ETERNUS

Disk storage systems

Server Connection Guide
(Fibre Channel)

for Oracle Solaris

Multipath Driver Settings
for MPxI/O Multipath Driver
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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 Solaris OS 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.

Note that this manual refers the following documents:

- Server Support Matrix
- ETERNUS Disk storage systems Server Connection Guide (Fibre Channel) for Oracle Solaris

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 three chapters.

- Chapter 1  Workflow
  This describes the workflow to set up multipaths using MPxIO.

- Chapter 2  Using MPxIO
  This describes points to note when using MPxIO.

- Chapter 3  Setting Up MPxIO
  This describes how to set up MPxIO.
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

- Oracle Solaris might be described as Solaris, Solaris Operating System, or Solaris OS.

■ Other names

- "Fibre Channel card" refers to the Fibre Channel interface module normally used by the server. A "Host Bus Adapter" (HBA) or "Channel Adapter" (CA) may be used instead, depending on the server.
- Italics are used to show variables such as values and characters that appear in command parameters and output examples.
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Chapter 1  Workflow

This chapter describes how to set up a multipath connection using MPxIO. Refer to "Chapter 3 Setting Up MPxIO" (page 8) for more details. When the CPU that is installed in the server is x64, the default setting values for MPxIO are enabled. Confirm that the default value for MPxIO is enabled in Step 2 of the following workflow.

Workflow

1. Disable MPxIO on paths not requiring it (/kernel/drv/fp.conf)
   Specify any devices that will not form part of the multipath connection.

2. Change Settings (/kernel/drv/fp.conf, /kernel/drv/scsi_vhci.conf)
   1. Enable multipathing.
   2. Enable the auto-failback function.
   Solaris 10 OS  "3.1 Solaris 10 OS" (page 8)  Solaris 9 OS  "3.2 Solaris 9 OS" (page 12)  Solaris 8 OS  "3.3 Solaris 8 OS" (page 16)

3. Effect the Changed Settings
   Reconfigure the server and restart it.

4. Multipath Status Check
   Check the status of the multipath connection after the MPIO settings are complete.
Chapter 2  Using MPxIO

When using MPxIO, read the following notes carefully.

- Before installing MPxIO, also check the usage conditions and list of supported environments given in the relevant notes in the "Notes" section of the "ETERNUS Disk storage systems Server Connection Guide (Fibre Channel) for Oracle Solaris" and the "Server Support Matrix".

- MPxIO is bundled with Solaris 10 OS from Update 1 onwards, so separate installation is not required for these versions.

- Download and install the Sun StorEdge SAN (MPxIO) software from the following Oracle web-site for Solaris 10 OS, Solaris 9 OS, and Solaris 8 OS. Refer to the Oracle web-site for more details.

  http://www.oracle.com/ (Oracle web-site)

Refer to "Sun StorEdge Traffic Manager Installation and Configuration Guide" on the Oracle web-site (http://www.oracle.com/) for more detailed information.
Chapter 3  Setting Up MPxIO

The MPxIO set up procedure is common to all ETERNUS2000, ETERNUS4000, and ETERNUS8000 Disk storage systems, but some settings vary depending on the Solaris OS version.
Set up MPxIO according to the Solaris OS version being used.

3.1  Solaris 10 OS

3.1.1  Disabling MPxIO on Some Paths

When multipathing is not required for the specific LUN, use the following procedure to add physical paths for the relevant device to the "/kernel/drv/fp.conf" file in order to disable the multipath function for the device.
Disabling the multipath function is not necessary when multipathing is to be set up for all the LUNs that are recognized by the OS. In these cases, proceed to "3.1.2 Enabling MPxIO" (page 9).

---

**Caution**

If this setting is omitted, multipathing is set up for all LUNs recognized by the OS.
MPxIO must be disabled for the paths of connected devices that MPxIO does not support (such as a tape device).

