

Pillar Axiom Path Manager 3.0



Installation Guide
and Release
Notes

for Oracle Solaris 10 and 11



PILLAR AXIOM

Part Number: E28187-01

APM release 3.0

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Preface

Related Documentation

- *Pillar Axiom Customer Release Notes*
- *Pillar Axiom Glossary*
- *Pillar Axiom Administrator's Guide*
- *Pillar Axiom CLI Reference Guide*

Typographical Conventions

Table 1 Typography to mark certain content

Convention	Meaning
<i>italics</i>	Within normal text, words in italics indicate one of the following: <ul style="list-style-type: none">• A reference to a book title• New terms and emphasized words• Command variables
monospace	Indicates one of the following, depending on the context: <ul style="list-style-type: none">• The name of a file or the path to the file• <i>Output</i> displayed by the system on the command line
monospace (bold)	<i>Input</i> provided by an administrator on the command line.
>	Indicates a menu item or a navigation path in a graphical user interface (GUI). For example, "Click Storage > Clone LUNs " means to click the Clone LUNs link on the Storage page in the graphical user interface (GUI).

Table 1 Typography to mark certain content (continued)

Convention	Meaning
...	Used within an expression of a navigation path or within a cascading menu structure. The ellipsis indicates that one or more steps have been omitted from the path or menu structure. For example, in the Groups > Volume Groups > Actions > ... > Data Protection > Create menu structure, the ... implies that one or more menu items have been omitted.

Oracle Contacts

Table 2 Oracle resources

For help with...	Contact...
Support	http://www.oracle.com/support/index.html
Training	https://education.oracle.com
Documentation	<ul style="list-style-type: none"> • Oracle Technical Network: http://www.oracle.com/pls/topic/lookup?ctx=pillardocs • From the Pillar Axiom Storage Services Manager (GUI): Support > Documentation • From Pillar Axiom HTTP access: http://system-name-ip/documentation.php where <i>system-name-ip</i> is the name or the public IP address of your system.
Documentation feedback	http://www.oracle.com/goto/docfeedback
Contact Oracle	http://www.oracle.com/us/corporate/contact/index.html

CHAPTER 1

Introduction to APM

APM Requirements

Pillar Axiom systems presenting LUNs to Oracle Solaris 10 and Oracle Solaris 11 operating systems using Pillar Axiom Path Manager (APM) 3.0 must be running release 4.5 or higher of the Pillar Axiom software.

APM Architecture

The Pillar Axiom Path Manager (APM) 3.0 software for Oracle Solaris 10 and Oracle Solaris 11 works with the StorageTek Traffic Manager Software (STMS) and communicates with Pillar Axiom systems on a control path, which is separate from the data path. STMS manages the LUN data access paths.

The following figure illustrates how the APM software installed on a SAN host interacts with a Pillar Axiom system. Refer to the table below to determine the significance of the lines and colors in the figure.

