

# Oracle FS Path Manager 4 HP-UX 11i V3 Installation Guide



FLASH STORAGE  
SYSTEMS

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# Contents

- List of Tables ..... 6
- List of Figures ..... 7
- Preface ..... 8
  - Oracle Resources ..... 8
  - Typographical Conventions ..... 9
  - Command Syntax Conventions ..... 9
- Chapter 1: Introduction to Oracle FS Path Manager ..... 11**
  - FSPM Overview ..... 11
  - FSPM Features ..... 11
  - FSPM Architecture ..... 13
    - Control Path ..... 15
    - Data Path ..... 15
  - Supported HP-UX Distributions and Platforms ..... 15
  - Operating Limits ..... 16
  - Supported FC SAN Hardware Components ..... 16
    - Supported iSCSI Software and Hardware ..... 17
    - FC HBA and FCoE Filesets ..... 17
    - Supported FC Switches ..... 18
  - FCoE Support Overview ..... 18
    - Supported FCoE Adapter Requirements ..... 18
    - Supported FCoE Switches ..... 19
  - Install HP HBAs or FCoE CNAs ..... 19
- Chapter 2: Install FSPM ..... 20**
  - Prepare to Install FSPM Software ..... 20
    - Delete SAN Host Before FSPM Installation ..... 20
  - Pre-Configure the SAN for Oracle FS System Integration ..... 21
    - Create a Temporary Host Entry (Optional) ..... 23
    - Verify Management Network Requirements ..... 24
  - FSPM Download and Installation Overview ..... 24
    - Download the FSPM Software ..... 25
    - Install the FSPM Software ..... 25
    - Configure SAN Host Access to LUNs ..... 26
  - Install a Boot from SAN LUN ..... 28
  - About Load Balancing Configuration ..... 28
  - About Path Selection ..... 29
  - Stop and Start FSPM Software ..... 30
  - Host Reconfiguration Overview ..... 31
    - Updating Fibre Channel or iSCSI Initiators Information ..... 31
    - iSCSI HBAs or IP Addresses Change ..... 32
    - Rename the FSPM Host ..... 33

---

Upgrade from Earlier Versions of APM or FSPM.....	34
Remove the FSPM Software (Optional).....	34
<b>Index.....</b>	<b>36</b>

# List of Tables

Table 1: Oracle resources.....8

Table 2: Typography to mark certain content.....9

Table 3: Typography to mark command syntax.....9

Table 4: FSPM 4 for HP-UX 11i v3 features.....12

Table 5: Line and color key for FSPM interaction diagram.....13

Table 6: FSPM operating limits.....16

# List of Figures

Figure 1: FSPM interaction with an Oracle FS System .....14

Figure 2: Delete SAN Host.....21

Figure 3: Detailed FSPM information.....27

# Preface

## Oracle Resources

Table 1: Oracle resources

For help with...	Contact...
Support	<a href="http://www.oracle.com/support">http://www.oracle.com/support</a> (www.oracle.com/support)
Training	<a href="https://education.oracle.com">https://education.oracle.com</a> (https://education.oracle.com)
Documentation	<ul style="list-style-type: none"><li>• <b>Oracle Technology Network Documentation:</b> (<a href="http://docs.oracle.com">http://docs.oracle.com</a>)</li><li>• From the Oracle FS System Manager (GUI): Help &gt; Documentation</li><li>• From Oracle FS System HTTP access: (<a href="http://system-name-ip/documentation.php">http://system-name-ip/documentation.php</a> where system-name-ip is the name or the public IP address of your system)</li></ul>
Documentation feedback	<a href="http://www.oracle.com/goto/docfeedback">http://www.oracle.com/goto/docfeedback</a> ( <a href="http://www.oracle.com/goto/docfeedback">http://www.oracle.com/goto/docfeedback</a> )
Contact Oracle	<a href="http://www.oracle.com/us/corporate/contact/index.html">http://www.oracle.com/us/corporate/contact/index.html</a> ( <a href="http://www.oracle.com/us/corporate/contact/index.html">http://www.oracle.com/us/corporate/contact/index.html</a> )



## Typographical Conventions

Table 2: Typography to mark certain content

Convention	Meaning
<i>italics</i>	<p>Within normal text, words in italics indicate one of the following items:</p> <ul style="list-style-type: none"> <li>• Hypertext, as in a URL</li> <li>• A reference to a book title</li> <li>• New terms and emphasized words</li> <li>• Command variables</li> </ul>
monospace	<p>Indicates one of the following, depending on the context:</p> <ul style="list-style-type: none"> <li>• The name of a file or the path to the file</li> <li>• <i>Output</i> displayed by the system on the command line</li> </ul>
<b>monospace</b> (bold)	<i>Input</i> provided by an administrator on the command line.
>	Indicates a menu item or a navigation path in the Oracle FS System Manager (GUI). For example, “Click SAN > Storage > LUNS > Action > Clone” means to click the Clone link on the SAN page in the GUI.
...	Indicates that one or more steps have been omitted from the path or menu structure. The ellipsis is used within an expression of a navigation path or within a cascading menu structure. For example, in the SAN > Storage > LUNS > ... > Clone menu structure, the ... implies that one or more menu items have been omitted.

## Command Syntax Conventions

Table 3: Typography to mark command syntax

Typographic symbol	Meaning
[ ]	Square brackets. Delimits an optional command parameter or a set of optional command parameters.
{ }	Braces. Delimits a set of command parameters, one of which must be selected.
	Vertical bar. Separates mutually exclusive parameters.
...	Ellipsis. Indicates that the immediately preceding parameter or group of parameters can be repeated.
monospace	Indicates the name of a command or the name of a command option (sometimes called a <i>flag</i> or <i>switch</i> ).
<i>italic</i>	Indicates a variable for which you need to supply a value.

Command parameters that are not enclosed within square brackets ( [ ] ) are required.

**Important:** The above symbols (and font styling) are based on the POSIX.1-2008 specification. These symbols are used in the command syntax only to clarify how to use the command parameters. *Do not enter these symbols on the command line.*

# Introduction to Oracle FS Path Manager

The following information provides an overview of the Oracle FS Path Manager (FSPM) and its features.

## FSPM Overview

The information in this document is for system administrators who want to use the Oracle FS Path Manager (FSPM) software on a SAN host running the HP-UX 11i v3 operating system. FSPM supports SAN multipathing to the Oracle FS System and to the Pillar Axiom system. The FSPM software replaces the Axiom Path Manager (APM) software.

FSPM automates the task of configuring information about the host in the Oracle FS System Manager. Oracle recommends that you install FSPM as part of initially connecting the host in the SAN to the Oracle FS System. This document describes the sequence of steps for doing this.