---

**Procedure**

1. Use the "cat" command (etc.) to check the "/etc/path_to_inst" file and identify the physical pathname of the device for which multipathing is not required.
   In this example, the physical path is "/pci@8,600000/SUNW,qlc@2"

   ```
   # cat /etc/path_to_inst
   "/pci@8,600000/SUNW,qlc@2" 0 "qlc"
   "/pci@8,600000/SUNW,qlc@2/fp@0,0" 5 "fp"
   "/pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w500000e0113ce2e1,0" 5 "ssd"
   
   Physical path
   ```

2. Add the following line to the "/kernel/drv/fp.conf" file using the "vi" command.

   ```
   name="fp" parent="Physical path" port=0 mpxio-disable="yes";
   ```
3.1.2 Enabling MPxIO

Enable MPxIO by adding the following line to the "/kernel/drv/fp.conf" file.

```plaintext
mpxio-disable="no";
```

3.1.3 Checking the Storage System Status

Use the "format" command to check the path status before multipathing is set up (example output follows).

```plaintext
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c1t0d0 <SUN146G cyl 14087 alt 2 hd 24 sec 848>
   /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w500000e0113ce2e1,0
1. c2t2051000B5D6A0109d0 <FUJITSU-E8000-0000 cyl 6248 alt 2 hd 64 sec 256>
   /pci@9,600000/SUNW,qlc@1,1/fp@0,0/ssd@w2051000b5d6a109,0
2. c3t2050000B5D6A0109d0 <FUJITSU-E8000-0000 cyl 6248 alt 2 hd 64 sec 256>
   /pci@9,600000/SUNW,qlc@2,1/fp@0,0/ssd@w2050000b5d6a109,0
```

"d0" device is connected to c2 and c3 paths.
3.1.4 Editing the "'/kernel/drv/scsi_vhci.conf'" Settings

Edit the "'/kernel/drv/scsi_vhci.conf'" file to enable the auto-failback function.
Check that an "auto-failback="enable";" line exists, enabling the auto-failback function.
Otherwise, add this line or change its value to "enable".

```
# Copyright 2004 Sun Microsystems, Inc.
# All rights reserved.
# Use is subject to license terms.
#
#pragma ident "@(#)scsi_vhci.conf       1.9     04/08/26 SMI"
#
name="scsi_vhci" class="root";
#
Load balancing global configuration: setting load-balance="none" will cause
all I/O to a given device (which supports multipath I/O) to occur via one
path. Setting load-balance="round-robin" will cause each path to the device
to be used in turn.
#
load-balance="round-robin";
#
Automatic failback configuration
# possible values are auto-failback="enable" or auto-failback="disable"
auto-failback="enable";
#
For enabling MPxIO support for 3rd party symmetric device need an
entry similar to following in this file. Just replace the "SUN     SENA"
part with the Vendor ID/Product ID for the device, exactly as reported by
Inquiry cmd.
#
device-type-scsi-options-list =
# "SUN     SENA", "symmetric-option";
#
# symmetric-option = 0x1000000;
```

3.1.5 Reconfiguring and Restarting the Server

Reconfigure and reboot the server to effect the new settings.
The ETERNUS Disk storage system can be reconfigured by creating the "'/reconfigure'" file and
rebooting the server.

```
# touch /reconfigure
# /usr/sbin/shutdown -y -g0 -i6
```
3.1.6 Checking the MPxIO Multipath Status

Use the "format" command to check the MPxIO multipath status after multipathing is set up (example output follows).

Example: ETERNUS8000

```
$ format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
 0. c1t0d0 <SUN146G cyl 14087 alt 2 hd 24 sec 848>
    /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@g6000b5d000006a010900000000d0s2
 1. c7t6000B5D0006A000006A0109000000d0s2 <FUJITSU-E8000-0000 cyl 6248 alt 2 hd 64 sec 256>
    /scsi_vhci/ssd@g6000b5d000006a010900000000d0s2

Both path States show as "ONLINE" indicating this multipath is normal
```

Use the "luxadm" command to check that each path in the multipath configuration is normal.

