking the device-mapper multipath Status and Created Devices

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 (3600000e00d00000000000f7e00010000) 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]
  \_ round-robin 0 [prio=10][enabled]
  \_ 3:0:0:1 sdc 8:32 [active][ready]
```

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

Two block device names are displayed for a two-path configuration.
When one path (the "3:0:0:X" side) is in error status (This example is for the ETERNUS2000)

```
# multipath -ll
mpath2 (3600000e00d00000000000f7e00010000) 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]
  \_ round-robin 0 [prio=0][enabled]
  \_ 3:0:0:1 sdc 8:32 [failed][faulty]
```

The status for the failed path is "[failed][faulty]".
Chapter 3   For SUSE Linux Enterprise Server 11

This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running SLES11.

3.1 Setting Up the device-mapper multipath

Set up the multipath environment.

3.1.1 Preparation

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

3.1.2 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 to "/etc".

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

2. Add the following lines to the file.
   (This example is for the ETERNUS4000)
   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.

```bash
devices {
    device {
        vendor            "FUJITSU"
        product           "E4000"
        prio              alua
        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 ETERNUS8000, specify "E8000" as the "product" option.

If any internal disks or other devices are to be excluded from the multipath configuration, add a blacklist section specifying the excluded devices. Refer to the Novell web-site for details.

### 3.1.3 Enabling the device-mapper multipath

Enable the device-mapper multipath using the following commands.

```bash
# insserv boot.multipath multipathd
# chkconfig multipathd on
# chkconfig boot.multipath on
# /etc/init.d/boot.multipath start
# /etc/init.d/multipathd start
```

### 3.1.4 Rebooting the Linux Server

Reboot the Linux server.

Example

```bash
# shutdown -r now
```
3.2 Checking the device-mapper multipath

After they have been enabled, confirm the device-mapper multipath settings.

3.2.1 Recognizing the Post device-mapper multipath LUNs

Check the device file created by the device-mapper multipath.

Example:

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

```
total 0
lrwxrwxrwx 1 root root 16 Apr  2 00:44 control -> ../device-mapper
brw------- 1 root root 253,  0 Apr  2 00:44 mpatha
brw------- 1 root root 253,  1 Apr  2 00:44 mpathb
brw------- 1 root root 253,  2 Apr  2 00:44 mpathc
brw------- 1 root root 253,  3 Apr  2 00:44 mpathd
  ...
brw------- 1 root root 253, 23 Apr  2 00:44 mpathu
brw------- 1 root root 253, 24 Apr  2 00:44 mpathv
brw------- 1 root root 253, 25 Apr  2 00:44 mpathw
brw------- 1 root root 253, 26 Apr  2 00:44 mpathx
```

3.2.2 Checking the device-mapper multipath Status and Created Devices

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

- When both paths are in normal status (This example is for the ETERNUS8000)

```
#multipath -ll
mpathjb (36000b5d0006a000006a0317a000000) dm-2 FUJITSU,E8000
size=10G features='1 queue_if_no_path' hwhandler='0' wp=rw
  `- policy= fround-robin 0' prio=150 status=active
    `-- 3:0:0:1 sdc 8:32 active ready running
    `-- 4:0:0:1 sde 8:64 active ready running
```

"E8000" is displayed since the ETERNUS8000 is connected.

"active ready" is displayed.
• When one path (the "3:0:0:X" side) is in error status (This example is for the ETERNUS8000)

```
#multipath -ll
mpathjb (36000b5d0006a0000006a0317000a0000) dm-2 FUJITSU,E8000
size=10G features='1 queue if no path' hwhandler='0' wp=rw
'-- policy='round-robin 0' prio=150 status=active
 ' 4:0:0:1 sde 8:64 active ready running

The status for the failed path is not displayed.
```
Chapter 4  For SUSE Linux Enterprise Server 10

This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running SLES10.

4.1 Setting Up the device-mapper multipath

Set up the multipath environment.

4.1.1 Preparation

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

4.1.2 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 to "/etc".