This document describes how to install and configure FSPM.

**Note:** In this document, references to an Oracle FS System, also refer to a Pillar Axiom System unless specifically noted. References to the Oracle FS System Controller, also refer to a Pillar Axiom System Slammer Control Unit unless specifically noted.

If you are updating your Pillar Axiom software or Oracle Flash Storage System software, complete that update before installing the FSPM software on the SAN host.

This release supports both Fibre Channel (FC) and iSCSI Controller and Slammer ports. You can connect your host to Fibre Channel or iSCSI ports on Controller or Slammer.

### Related Links

[FSPM Features](#)

[FSPM Architecture](#)

## FSPM Features

FSPM works with the HP-UX native multipathing features to provide the following functions:

- Routes I/O to Oracle FS System LUNs using the best available data paths

- Allocates traffic among the available paths to ensure that access to the LUNs is not interrupted if a path fails
- Automatically configures the host information in the Oracle FS System Manager (GUI) and updates the host configuration information if the host information changes

Automatic configuration of host information enables the GUI to report information about the instance of FSPM running on the host. An example is the number of working paths reported to the GUI from FSPM. In some environments, automatic configuration includes features such as load balancing.

Each FSPM release provides different features and the features provided for each platform vary. The following table describes the specific features implemented in FSPM 4.

**Table 4: FSPM 4 for HP-UX 11i v3 features**

Feature	Benefit
Automatic data path failover	Automatically switches to the most suitable paths available after a path failure or fail back.
Automatic recognition of SAN hosts by the Oracle FS System Services.	Sends a description of the host to each Pilot management controller on connected Oracle FS Systems, enabling the Oracle FS System Services to create a host definition. This definition provides information including the WWNs for each host FC port, iSCSI Initiator Names associated with the hosts, and the version of FSPM running on the host.
Call-Home log collection	<p>When an Oracle FS administrator uses Oracle FS System Manager (GUI) to collect system information, the Oracle FS System can be instructed to send a request to each connected FSPM host. The FSPM host collects diagnostic information and sends the information to the Oracle FS System, where the information is bundled with any other requested information.</p> <p>The Oracle FS System can transmit this information to Oracle Customer Support. The information collected from each FSPM host includes</p> <ul style="list-style-type: none"> <li>• Log files from the FSPM components</li> <li>• Configuration and status information from the operating system</li> <li>• System and error logs from the operating system</li> </ul> <p>No customer data is transmitted.</p> <p><b>Note:</b> For more information on Call-Home, refer to the <i>Oracle Flash Storage System Administrator's Guide</i>.</p>
Support for FC connections to Controllers	Makes connections to Oracle FS System storage arrays over a high-speed FC network infrastructure.

**Table 4: FSPM 4 for HP-UX 11i v3 features (continued)**

Feature	Benefit
Support for iSCSI connections to Controllers	Makes connections to Oracle FS System storage arrays over long distances using an IP network infrastructure.
FSPM monitoring from the Oracle FS System Manager GUI	Monitors host multipathing from the Oracle FS System GUI.
Native multipathing	Multipathing support provided by the HP-UX 11i v3 native multipathing framework.

## FSPM Architecture

The Oracle FS Path Manager (FSPM) software uses HP-UX native multipathing to communicate with Oracle FS System servers along different pathways.

For information about HP-UX 11i v3 native multipathing, refer to the white paper [Native Multi-Pathing for Mass Storage](http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01906512/c01906512.pdf) (<http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01906512/c01906512.pdf>).

FSPM communicates with Oracle FS System servers along two separate paths: the control path and the data path. The FSPM daemon uses the control path to manage path communication, and FSPM works with the HP-UX native multipathing framework to manage the LUN data access paths.

The following figure illustrates how FSPM software installed on a SAN host interacts with an Oracle FS System. The following table describes meanings of the lines and colors used in the figure.

**Table 5: Line and color key for FSPM interaction diagram**





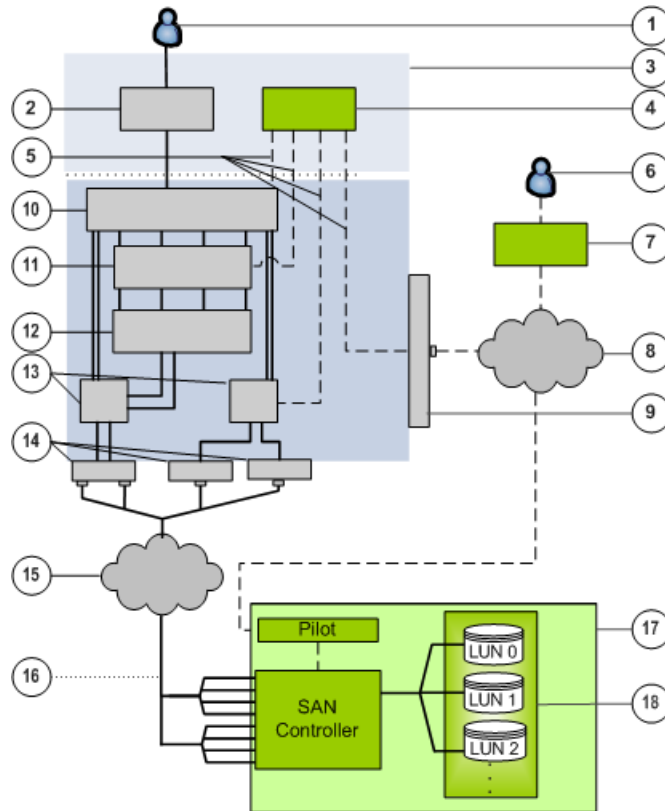
Graphic element	Description
————	Data path
-----	Control path
	Oracle FS System hardware and software
	Non-Oracle FS System hardware and software
	SAN host kernel space
	SAN host user space

Figure 1: FSPM interaction with an Oracle FS System



Legend 1	User	10 HP-UX multipathing features
2	User application	11 iSCSI software initiator (iSCSI)
3	User space	12 TCP/IP driver (iSCSI)
4	FSPM service, <code>fspmd</code>	13 HBA driver (FC) or NIC driver (iSCSI)
5	Control path (all dashed lines)	14 HBA (FC) or NIC (iSCSI)
6	Oracle FS System administrator	15 SCSI over Fibre Channel (FC) or iSCSI over IP (iSCSI)
7	Oracle FS System command line interface (CLI) or Oracle FS System Manager (GUI)	16 Data path (all solid lines)
8	Encrypted messages over TCP/IP	17 Oracle FS System
9	Network card	18 Drive Enclosure storage pool

### Related Links

[Control Path](#)

[Data Path](#)

## Control Path

The Oracle FS Path Manager (FSPM) control path provides a path to manage multipathing and communication.