Table 3 Line and color key for APM interaction diagram







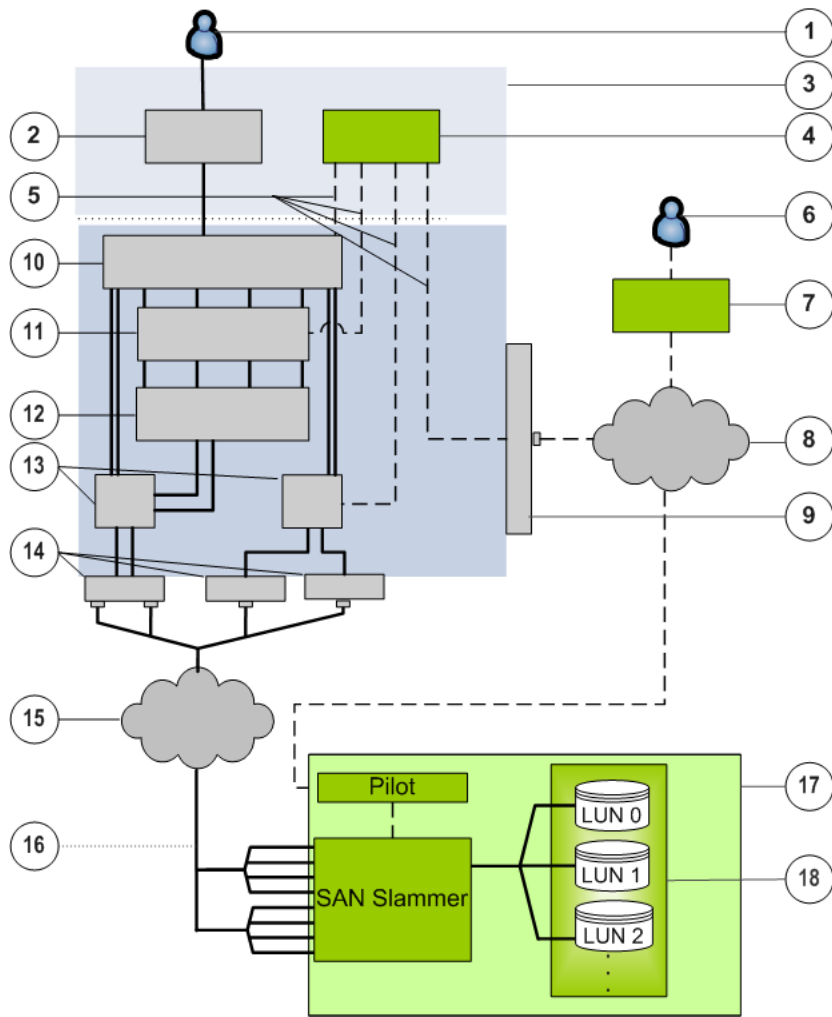
Graphic element	Description
	Data path
	Control path
	Pillar Axiom hardware and software
	Non-Pillar Axiom hardware and software
	SAN host kernel space
	SAN host user space

Figure 1 APM interaction with a Pillar Axiom system



Legend	
1 User	10 STMS
2 User application	11 iSCSI software initiator (iSCSI)
3 User space	12 TCP/IP driver (iSCSI)
4 APM daemon	13 HBA driver (FC) or NIC driver (iSCSI)
5 Control path (all dashed lines)	14 HBA (FC) or NIC (iSCSI)
6 Pillar Axiom administrator	15 SCSI over Fibre Channel (FC) or iSCSI over IP (iSCSI)
7 Pillar Axiom command line interface (CLI) or graphical user interface (GUI)	16 Data path (all solid lines)
8 Encrypted XML over TCP/IP	17 Pillar Axiom system
9 Network card	18 Brick storage pool

Related concepts

- [About the APM Control Path](#)
- [About the APM Data Path](#)
- [About Multipathing and STMS](#)

About the APM Control Path

The Pillar Axiom Path Manager (APM) control path provides a path separate from the data path to manage multipathing and communication.

The APM software uses a daemon to control multipathing and communication. The APM daemon uses the control path to perform the following actions:

- Get information from the Pilot management controller.
- Get Fibre Channel (FC) and iSCSI port information from the HBA and converged network adapter (CNA) drivers and from the iSCSI software initiator.
- Configure the StorageTek Traffic Manager Software (STMS).
- Send information such as host attributes and statistics to the Pilot management controller and, on request, collect logs from the host.

The APM daemon sends a description of the host to the Pilot on each connected Pillar Axiom system. In the Pillar Axiom Storage Services Manager, this description creates a definition for the host that includes any FC ports in the host and, if iSCSI is configured, the name of the iSCSI initiator.

The graphical user interface (GUI) and command line interface (CLI) list the World Wide Names (WWNs) of the FC ports in the host and the IP addresses that are used to make iSCSI connections to the Pillar Axiom system.

If you use iSCSI on the host to connect to a FC Slammer storage controller through an iSCSI-to-FC router, these connections are described as FC connections. Within APM, the connections appear to originate from the FC ports on the switch that are assigned to the host iSCSI initiator. The WWNs of these ports are displayed as FC HBA ports on the host. The HBA model associated with these ports is reported as iSCSI-FC router.

To establish the control path to a Pillar Axiom host, that host must be able to connect to the Pillar Axiom system over the data path. As part of the connection sequence, the Slammer returns the IP address of the Pilot to the APM host over the data path. The host uses the IP address of the Pilot to establish the control path to the Pillar Axiom system.