Example: ETERNUS8000

```
$ luxadm display /dev/rdsk/c7t6000B5D0006A000006A010900000000d0s2
DEVICE PROPERTIES for disk: /dev/rdsk/c7t6000B5D0006A000006A010900000000d0s2
Vendor:               FUJITSU
Product ID:           E8000
Revision:             0000
Serial Num:           6A0109
Unformatted capacity: 10240.000 MBytes
Write Cache:          Enabled
Read Cache:           Enabled
Minimum prefetch:   0x0
Maximum prefetch:   0x0
Device Type:           Disk device
Path(s):
    /dev/rdsk/c7t6000B5D0006A000006A010900000000d0s2
    /devices/scsi_vhci/ssd@g6000b5d000006a01090000000000d0s2
Controller            /devices/pci@0,600000/pci@0/pci@8/pci@0,1/QLGC,qlc@1/fp@0,0
    Device Address               500000e0d0400206,0
    Host controller port WWN     2100001b320aca5b
    Class                        primary
    State                        ONLINE
Controller            /devices/pci@0,600000/pci@0/pci@8/pci@0,1/QLGC,qlc@1/fp@0,0
    Device Address               500000e0d0400287,0
    Host controller port WWN     2101001b322aca5b
    Class                        primary
    State                        ONLINE
```

Refer to the "Sun StorEdge Traffic Manager Installation and Configuration Guide" on the Oracle web-site (http://www.oracle.com/) for details.
3.2 Solaris 9 OS

3.2.1 Disabling MPxIO on Some Paths

When multipathing is not required for some devices, the procedure that follows should be used to add the physical paths of these devices to the "/kernel/drv/fp.conf" file, in order to disable use of the multipath function for these devices.

This is not necessary when multipathing is to be set up for all devices recognized by the OS, in which case proceed to "3.2.2 Checking the Storage System Status" (page 13).

---

Caution If this setting is omitted, multipathing is set up for all LUNs recognized by the OS.
MPxIO must be disabled for the paths of connected devices that MPxIO does not support (such as a tape device).

---

Procedure

1. Use the "cat" command (etc.) to check the "/etc/path_to_inst" file and identify the physical pathname of the device for which multipathing is not required.
In this example, the physical path is "/pci@8,600000/SUNW,qlc@2"

```
# cat /etc/path_to_inst
"/pci@8,600000/SUNW,qlc@2" 0 "qlc"
"/pci@8,600000/SUNW,qlc@2/fp@0,0" 5 "fp"
"/pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w500000e0113ce2e1,0" 5 "ssd"
```

Physical path

2. Add the following line to the "/kernel/drv/fp.conf" file using the "vi" command.

```
name="fp" parent="Physical path" port=0 mpxio-disable="yes";
```

Example:

```
name="fp" parent="/pci@8,600000/SUNW,qlc@2" port=0 mpxio-disable="yes";
```

End of procedure
3.2.2 Checking the Storage System Status

Use the "format" command to check the path status before multipathing is set up (example output follows).

```
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c1t0d0 <SUN146G cyl 14087 alt 2 hd 24 sec 848>
   /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w500000e0113ce2e1,0
1. c2t2051000B5D6A0109d0 <FUJITSU-E8000-0000 cyl 6248 alt 2 hd 64 sec 256>
   /pci@9,600000/SUNW,qlc@1,1/fp@0,0/ssd@w2051000b5d6a0109,0
2. c3t2050000B5D6A0109d0 <FUJITSU-E8000-0000 cyl 6248 alt 2 hd 64 sec 256>
   /pci@9,600000/SUNW,qlc@2,1/fp@0,0/ssd@w2050000b5d6a0109,0
```

"d0" device is connected to c2 and c3 paths.

3.2.3 Editing the "/kernel/drv/scsi_vhci.conf" Settings

Edit the "/kernel/drv/scsi_vhci.conf" file.

### Procedure

1. **Enable MPxIO.**
   
   Check that an "mpxio-disable="no";" line exists, enabling MPxIO. Otherwise, add this line or change its value to "no".

2. **Enable the auto-failback function.**
   
   Check that an "auto-failback="enable";" line exists, enabling the auto-failback function. Otherwise, add this line or change its value to "enable".
3.2.4 Reconfiguring and Restarting the Server

Reconfigure and restart the server to effect the new settings.
The ETERNUS Disk storage system can be reconfigured by creating the "/reconfigure" file and rebooting the server.

```
# touch /reconfigure
#/usr/sbin/shutdown -y -g0 -i6
```
3.2.5 Checking the MPxIO Multipath Status

Use the "format" command to check the MPxIO multipath status after multipathing is set up (example output follows).