The FSPM daemon uses the control path to:

- Get path information from the HBA drivers.
- Monitor and update the HP-UX native multipathing framework.
- Send information such as host attributes and statistics to the Pilot, and collect logs from the host on request.

The FSPM daemon sends a description of the host to the Pilot on each connected Oracle FS System. In the Oracle FS System Manager (GUI), this description creates a definition for the host that includes any Fibre Channel ports in the host and any iSCSI Initiator Names configured on the host. The graphical user interface (GUI) and command line interface (CLI) list the port WWNs of the Fibre Channel ports in the host and IP addresses on the host that are used to make iSCSI connections to the Oracle FS System.

## Data Path

FSPM uses the HP-UX 11i v3 multipathing driver to provide paths for reading and writing data to LUNs on the Oracle FS System.

The multipathing driver:

- Controls and manages all data paths to the Oracle FS System LUNs
- Groups multiple data paths to an Oracle FS System LUN and presents this group to the host operating system as a single LUN or drive
- Determines which data paths to use
- Identifies and uses optimized data paths when possible
- Handles data path failover and failback
- Manages data path errors

A path that provides the best performance is referred to as an optimized path and is the preferred path for data transfer.

### Related Links

[FSPM Architecture](#)

[FSPM Architecture](#)

[Control Path](#)

## Supported HP-UX Distributions and Platforms

Oracle FS Path Manager (FSPM) is supported on 64-bit HP-UX platforms.

This release of FSPM supports HP-UX 11i v3 (HP-UX 11.31) Update 3 (September 2008 release) or later distributions for the following server architectures:

- 64-bit on PA-RISC 2.0
- 64-bit Itanium

This release does not support blade servers.

**Important:** This release of FSPM does not support HP-UX versions previous to HP-UX 11i v3 Update 3.

## Operating Limits

FSPM provides access over multiple data paths to LUNs defined on an Oracle FS System.

FSPM and the Oracle FS System operating software limits are described in this document.

**Table 6: FSPM operating limits**

FSPM capabilities	Maximum value
Target storage systems	Eight for each FSPM host in any combination of Oracle FS Systems and Pillar Axiom systems
Connect to LUNs	Up to 255 for each Pillar Axiom system and 4095 for each Oracle FS System. For HP-UX, you cannot use LUN 0 which reduces the total available number of LUNs by one.
Handle data paths	32 to each LUN
Handle FC HBA ports	32 for each SAN host

**Important:** Not all combinations of the operating limits were tested. If you configure an operating system to operate at or near these limits, the system might not work properly when these limits are used concurrently with each other.

## Supported FC SAN Hardware Components

Oracle FS Path Manager (FSPM) supports these Fibre Channel (FC) HBAs and Fibre Channel over Ethernet (FCoE) Converged Network Adapters (CNA).

List of supported HP FC HBAs. The information in the parenthesis indicates the driver type:

- A6795A (Tachyon)
- A6826A (QLogic)
- A9782A (QLogic)
- A9784A, AB465A (QLogic)
- AB378A, AB379A (QLogic)
- AB378B, AB379B (QLogic)
- AD193A, AD194A (QLogic)



- AD300A (QLogic)
- AD299A, AD335A (Emulex)
- AD221A, AD222A, AD393A (Emulex)
- AH400A, AH401A (QLogic)
- AH402A, AH403A (Emulex)
- AT094A (Emulex)

List of supported HP FCoE CNAs:

- AT111A (Emulex CNA)

## Supported iSCSI Software and Hardware

Lists supported iSCSI software and hardware.

Oracle FS Path Manager (FSPM) supports the following iSCSI software and hardware:

- iSCSI HBAs and other support hardware-assist mechanisms that are fully supported by the operating system
- The iSCSI software initiator included in the operating system distribution
- The iSCSI-to-FC routers to FC ports on the Oracle FS System Controllers and Pillar Axiom system Slammers are not supported

## FC HBA and FCoE Filesets

The FC-COMMON.FC-SNIA fileset must be installed prior to installing the driver package.

All relevant Fibre Channel drivers and associated software must be version B.11.31.0809 or later. The FC-COMMON.FC-SNIA fileset (part of the CommonIO bundle) must be installed. This fileset should be installed before the driver package to ensure that associated parts of the driver package are also installed. Before you install Oracle FS Path Manager (FSPM), use the following command to verify installation of the required filesets:

```
# swlist -R CommonIO FibrChanl-00 FibrChanl-01 FibrChanl-02
FibrChanl-03
```

Extracts from sample output of the `swlist` command follow. The versions shown are the minimum required.

**Note:** The descriptive information that appears at the end of each line in the output has been removed.

In all cases, the following filesets must be installed:

```
CommonIO                B.11.31.0809
CommonIO.FC-COMMON      B.11.31.0809
CommonIO.FC-COMMON.FC-SNIA B.11.31.0809
```

If you are using Tachyon HBAs, the following filesets must be installed:

FibrChanl-00	B.11.31.0809
FibrChanl-00.FC-TACHYON-TL	B.11.31.0809
FibrChanl-00.FC-TACHYON-TL.FC-TL-KRN	B.11.31.0809
FibrChanl-00.FC-TACHYON-TL.FC-TL-RUN	B.11.31.0809

If you are using QLogic HBAs, the following filesets must be installed:

FibrChanl-01	B.11.31.0809
FibrChanl-01.FC-FCD	B.11.31.0809
FibrChanl-01.FC-FCD.FC-FCD-KRN	B.11.31.0809
FibrChanl-01.FC-FCD.FC-FCD-RUN	B.11.31.0809

If you are using Emulex HBAs, the following filesets must be installed:

FibrChanl-02.FC	B.11.31.1303
FibrChanl-02.FC-FCLP	B.11.31.1303
FibrChanl-02.FC-FCLP.FC-FCLP-KRN	B.11.31.1303
FibrChanl-02.FC-FCLP.FC-FCLP-RUN	B.11.31.1303

If you are using Emulex CNAs, the following filesets must be installed:

FibrChanl-03	B.11.31.1303
FibrChanl-03.FC-FCOC	B.11.31.1303
FibrChanl-03.FC-FCOC.FC-FCOC-KRN	B.11.31.1303
FibrChanl-03.FC-FCOC.FC-FCOC-RUN	B.11.31.1303

## Supported FC Switches

For a list of supported Fibre Channel (FC) switches, refer to the *Oracle FS System Support and Interoperability Guide*, which can be found on the [Oracle Unified Storage Systems Documentation](http://www.oracle.com/technetwork/documentation/oracle-unified-ss-193371.html) website (<http://www.oracle.com/technetwork/documentation/oracle-unified-ss-193371.html>).