About the APM Data Path

Pillar Axiom Path Manager (APM) uses the StorageTek Traffic Manager Software (STMS) to provide paths for reading and writing data to LUNs on the Pillar Axiom system. STMS is also referred to as the Sun StorEdge Traffic Manager Software, MPxIO, Leadville, scsi_vhci, or SSTM.

STMS is responsible for the following:

- Controls and manages all data paths to Pillar Axiom LUNs
- Groups multiple data paths to a Pillar Axiom 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

See the architecture diagram for an illustration of how data flows from the host to the Pillar Axiom system.

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

Related references

- [APM Architecture](#)

About Multipathing and STMS

The Pillar Axiom Path Manager (APM) 3.0 software for Oracle Solaris 10 and Oracle Solaris 11 consists of a daemon that runs on the host system along with the StorageTek Traffic Manager software (STMS).

STMS is also referred to as the Sun StorEdge Traffic Manager Software, MPxIO, Leadville, scsi_vhci, or SSTM. The software prevents multiple paths from being presented as multiple drives. Every Pillar Axiom LUN that is configured for multipath access is presented as a single drive to the operating system.

The STMS driver supports failover and failback across redundant paths. The APM daemon uses the control path to send and receive information about the hosts, as shown in the APM architecture illustration. The daemon runs as a background process at the user level and looks after management tasks. The

daemon sends host attributes to the Pilot. STMS takes control of the paths, hides actual paths from the operating system, and behaves like a virtual HBA with a single path to each LUN.

Related references

- [APM Architecture](#)

APM Features

Pillar Axiom Path Manager (APM) is defined as:

Optional software installed on a SAN host to manage multiple paths to the Pillar Axiom system.

APM, working in conjunction with the StorageTek Traffic Management Software (STMS), performs the following primary functions:

- Routes I/O to Pillar Axiom LUNs using only the best available data paths
- Shares traffic among the available paths and ensures that access to the LUNs is not interrupted if some paths fail
- Automatically configures the host into the Pillar Axiom Storage Services Manager and updates the configuration if the host information changes

Automatic configuration of host information enables the Pillar Axiom Storage Services Manager to report information about the instance of APM running on the host such as the number of working paths. In some environments, automatic configuration includes features such as load balancing.

Each APM release provides different features, and the features provided for each platform might vary. The following table describes the specific features implemented in this release.

Table 4 APM 3.0 for Oracle Solaris 10 and Oracle Solaris 11 features

Feature	Benefit
Automatic data path failover	(Working in conjunction with STMS) Automatically switches to the most suitable paths available after a path failure or fail back.
Automatic recognition of SAN hosts by the Pillar Axiom Storage Services Manager	Sends a description of the host to each Pilot management controller on connected Pillar Axiom systems, allowing the Pillar Axiom Storage Services Manager to create a definition for the host. This definition includes such information as the WWNs for each of the host's Fibre Channel ports, the IP addresses for any iSCSI ports, and the version of APM running on the host.
Call-Home log collection	When a Pillar Axiom administrator uses the Pillar Axiom Storage Services Manager to collect system information (refer to the <i>Pillar Axiom Administrator's Guide</i> for details),

Table 4 APM 3.0 for Oracle Solaris 10 and Oracle Solaris 11 features (continued)

Feature	Benefit
	<p>the Pillar Axiom system sends a request to each connected APM host. The APM hosts collect useful diagnostic information and send it to the Pillar Axiom system, where it is bundled with any other requested information. The Pillar Axiom system can then transmit this information to Oracle Customer Support. The information collected from each APM host includes:</p> <ul style="list-style-type: none"> • Logs from the APM components • Configuration and status information from the operating system • System and error logs from the operating system <p>No customer data is transmitted.</p>
Support for FC connections to FC Slammers	Makes connections to Pillar Axiom storage arrays over a high-speed FC network infrastructure.
Support for iSCSI connections to both FC and iSCSI Slammers	<p>Makes connections to Pillar Axiom storage arrays over long distances using an IP network infrastructure.</p> <p>Note: iSCSI connections to FC Slammers require iSCSI-to-FC routers.</p>
Support for FC clustering	Clustering is supported as specified by Oracle for Oracle Solaris 10 and Oracle Solaris 11 with STMS.
Support for Boot from SAN	Boot from SAN is supported as specified for STMS on Oracle Solaris 10 and Oracle Solaris 11.
FCoE CNAs	Fibre Channel over Ethernet (FCoE) Converged Network Adapters (CNAs) are supported on the host.