Example: ETERNUS8000

```
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c1t0d0 <SUN146G cyl 14087 alt 2 hd 24 sec 848> /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w500000e0113ce2e1,0
1. c7t60000B5D0006A010900000000d0 <FUJITSU-E8000-0000 cyl 6248 alt 2 hd 64 sec 256> /scsi_vhci/ssd@g6000b5d0006a010900000000d0

---
c2 and c3 paths changed to c7 path, making a multipath configuration.
---
```

Use the "luxadm" command to check that each path in the multipath configuration is normal.

Example: ETERNUS8000

```
# luxadm display /dev/rdsk/c7t60000B5D0006A010900000000d0s2
DEVICE PROPERTIES for disk: /dev/rdsk/c7t60000B5D0006A010900000000d0s2
Vendor:               FUJITSU
Product ID:           E8000
Revision:             0000
Serial Num:           6A0109
Unformatted capacity: 10240.000 MBytes
Write Cache:          Enabled
Read Cache:           Enabled
Minimum prefetch:   0x0
Maximum prefetch:   0x0
Device Type:           Disk device
Path(s):
  /dev/rdsk/c7t60000B5D0006A010900000000d0s2
  /devices/scsi_vhci/ssd@g6000b5d0006a010900000000d0s2
  /devices/pci@0,600000/pci@0/pci@8/pci@0,1/QLGC,qlc@1/fp@0,0
Controller            /devices/pci@0,600000/pci@0/pci@8/pci@0,1/QLGC,qlc@1/fp@0,0
  Device Address               500000e0d0400206,0
  Host controller port WWN     2100001b320aca5b
  Class                        primary
  State                        ONLINE
Device Address               500000e0d0400287,0
Host controller port WWN     2101001b322aca5b
Class                        primary
State                        ONLINE
```

Both path States show as "ONLINE" indicating this multipath is normal.

Refer to the "Sun StorEdge Traffic Manager Installation and Configuration Guide" on the Oracle web-site (http://www.oracle.com/) for details.
3.3 Solaris 8 OS

3.3.1 Disabling MPxIO on Some Paths

When multipathing is not required for some devices, the procedure that follows should be used to add the physical paths of these devices to the "/kernel/drv/fp.conf" file, in order to disable use of the multipath function for these devices. This is not necessary when multipathing is to be set up for all devices recognized by the OS, in which case proceed to "3.3.2 Checking the Storage System Status" (page 17).

Procedure

1. Use the "cat" command (etc.) to check the "/etc/path_to_inst" file and identify the physical pathname of the device for which multipathing is not required. In this example, the physical path is "/pci@8,600000/SUNW,qlc@2"

```
# cat /etc/path_to_inst
"/pci@8,600000/SUNW,qlc@2" 0 "qlc"
"/pci@8,600000/SUNW,qlc@2/fp@0,0" 5 "fp"
"/pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w500000e0113ce2e1,0" 5 "ssd"
```

2. Add the following line to the "/kernel/drv/fp.conf" file using the "vi" command.

```
name="fp" parent="Physical path" port=0 mpxio-disable="yes";
```

Example:

```
name="fp" parent="/pci@8,600000/SUNW,qlc@2" port=0 mpxio-disable="yes";
```

End of procedure

Caution
If this setting is omitted, multipathing is set up for all LUNs recognized by the OS. MPxIO must be disabled for the paths of connected devices that MPxIO does not support (such as a tape device).
### 3.3.2 Checking the Storage System Status

Use the "format" command to check the path status before multipathing is set up (example output follows).

```
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c1t0d0 <SUN146G cyl 14087 alt 2 hd 24 sec 848>
   /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w500000e0113ce2e1,0
1. c2t2051000B5D6A0109d0 <FUJITSU-E8000-0000 cyl 6288 alt 2 hd 64 sec 256>
   /pci@9,600000/SUNW,qlc@1,1/fp@0,0/ssd@w2051000b5d6a0109,0
2. c3t2050000B5D6A0109d0 <FUJITSU-E8000-0000 cyl 6288 alt 2 hd 64 sec 256>
   /pci@9,600000/SUNW,qlc@2,1/fp@0,0/ssd@w2050000b5d6a0109,0
```

"d0" device is connected to c2 and c3 paths.