**Note:** Refer to the switch vendor's website for the most recent installation instructions, patches, and firmware.

## FCoE Support Overview

The Oracle FS Path Manager (FSPM) software can be used on SAN hosts that use Fibre Channel over Ethernet (FCoE) connections from Converged Network Adapters (CNAs) through a switch to an FC SAN.

FSPM manages FCoE connections the same as FC connections.

**Note:** For additional information on FCoE support including adapters, review the *Oracle Flash Storage System Support and Interoperability Guide*.

## Supported FCoE Adapter Requirements

All FCoE adapters that meet the FC HBA requirements are supported. See *FC HBA and FCoE Filesets* for requirements.

**Note:** For all FCoE adapters, Oracle recommends the latest firmware and driver versions available from the vendor be installed.

## Supported FCoE Switches

The supported Fibre Channel over Ethernet (FCoE) converged network adapters (CNAs) were tested in conjunction with the Brocade 8000 switch.

For best results, the Brocade 8000 switch must be running Fabric OS version 6.4.0a or higher.

## Install HP HBAs or FCoE CNAs

Oracle FS Path Manager (FSPM) for HP-UX supports a variety of HP Fibre Channel (FC) HBAs or Fibre Channel over Ethernet (FCoE) Converged Network Adapters (CNA).

- 1 Install HP HBAs or FCoE CNAs according to the instructions at the HP support download page.
- 2 If necessary, download the driver kit appropriate for your HBA or FCoE CNA and operating system from the HP support download page, and follow the HP installation instructions.

# Install FSPM

The following information describes the process to install and configure FSPM.

## Prepare to Install FSPM Software

To ensure a successful installation of Oracle FS Path Manager (FSPM), perform the following tasks in sequence:

Oracle recommends that you install FSPM on the host or hosts as part of the process of initially connecting a host or hosts to the Oracle FS System through the SAN and assigning storage to the host. The sequence of steps in this document assumes that there are no configuration entries in the Oracle FS System Manager for a SAN host. If there are host configuration entries, these entries must be deleted as described in this document before you install FSPM.

**Note:** FSPM for HP-UX is distributed as a Software Distributor-HP-UX (SD-UX) package. The commands in this document are examples of typical HP-UX commands. You may need to change these commands depending on your system configuration. Before you install FSPM, we recommend that you become familiar with SD-UX command variations.

To ensure a successful installation of FSPM, perform the following tasks:

**Note:** If you are installing a boot-from-SAN configuration, see the instructions in this document.

- 1 Read the *Oracle FS Path Manager Release Notes* to determine which versions of HP-UX are supported as well as updates to this document.
- 2 Verify that your Fibre Channel (FC) SAN components are supported as described in this document.
- 3 Verify, for configuration requirements later in this document, that you do not plan to use any LUNs with a value of 0.

## Delete SAN Host Before FSPM Installation

Before you install the FSPM software, you need to delete any SAN host that was manually created.

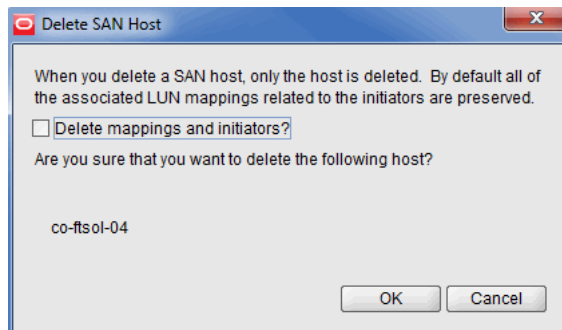
During installation, FSPM automatically creates a host entry for the host in the Oracle FS System Services and associates the host's initiators with the entry. If you manually associated any of the host's initiators with a host entry and mapped LUNs to the host, you must delete that host entry before installing

FSPM on the host. If you do not follow this process to delete the host entry, the LUN mappings are deleted and you need to recreate the LUN mappings after installing FSPM.

**Note:** In this section, all references to GUI screens refer to the layout of the Oracle FS System Manager (GUI) version 6.0. Other GUI versions are organized differently, but all versions offer equivalent functionality. Review the *Administrator's Guide* for details on how to access the features in older versions of the GUI.

- 1 From the GUI, navigate to the SAN > Storage > Hosts page.
- 2 Select the host you want to delete.
- 3 Select SAN > Storage > Hosts > Actions > Delete Host  
The Delete SAN Host dialog is displayed.
- 4 On the Delete SAN Host dialog, make sure Delete mappings and initiators? is not checked, which is the default value. If the box is checked, uncheck the box. This saves the associated LUN mappings to the host which FSPM restores as part of the FSPM installation process.

**Figure 2: Delete SAN Host**



- 5 Select OK to delete the SAN host.

You can also delete the SAN Host using the Oracle FS CLI. Review the *Oracle FS CLI Reference Guide* for further information.

## Pre-Configure the SAN for Oracle FS System Integration

Before you install the Oracle FS Path Manager (FSPM) software, prepare your SAN host connections with the Oracle Flash Storage System.

Prerequisites: Verify that your system meets these requirements:

- Available FC or iSCSI ports on a Controller or Slammer.
- Supported HBA and converged network adapter (CNA) drivers, if using FC or FCoE.

- Ethernet connections to the management ports on the Pilot.
- A controller network configuration that enables an application on the SAN host to connect to a Pillar Axiom TCP port 26004 or Oracle FS System TCP port 26012 on the Pilot. Make sure these TCP ports are open.

Prepare your SAN host components so that they will be able to connect with the Oracle FS System system.

**Note:** In this section, all references to GUI screens refer to the layout of the Oracle FS System Manager (GUI) version 6.0. Other GUI versions are organized differently, but all versions offer equivalent functionality. Review the *Administrator's Guide* for details on how to access the features in older versions of the GUI.

- 1 Verify that all FC components and software are installed on the SAN host according to the instructions in this Installation Guide.
- 2 Set up the physical connectivity and any required switch zoning for the SAN.  
Proper setup is needed so that all required host HBA ports can access the Controller ports on the Oracle FS System or Slammer ports on a Pillar Axiom system.
- 3 From the GUI, navigate to the SAN > Storage > Hosts page.
- 4 A host entry must be configured for the host on which you are installing FSPM. If you previously associated initiators on this host with a host name, you can use that host entry; otherwise you need to create a temporary host entry now. See information on creating a temporary host entry in this document.
- 5 Configure the host entry in the GUI to enable HP-UX Compatibility Mode. From the GUI, navigate to the SAN > Storage > Hosts > Actions > Modify Host > Advanced tab. Under **Host Settings** select HP-UX Compatibility Mode
- 6 Map a LUN to the host.  
After enabling HP-UX Compatibility Mode, map a LUN to the host on any LUN number (1-4095) *except* LUN 0. See your *Administrator's Guide*. for instructions.