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

2. Add the following lines to the file.
   (This example is for the ETERNUS4000)
   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.

```plaintext
devices {
    device {
        vendor                     "FUJITSU"
        product                    "E4000"
        prio_callout               "/sbin/mpath_prio_alua %d"
        path_grouping_policy       multibus
        path_selector              "round-robin 0"
        failback                   immediate
        no_path_retry              10
    }
}
```

For the ETERNUS2000, specify "E2000" as the "product" option.
For the ETERNUS8000, specify "E8000" as the "product" option.

If any internal disks or other devices are to be excluded from the multipath configuration, add a blacklist section specifying the excluded devices. Refer to the Novell web-site for details.

---

4.1.3 Enabling the device-mapper multipath

Enable the device-mapper multipath using the following commands.

```plaintext
# insserv boot.multipath multipathd
# chkconfig multipathd on
# chkconfig boot.multipath on
# /etc/init.d/boot.multipath start
# /etc/init.d/multipathd start
```

4.1.4 Rebooting the Linux Server

Reboot the Linux server.

Example

```plaintext
# shutdown -r now
```

After rebooting, the following warning message may appear in the "/var/log/message". However, there is no actual problem with multipath configuration and operation.

```
Jun 30 16:15:00 nvcs2 multipathd: sdb: Using deprecated prio_callout "/sbin/mpath_prio_alua %d" (controller setting) Please fixup /etc/multipath.conf
```
4.2 Checking the device-mapper multipath

After they have been enabled, confirm the device-mapper multipath settings.

4.2.1 Recognizing the Post device-mapper multipath LUNs

Check the device file created by the device-mapper multipath.

Example:

```
# cd /dev/mapper
# ls -l
total 0
lrwxrwxrwx 1 root root 16 Apr  2 00:44 control -> ../device-mapper
brw------- 1 root root 253,  0 Apr  2 00:44 mpatha
brw------- 1 root root 253,  1 Apr  2 00:44 mpathb
brw------- 1 root root 253,  2 Apr  2 00:44 mpathc
brw------- 1 root root 253,  3 Apr  2 00:44 mpathd
    :brw------- 1 root root 253, 23 Apr  2 00:44 mpathu
brw------- 1 root root 253, 24 Apr  2 00:44 mpathv
brw------- 1 root root 253, 25 Apr  2 00:44 mpathw
brw------- 1 root root 253, 26 Apr  2 00:44 mpathx
```

4.2.2 Checking the device-mapper multipath Status and Created Devices

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

- When both paths are in normal status (This example is for the ETERNUS4000)

```
# multipath -ll
mpathr (3600000e00d00000000000422001e0000) dm-20 FUJITSU,E4000
    [size=2.0G][features=1 queue_if_no_path][hwhandler=0]
    _ round-robin 0 [prio=100] [active]
    _ 6:0:0:6 sdaf 65:240 [active] [ready]
    _ 5:0:0:6 sdh  8:112 [active] [ready]
    :   
```

"E4000" is displayed since the ETERNUS4000 is connected.

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

Two block device names are displayed for a two-path configuration.
### 4.2 Checking the device-mapper multipath

- When one path (the "5:0:0:X" side) is in error status. (This example is for the ETERNUS4000)

```bash
# multipath -ll
mpathr (3600000e00d0000000000422001e0000) dm-20 FUJITSU,E4000
[size=2.0G][features=1 queue_if_no_path][hwhandler=0]
  \_ round-robin 0 [prio=100][active]
  \_ 6:0:0:6 sdaf 65:240 [active][ready]
  \_ 5:0:0:6 sdh 8:112 [failed][faulty]

The status for the failed path is "[failed][faulty]".
```

For SLES10, the following message may appear in the path status after executing the "multipath -ll" command. However, there is no actual problem with multipath configuration and operation.

```bash
sdaf: Using deprecated prio_callout '/sbin/mpath_prio_alua %d' (controller setting)
Please fixup /etc/multipath.conf
sdh: Using deprecated prio_callout '/sbin/mpath_prio_alua %d' (controller setting)
Please fixup /etc/multipath.conf
```
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