### 3.3.3 Editing the "/kernel/drv/scsi_vhci.conf" Settings

Edit the "/kernel/drv/scsi_vhci.conf" file.

#### Procedure

1. **Enable MPxIO.**
   
   Check that an "mpxio-disable="no";" line exists, enabling MPxIO. Otherwise, add this line or change its value to "no".

2. **Enable the auto-failback function.**
   
   Check that an "auto-failback="enable";" line exists, enabling the auto-failback function. Otherwise, add this line or change its value to "enable".

3. **Enable the Symmetric option.**
   
   Add the following line.

   - For the ETERNUS2000
     
     ```
     device-type-scsi-options-list = 
     "FUJITSU E2000", "symmetric-option";
     symmetric-option = 0x1000000;
     ```

   - For the ETERNUS4000
     
     ```
     device-type-scsi-options-list = 
     "FUJITSU E4000", "symmetric-option";
     symmetric-option = 0x1000000;
     ```

   - For the ETERNUS8000
     
     ```
     device-type-scsi-options-list = 
     "FUJITSU E8000", "symmetric-option";
     symmetric-option = 0x1000000;
     ```
3.3.4  Reconfiguring and Restarting the Server

Reconfigure and restart the server to effect the new settings.

The ETERNUS Disk storage system can be reconfigured by creating the "/reconfigure" file and rebooting the server.

```
# touch /reconfigure
#/usr/sbin/shutdown -y -g0 -i6
```
3.3.5 Checking MPxIO Multipath Status

Use the "format" command to check the MPxIO multipath status after multipathing is set up (example output follows).

Example: ETERNUS8000

```bash
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c1t0d0  <SUN146G cyl 14087 alt 2 hd 24 sec 848>
   /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@g600000e0113ce2e1,0
1. c7t6000bd50006ad000060a10900000000d0s2  <FUJITSU-E8000-0000 cyl 6248 alt 2 hd 64
   sec 256> /scsi_vhci/ssd@g6000b5d0006a0000006a010900000000

c2 and c3 paths changed to c7 path, making a multipath configuration.
```

Use the "luxadm" command to check that each path in the multipath configuration is normal.

Example: ETERNUS8000

```bash
# luxadm display /dev/rdsk/c7t6000bd50006ad000060a10900000000d0s2
DEVICE PROPERTIES for disk: /dev/rdsk/c7t6000bd50006ad000060a10900000000d0s2
Vendor:             FUJITSU
Product ID:         E8000
Revision:           0000
Serial Num:         6A0109
Unformatted capacity: 10240.000 MBytes
Write Cache:        Enabled
Read Cache:         Enabled
Minimum prefetch:   0x0
Maximum prefetch:   0x0
Device Type:        Disk device
Path(s):
/dev/rdsk/c7t6000bd50006ad000060a10900000000d0s2
/devices/scsi_vhci/ssd@g6000b5d0006a0000006a010900000000c,raw
Device Address       500000e0d004000206,0
Host controller port WWN     2100001b320aca5b
Class                        primary
State                        ONLINE
Controller                /devices/pci@0,600000/pci@0/pci@8/pci@0,1/QLGC,qlc@1/fp0@0,0
Device Address       500000e0d004000287,0
Host controller port WWN     2101001b322aca5b
Class                        primary
State                        ONLINE
```

Both path States show as "ONLINE" indicating this multipath is normal.

Refer to the "Sun StorEdge Traffic Manager Installation and Configuration Guide" on the Oracle web-site (http://www.oracle.com/) for details.
ETERNUS Disk storage systems
Server Connection Guide (Fibre Channel) for Oracle Solaris
Multipath Driver Settings for MPxIO Multipath Driver

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