**Note:** Do not map a LUN to the host on LUN number 0. Make sure there is no globally mapped LUN on the Oracle FS System using LUN number 0.

## Create a Temporary Host Entry (Optional)

When no host entry for the SAN host is available in Oracle FS System Manager (GUI), create a temporary host entry. This host entry will be replaced when you install FSPM.

- 1 Find the Fibre Channel Port WWN or iSCSI host initiator name of one of the host ports that you have connected to the Pillar Axiom Slammer or Oracle FS System Controller.

The port WWNs can be found on the host by running the following command:

```
# scsimgr get_info all_ctlr
```

The abbreviated output of this command shows information for all SCSI controllers in the host. For FC controllers, the port WWN is in a line similar to the following:

```
Port name = 0x50060b00001cf8c2
```

The iSCSI Initiator name can be found on the host by running the following command:

```
# iscsiutil -l
```

The abbreviated output of this command shows information for the iSCSI initiator name in a line similar to the following:

```
Initiator Name: iqn.1986-03.com.hp:ca-  
devapm-123.a1812027-916c-11e2-9b88-9805f2cc1cba
```

- 2 In the GUI, select SAN > Storage > Hosts, and select the Associate Hosts action.

**Tip:** You can also use the Oracle FS CLI for this purpose. Review the *CLI Reference Guide* for information.

- 3 Enter a unique temporary Host Name for the entry (this Host Name will be replaced when FSPM is installed).
- 4 Select Specify WWN or Specify iSCSI device name and enter one of the discovered host port WWNs or iSCSI initiator name from the command output.

To enter the port WWN into the GUI, take the sequence after the "0x" and split it into eight sets of two characters separated by colons. For example, for the Port name, you would enter the following:

```
# 50:06:0b:00:00:1c:f8:c2
```

**Tip:** If there are fewer than 16 characters after the "0x", fill on the left with zeroes.

For the iSCSI initiator name, enter the complete name .

- 5 Click OK to create the host entry.
- 6 Select the new entry to configure it.

---

## Verify Management Network Requirements

FSPM communicates with the Pilot using secure encrypted messages. The SAN host where the FSPM is installed requires a TCP/IP connection for communication with Oracle FS System Manager (GUI) or Pillar Axiom Storage Services Manager (GUI).

The network configuration must enable the SAN host to connect to a Pillar Axiom storage system using TCP port 26004 or an Oracle FS System using TCP port 26012. These ports are used to connect control path to the Pilot management Ethernet interfaces.

Network firewalls may be running on the host or in the network between the host and the Pilot. Firewall settings can block access to ports 26004 or 26012. Changes to the firewall settings can block a port that was previously open.

To resolve the blocked port, first determine if TCP port 26004 on a Pillar Axiom storage system or TCP port 26012 on an Oracle FS System is open and not blocked. You can test connectivity from the host to the system by using the `telnet` command to access the Pillar Axiom storage system or the Oracle FS System. No data is returned if you can successfully access the system. The port is open and not blocked. If you successfully access the Pillar Axiom storage system or the Oracle FS System with the `telnet` command, quit or escape from the `telnet` session.

To access the Pillar Axiom storage system or the Oracle FS System with `telnet`, you need the IP or DNS name of the Pillar Axiom storage system or Oracle FS System.

Here is an example of the command for the Pillar Axiom storage system port:

```
telnet axiom_ip_or_dns_name 26004
```

Here is an example of the command for the Oracle FS System port:

```
telnet oraclefs_ip_or_dns_name 26012
```

If the `telnet` command fails then unblock TCP port 26004 on a Pillar Axiom storage system or TCP port 26012 on an Oracle FS System. After unblocking the TCP port, verify that the TCP port is open using the `telnet` command.

## FSPM Download and Installation Overview

After you prepare your SAN for FSPM, you can download and install the FSPM package from the Oracle Technology Network (OTN).

Once FSPM is downloaded and installed, you configure access from the SAN host to the Oracle FS System LUNs.



## Related Links

[Download the FSPM Software](#)

[Install the FSPM Software](#)

[Upgrade from Earlier Versions of APM or FSPM](#)

[Remove the FSPM Software \(Optional\)](#)

## Download the FSPM Software

The software and documentation are distributed as a single zip archive that is available for download from the Oracle Technology Network (OTN).

Prerequisite: Join the [Oracle Technology Network](#) to gain access to software and documentation downloads:

<http://www.oracle.com/technetwork/community/join/why-join/index.html>

Follow these steps to access and download the software:

- 1 On the Oracle Technology Network, open the [Oracle Flash Storage System Downloads](#) page (<http://www.oracle.com/technetwork/server-storage/san-storage/downloads/index.html>) in a web browser.
- 2 From Oracle FS System Downloads, select Accept License Agreement.
- 3 Locate and select the name of the software package to download for your operating system version.
- 4 Extract the contents of the software bundle archive to a local drive connected to the SAN host.

The archive contains software installation packages for all supported hardware platforms, as well as documentation, for the specified version. Extract the package on a local drive for your hardware platform and the documentation.

After you download the software, you can install it on your host system.

## Install the FSPM Software

After you download the Oracle FS Path Manager (FSPM) installation package, you can install the software on your SAN host.

Prerequisite: Complete any needed pre-configuration of the SAN as described in this document.

Install the FSPM depot file using the following command:

```
# swinstall -s `hostname`:/tmp/fspm-version.platform.depot  
FSPM
```

**Note:** In the command above, `/tmp` is the temporary directory where you saved the downloaded depot file, and *version* and *platform* are the names of the release version and the hardware platform on the installation package

---

you downloaded. Examples include: `fspm-4.0.x.hppa.depot` or `fspm-4.0.x.ia64.depot`

After you install the software, follow the instructions on how to configure SAN host access to LUNs. You must complete that task for the software to function correctly.