Related concepts

- [About Boot from SAN](#)
- [About Clustering](#)

About Boot from SAN

Oracle supports booting the host using a LUN on a Pillar Axiom system as the system drive.

Contact Oracle Customer Support to verify that your system and configuration can support booting from a SAN-attached drive *before* you install the Pillar Axiom Path Manager (APM) software.

The hardware dependencies and possible deployment scenarios involved in setting up a SAN with boot technology are beyond the scope of this document. For information on how to set up an Oracle system to boot from a multipathed SAN-attached drive, including system requirements, refer to the Boot from SAN section of the document appropriate for your operating system:

Oracle Solaris 10	Oracle Solaris 11
Oracle Solaris SAN Configuration and Multipathing Guide (http://docs.oracle.com/cd/E18752_01/html/820-1931/index.html)	Oracle Solaris Administration: SAN Configuration and Multipathing (http://docs.oracle.com/cd/E23824_01/html/E23097/index.html)

About Clustering

Pillar Axiom Path Manager (APM) supports cluster configurations on Oracle Solaris 10 and Oracle Solaris 11 with the StorageTek Traffic Management Software (STMS) as specified by Oracle.

Refer to the clustering documentation on the [Solaris Cluster documentation website](http://www.oracle.com/technetwork/server-storage/solaris-cluster/documentation/) (<http://www.oracle.com/technetwork/server-storage/solaris-cluster/documentation/>) for more information.

Supported Hardware

Pillar Axiom Path Manager (APM) 3.0 for Oracle Solaris 10 and Oracle Solaris 11 supports the following hardware.

Table 5 Supported hardware

Hardware	Supported
SPARC servers	All SPARC servers qualified for use with Oracle Solaris 10 and Oracle Solaris 11
x86 servers	All x86 servers qualified for use with Oracle Solaris 10 and Oracle Solaris 11
HBAs	All FC HBAs supported by STMS
CNAs	All FCoE CNAs supported by STMS
iSCSI	All iSCSI configurations supported by STMS

Required Software

Pillar Axiom Path Manager (APM) 3.0 for Oracle Solaris 10 and Oracle Solaris 11 requires the following software patches and updates.

Table 6 Supported software

Operating system	Supported
Solaris 10	<p>Any of the following:</p> <ul style="list-style-type: none"> • Oracle Solaris 10 8/07 (update 4) through 9/10 (Update 9), plus the 8/11 (Update 10) patchset, plus patch 147440-19 (on SPARC), or 147441-19 (on x86) • Any of Oracle Solaris 10 8/07 (Update 4) through 8/11 (Update 10) plus the patchset associated with any update later than 8/11 (Update 10) • Oracle Solaris 10 8/11 (update 10) plus patch 147440-19 (on SPARC), or and 147441-19 (on x86) • Any update later than Oracle Solaris 10 8/11 (Update 10) <p>Note: You can also use later versions of these patches, or subsequent patches that supercede these patches.</p>
Solaris 11	<p>Either of the following:</p> <ul style="list-style-type: none"> • Oracle Solaris 11 11/11 with Support Repository Update 7 (SRU7) or any later SRU • Any update later than Oracle Solaris 11 11/11 <p>Note: APM 3.0 does not support Oracle Solaris 11 Express.</p>

Operating Limits

Pillar Axiom Path Manager (APM) provides access over multiple data paths to LUNs defined on a Pillar Axiom system.

APM and the Pillar Axiom software limit the following aspects of this access.

Table 7 APM operating limits

APM capabilities	Maximum value
Target Pillar Axiom systems	Eight for each SAN host
Connect to SAN Slammer storage controllers	Four for each Pillar Axiom system
Connect to LUNs	256 for each Pillar Axiom system
Handle data paths	32 to each LUN
Handle FC HBA ports	32 for each SAN host

Important! Not all combinations of the limits shown have been tested. Use care when operating a system that has been configured to run at or near these limits. The system may exhibit anomalies when all limits are exercised concurrently.