### Related Links

[Pre-Configure the SAN for Oracle FS System Integration](#)

[Configure SAN Host Access to LUNs](#)

## Configure SAN Host Access to LUNs

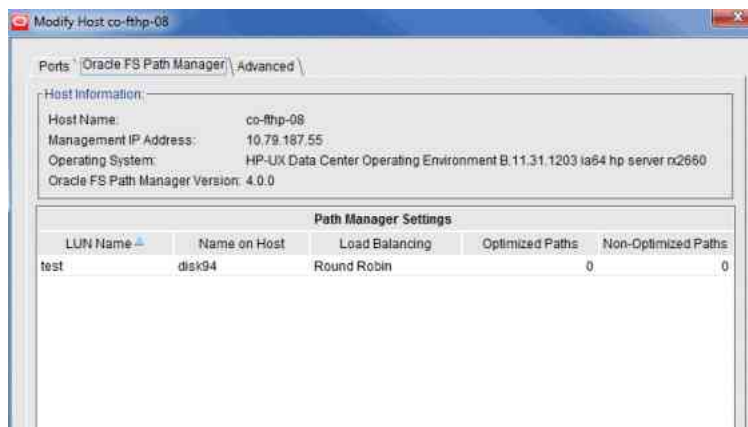
Verify that the SAN host communicates with the Oracle FS System LUNs after installing the FSPM software.

**Note:** In this section, all references to GUI screens refer to the layout of the Oracle FS System Manager (GUI) version 6.0. Other GUI versions are organized differently, but all versions offer equivalent functionality. Review the *Administrator's Guide* for details on how to access the features in older versions of the GUI.

To use the GUI to validate the LUN configuration, perform these steps:

- 1 In the GUI, navigate to SAN > Storage > Hosts.
- 2 Verify that an entry under the host name has been created or updated and is shown as Communicating. Any HBA ports in the host that were associated with other host entries should have been transferred to the new entry, along with any associated LUN mappings. These LUN mappings include any temporary host entry created during the *Pre-Configure the SAN for Oracle FS System Integration* process. If the associations have been transferred correctly, delete the empty temporary host entry.
- 3 Configure the host entry in the GUI to enable HP-UX Compatibility Mode. From the GUI, navigate to the SAN > Storage > Hosts > Actions > Modify Host > Advanced tab. Under **Host Settings** select HP-UX Compatibility Mode
- 4 Create new LUNs on the Oracle FS System for this host and set up mappings of LUNs to the new host entry.
- 5 Verify the FSPM version you installed. Select the name of the new host and the select Actions > View Host > Oracle FS Path Manager to view the version information. The operating system and FSPM versions shown in the illustration can differ from your configuration.

Figure 3: Detailed FSPM information



- Review the LUN names on the Oracle FS System under the LUN Name column.

The column titled LUN Name on Host should show the HP-UX agile view disk names that HP-UX allocates to each LUN. We recommend that you use the agile view when managing Oracle FS System LUNs on HP-UX 11i v3. See the HP [Mass Storage Device Naming](http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01906504/c01906504.pdf) white paper (<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01906504/c01906504.pdf>) for more information about agile view.

**Note:** After you map a LUN to the host, it can take two or three minutes for FSPM to make the LUN accessible at the host and report its name and other information to the GUI. You may need to refresh the GUI screen to see the information when it is reported as there can be a delay between the time the configuration change was made and when the change is displayed on the GUI.

- Review the load balancing algorithm being used for each LUN to determine if you need to change the current load balancing setting.
- Review the numbers of optimized and non-optimized paths currently reported by FSPM under the Optimized Paths and Non-Optimized Paths. Notice that 0 is reported when the LUN is not opened for I/O.
- Select the SAN > Storage > Host-LUN Mapping and verify that the host and LUN connections are as expected. The Host-LUN Mapping tab should display the LUNs that are mapped to the host and information about the LUN. Verify that the following information is displayed:
  - The LUN numbers used to make the LUN visible to the host
  - An indication whether or not each SAN port on the host has a connection to at least one port on the Controller

## Install a Boot from SAN LUN

Oracle FS Path Manager (FSPM) for HP-UX 11i v3 supports booting from a SAN LUN. Follow the normal HP-UX procedures for setting up a SAN boot LUN, and then install FSPM. Here are some tips:

- Prerequisites:
- Refer to the HBA installation guides to verify the HBAs support booting from the SAN.
  - Verify that the HBA firmware ROM and EFI are up to date. If necessary, download the latest update from the HP support site and install it on your HBAs. Be sure to update all board functions on multi-port HBAs.
- 1 Perform any necessary pre-configuraiton task to prepare the SAN as described in this document to enable the host to see a single path to the Oracle Flash Storage System.
  - 2 Create a LUN for the installation, and map it to the host entry that includes the host HBA port.

**Note:** HP-UX 11i v3 does not require installation on LUN 0.

- 3 Boot the HP-UX 11i v3 installation DVD, select the newly created LUN for installation, and follow the normal procedure for installing and configuring a LUN.
- 4 Boot the system from the newly installed LUN.
- 5 Install FSPM.
- 6 Connect all SAN paths.
- 7 Run the following command:

```
# ioscan -fn
```

- 8 (Optional) Run the following command to configure alternate paths to the boot LUN:

```
# setboot(1m)
```

See the white paper [setboot\(1M\) in HP-UX 11i v3](http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01915883/c01915883.pdf) (<http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01915883/c01915883.pdf>) for more information.

### Related Links

[Pre-Configure the SAN for Oracle FS System Integration](#)  
[Install the FSPM Software](#)

## About Load Balancing Configuration

Load balancing is implemented by the HP-UX multipathing driver.

Load balancing is configured and managed using the `scsimgr` command on the host. Refer to the HP white paper [Native Multi-Pathing for Mass Storage](#) ([http://](#)

---

[h20000.www2.hp.com/bc/docs/support/SupportManual/c01906512/c01906512.pdf](http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01906512/c01906512.pdf)) for more information on configuring load balancing.

On an Oracle FS System, the load balancing setting being used by the HP-UX features is displayed in the Oracle FS System Manager GUI, but you cannot change it from the GUI.

On Pillar Axiom systems, the setting displayed in the GUI is not related to the setting being used by the HP-UX multipathing features. The GUI allows you to change the setting, but the value set in the GUI is ignored.

Review the *Oracle FS System Release Notes* for updated references to HP-UX documentation.

## About Path Selection

HP-UX native multipathing selects the best paths to access Oracle FS System LUNs.

Path selection is based on three factors:

- Path optimization state
- Path performance
- Path availability

A path's optimization state depends on whether the LUN is currently homed on the Controller to which the path is connected. An *optimized path* is a path that connects through the Controller where the LUN is resident or *homed*. A *non-optimized path* is a path that connects through to a Controller where the LUN is not resident (homed) on the that Controller. Optimized paths are always preferred, but if an optimized path is not available, the non-optimized path is used temporarily for I/O traffic.

Path performance is determined by how quickly and reliably a path transfers I/O traffic to and from a LUN. Generally, FC paths perform better than iSCSI paths, so FC paths are preferred over iSCSI paths.

Path availability is determined by the ability of the path to transfer I/O traffic. An available path is fully functional but if the path stops working, the path is considered unavailable.

These factors determine how the paths to each Oracle FS System LUN are divided into groups.

HP-UX native multipathing groups the paths in the following order of preference:

- First, FC and iSCSI optimized
- Next, FC and iSCSI non-optimized

For each LUN, the currently configured load balancing algorithm is used to select paths from the most preferred group that has paths available. Only paths from a single group are used at any one time.

When an active path fails, I/O traffic is transferred to a different path. I/O performance is reduced for a short time while the operating system recognizes the failure and makes the path transfer. After the path transfer is complete, I/O performance improves.

If the failing path is optimized and the new path is non-optimized, I/O performance can continue to be reduced after path transfer because a lower-performance path is in use. Within a few minutes of traffic being transferred to a non-optimized path, the Oracle FS System attempts to move the LUN to the appropriate Controller for path optimization. After transfer to an optimized path succeeds, I/O performance improves.

## Stop and Start FSPM Software

Follow these instructions to stop or start the Oracle FS Path Manager (FSPM) service (also referred to as a daemon) that runs on the host where FSPM is installed.

FSPM installs a service which monitors status and manages the Control Path connections to an Oracle FS System. The service is configured to start automatically when the host is booted up and to remain running until the host is shut down. (When the host is restarted, the service is restarted.) Generally, you do not need to stop nor start the service after installation. As part of troubleshooting procedures, Oracle Customer Support can request you to stop and start the service. Do not stop the service unless requested by Oracle Customer Support as diagnostic information can be lost.

The following information describes how to determine if the FSPM service is running. This information also describes how to restart the service, stop the service, and start the service.

**Note:** Stopping or restarting the service can delete diagnostic information which is useful when investigating problems. You should only stop or restart the service if you are performing troubleshooting procedures or requested to do so by Oracle Customer Support. If you are trying to resolve a problem with FSPM, collect logs from the Oracle FS System before restarting the service. Make sure you include the FSPM host in the collected set of system logs. See the *Oracle Flash Storage System Administrator's Guide* or the Oracle FS System Manager (GUI) online help for information on how to collect system logs.

- 1 Verify that you have administrator privileges to restart, stop, or start services.
- 2 To verify the status (running or stopped) of the FSPM service on the host, perform the following:
  - From the command line, run the following command:

```
ps -ef | grep fspmd
```

If the FSPM service is stopped, you need to start the service. Follow the steps in this document.

---

3 To restart the FSPM service, perform the following:

- From the command line, run the following command:

```
/sbin/init.d/fspmd restart
```

After restarting the FSPM service, verify the service status is running by following the steps in this document.

4 To stop the FSPM service, use the following command:

- From the command line, run the following command:

```
/sbin/init.d/fspmd stop
```

After stopping the FSPM service, verify the service status is stopped by following the steps in this document.

5 To start the FSPM service, use the following command:

- From the command line, run the following command:

```
/sbin/init.d/fspmd start
```

After starting the FSPM service, verify the service status is running by following the steps in this document.

## Host Reconfiguration Overview

Once you have installed Oracle FS Path Manager (FSPM) and the host is using LUNs from a Oracle FS System, you may need to reconfigure the host.

Reconfiguring the host in any of the following ways affects how the Oracle FS System recognizes connections from the host.

- Add, remove, or replace a Fibre Channel (FC), FCoE, or iSCSI HBA
- Add, remove, or change an iSCSI initiator name used by the host
- Add, remove, or change IP addresses the host uses to connect through iSCSI
- Add, remove, or change IP addresses the host uses to connect to the Pilot management controller
- Rename the host

If you need to make any of these changes, refer to the following sections for instructions.

### Updating Fibre Channel or iSCSI Initiators Information

Follow these instructions if you add, remove, or replace a SAN initiator identifier in the host.

Changes to Fibre Channel (FC) HBAs installed in the host, and changes to iSCSI initiator names used by the host, effect how the Oracle FS System recognizes connections from the host. When the SAN initiators used by the host are

changed, the Oracle FS System definition of the host must be updated to match, and any LUN mappings to the host must be adjusted. Oracle FS Path Manager (FSPM) does most of this automatically when you follow these steps.

- 1 Make the changes to the configuration.

FSPM tries to ensure that the changes are automatically passed to the Oracle FS System when the FSPM daemon is restarted.

If you replaced all the FC HBAs in the host, you must make a LUN on the Oracle FS System system visible to at least one of the new ports on the host. This LUN can be unmapped or mapped to one of the host ports. If you map the LUN to one of the ports, it maps to all ports on the host after the FSPM daemon is restarted. If you decide that this LUN is temporary, delete it after you restart the daemon.

- 2 Choose one of:

- Reboot the host as part of reconfiguring the HBAs and after setting up the mapping described earlier, if necessary.

No further action is needed.

- Do not reboot the host as part of the reconfiguration (for example, if you use a “hot plug” method to change HBAs).

Restart the FSPM software after the reconfiguration is completed and after setting up the mapping described earlier, if necessary. To restart the FSPM, review the information on starting and stopping the FSPM software as described in this document.

The FSPM daemon discovers the change when it starts up after the system reboot or after being explicitly restarted. The FSPM daemon updates the Oracle FS System management software. The LUN mappings to the host are automatically adjusted to match the new SAN connections from the host.

### **Related Links**

[\*Stop and Start FSPM Software\*](#)

### **iSCSI HBAs or IP Addresses Change**

Changes to an iSCSI HBA do not require any further actions if the iSCSI initiator name or IP addresses are not changed.

If you change an iSCSI HBA and do not change the iSCSI initiator name or IP address that the host uses to make iSCSI connections to the Oracle FS System, no changes are required.



---

## Rename the FSPM Host

Follow these instructions to rename a host where Oracle FS Path Manager (FSPM) is installed and to ensure the new host name change is updated in the Oracle FS System configuration information.

FSPM installs a service which monitors status and manages the Control Path connections to an Oracle FS System. When the FSPM service running on a host makes a Control Path connection to a Pilot, it sends the hostname which FSPM discovered from the host to the Oracle FS System. That hostname is used as the name of the host entry in the Oracle FS System Services. If you want to change the hostname of a SAN host that is running FSPM, use the following sequence of steps to create an FSPM host entry in the Oracle FS System Services with the new name and the same LUN mappings as the old FSPM host entry.

**Note:** If you rename a host without going through this process, the LUN mappings to the host are lost. You will not be able to access the Oracle FS System LUNs from the host until the LUN mappings are recreated. This process preserves the LUN mappings from the original host name to the renamed host name.

The following information describes how to rename a host where FSPM is installed.

- 1 From the Oracle FS System Manager (GUI), ensure that one of the host initiators is connected to the Oracle FS System. Follow these steps:
  - a) From the GUI, select SAN > Storage > Hosts.
  - b) Under the Host Name locate the host to be renamed.
  - c) Under the Controller-Initiator Connectivity verify that Connected is displayed for one of the connections.
- 2 Stop the FSPM service. Follow information provided in this document.
- 3 Review the existing LUN mappings for the host you are renaming before deleting the host. From the GUI, select SAN > Storage > Host-LUN Mapping to review the LUN mappings to the host you are deleting.
- 4 From the GUI, select SAN > Storage > Hosts to select the host you want to delete.
- 5 From the GUI select SAN > Storage > Hosts > Actions > Delete Host and delete the host to be renamed. The Delete SAN Host dialog is displayed.
  - a) When the Delete SAN Host dialog is displayed, make sure the Delete mappings and initiators is not checked. This preserves the associated LUN mappings to the host. Select OK to delete the SAN Host.
  - b) You can also delete a SAN Host using the Oracle FS CLI. Review the *Oracle Flash Storage System CLI Reference* for further information.
- 6 From the host operating system, rename the host.

- 7 Start the FSPM service (also referred to as the daemon) following the instructions in this document.  
Once the FSPM is started, FSPM logs into the Pilots and sends a message that includes the new host name. The Oracle FS System creates an FSPM host entry with the new host name and transfers the initiators and LUN mappings associated to the host. (These values were preserved when the host was deleted.)
- 8 Configure the host entry in the GUI to enable HP-UX Compatibility Mode. From the GUI, navigate to the SAN > Storage > Hosts > Actions > Modify Host > Advanced tab. Under **Host Settings** verify that HP-UX Compatibility Mode is enabled. If not, then enable HP-UX Compatibility Mode by selecting it.
- 9 From the GUI, select SAN > Storage > Host-LUN Mapping to verify the LUN mappings are restored to the renamed host.

## Upgrade from Earlier Versions of APM or FSPM

If you are upgrading to Oracle FS Path Manager (FSPM) from an earlier version of APM or FSPM, perform the following steps to ensure a successful installation.

Review the *Oracle FS Path Manager Release Notes* to determine if you need to update the operating system software before installing a new version of FSPM.

- 1 Uninstall a previous version of APM.  
Enter this command:  

```
swremove AXIOMPM
```
- 2 Uninstall a previous version of FSPM.  
Enter this command:  

```
swremove FSPM
```
- 3 Upgrade the operating system to the required software level. Follow the operating system instructions for installing any required upgrades or patches.
- 4 Install FSPM 4 software following the information provided in *Install the FSPM Software* in this document.

### Related Links

[FSPM Download and Installation Overview](#)

## Remove the FSPM Software (Optional)

Follow these instructions to remove the FSPM. If you are upgrading FSPM, you must remove the previous version before installing a newer version.

When you remove FSPM, the ability to manage multiple paths to Oracle FS System LUNs through FSPM is no longer available. Support for multiple paths is

still available through the operating system multipathing features, but FSPM management of LUNs is not available.

- 1 Log in as root.
- 2 Use this command to remove the FSPM software:

```
swremove FSPM
```

# Index

## B

boot from SAN [28](#)  
Brocade [18](#)

## C

CNA drivers  
    recommended settings [18](#)  
CNAs  
    FCoE [18](#)  
configuration  
    Oracle FS System LUNs [26](#)  
contact information [8](#)  
contacts, Oracle [8](#)  
conventions  
    command syntax [9](#)  
    typographical [9](#)  
customer support [8](#)

## D

delete  
    SAN [20](#)  
delete SAN hosts [20](#)  
documentation  
    feedback [8](#)  
download  
    FSPM software [25](#)

## E

education programs [8](#)  
Emulex [18](#)

## F

FC  
    switches [18](#)  
FCoE  
    supported CNA settings [18](#)  
    supported CNAs [18](#)  
    supported switches [19](#)  
features  
    FSPM [11](#)  
feedback, documentation [8](#)  
Fibre Channel  
    supported HBAs [16](#)  
FSPM  
    control path [15](#)  
    how to  
        download software [25](#)  
        install software [25](#)  
    pre-installation requirements [20](#)

FSPM software  
    data path [15](#)  
    definition [11](#)  
    features [11](#)  
    how to  
        remove (uninstall) [34](#)  
        upgrade [34](#)  
    operating limits [16](#)

## H

HBAs  
    HP [19](#)  
host entry  
    temporary [23](#)  
host name  
    how to  
        rename [33](#)  
HP HBAs  
    install [19](#)  
    install drivers [19](#)  
    supported [19](#)  
HP-UX Compatibility Mode  
    how to  
        enable [21](#)  
HP-UX native multipathing [13](#)

## I

install  
    FSPM software [25](#)  
    HP HBAs [19](#)  
    Multipath Tools [25](#)  
iSCSI  
    supported hardware [17](#)  
    supported software [17](#)

## L

load balancing [28](#)  
LUN 0  
    map to host [21](#)  
LUN configuration  
    SAN hosts [26](#)

## M

management network  
    pre-installation requirements [24](#)  
map LUN 0 [21](#)  
multipathing  
    HP-UX [13](#)

---

## N

native multipathing  
  HP-UX [13](#)

## O

online help [8](#)  
Oracle Documentation [8](#)  
Oracle FS Storage system  
  configure for LUN access [26](#)  
Oracle Technology Network [8](#)

## P

POSIX.1-2008 specification [9](#)  
pre-configure SAN hosts [21](#)  
pre-installation requirements  
  management network [24](#)  
product support [8](#)

## Q

Qlogic [18](#)

## R

remove (uninstall)  
  FSPM software [34](#)  
rename  
  FSPM host name [33](#)

## S

sales information [8](#)  
SAN hosts  
  delete before installation [20](#)  
  LUN configuration [26](#)  
  pre-configure [21](#)  
service (daemon)  
  how to  
    stop or stop service [30](#)  
stop or start  
  FSPM software [30](#)  
Support portal [8](#)  
supported  
  Fibre Channel HBAs [19](#)  
  FSPM models [11](#)  
  hardware platforms [15](#)  
  HP-UX versions [15](#)  
  iSCSI hardware [17](#)  
  iSCSI software [17](#)  
switches  
  FC [18](#)  
  FCoE [19](#)  
syntax conventions [9](#)

## T

temporary host entry [23](#)  
training programs [8](#)  
typographical conventions [9](#)

## U

upgrade  
  FSPM software [34](#)