CHAPTER 2

Install APM

Prepare to Install the APM Software

To ensure a successful installation of Pillar Axiom Path Manager (APM), perform the following tasks in sequence:

- 1 Read the APM Release Notes at the end of this Guide.
- 2 Ensure that the Pillar Axiom system is running release 4.5 or higher of the Pillar Axiom software.
- 3 Ensure that the required software has been installed with all required Oracle Solaris patches and updates .
- 4 If you are using Fibre Channel (FC) or FC over Ethernet (FCoE) connections, verify that your FC SAN components and HBAs are supported and installed according to the manufacturer's instructions.
- 5 If you are using iSCSI connections, verify that your iSCSI configurations are supported and installed according to the manufacturer's instructions.
- 6 Pre-configure the SAN host for Pillar Axiom integration.

Related concepts

- [Management Network Requirements](#)

Related references

- [Supported Hardware](#)
- [Required Software](#)
- [Operating Limits](#)

Related tasks

- [Pre-Configure the SAN Host for Pillar Axiom Integration](#)

Management Network Requirements

The Pillar Axiom Path Manager (APM) software communicates with the Pilot over secure, encrypted XML. The SAN host on which the APM software is installed requires a TCP/IP connection for communication with the Pillar Axiom Storage Services Manager.

The network configuration must allow the SAN host to connect to TCP port 26004 on the Pilot's management Ethernet interfaces to connect the control path.

Pre-Configure the SAN Host for Pillar Axiom Integration

Before you install the Pillar Axiom Path Manager (APM) software, prepare your SAN host connections with the Pillar Axiom system.

Prerequisites:

Verify that your system has the following characteristics:

- At least one SAN Slammer storage controller that has Fibre Channel (FC) or iSCSI ports
- Supported HBA and converged network adapter (CNA) drivers
- Ethernet connections to the management ports on the Pilot management controller
- A network configuration that allows an application on the SAN host to connect to TCP port 26004 on the Pilot

Perform the following actions to prepare your SAN host connections:

- 1 Verify that all FC and iSCSI components and software are installed on the SAN host according to the instructions in this guide.
- 2 Set up the physical connectivity and any required switch zoning for the SAN.

Proper setup is needed so all required host ports can access the Slammer ports on the Pillar Axiom system.

- 3 If you are using iSCSI connections, verify that your network is configured for iSCSI multipathing, and that you have configured the iSCSI software initiator correctly.
- 4 Launch the Pillar Axiom Storage Services Manager and navigate to the **Storage > SAN > Hosts** page.
- 5 Verify the SAN connections.

Each host port should display individually as follows:

Table 8 Characteristics of SAN connections to host ports

Column label	Port type	
	FC	iSCSI
Host Name:	Hostname Unknown	IQN (iSCSI Qualified Name)
Host Port:	WWN	IP address

About APM Software Installation

After you prepare your SAN for Pillar Axiom Path Manager (APM), download and install the APM software. After that, configure APM and the Pillar Axiom software so that they can work together.

The APM installation requires that you download the APM software package from My Oracle Support and install the software on your system.

After you install APM, configure access from the SAN host to Pillar Axiom LUNs.

- If you are updating an existing APM installation, see the instructions for updating the APM software.
- To remove the software from your SAN host, see the instructions for removing the APM software.

Related concepts

- [About Configuring Load Balancing](#)

Related tasks

- [Configure SAN Host Access to the Pillar Axiom LUNs](#)
- [Display the LUNs](#)
- [Download the APM Software](#)
- [Install the APM Software](#)
- [Upgrade from Earlier Versions of Pillar Axiom Path Manager](#)
- [Remove the APM Software \(Optional\)](#)

Download the APM Software

Download the Pillar Axiom Path Manager (APM) software from My Oracle Support.

Prerequisite:

You need to be registered with My Oracle Support to download the APM software.

The APM software comes in a single zip archive that you will need to download.

- 1 Sign in to [My Oracle Support](http://support.oracle.com) (<http://support.oracle.com>).
- 2 In the My Oracle Support dashboard, click **Patches & Updates**.
- 3 In the Patch Search frame, select **Product or Family (Advanced)**.
- 4 From the **Product is** list box, choose **Oracle Axiom Product Family**.

- 5 From the **Release is** list box, select the APM version.
- 6 From the **Platform is** list box, select the operating system and hardware platform.
- 7 Click **Search**.
Result:
Search results are displayed in the Patch Search Results window. If no results are returned, refine your search criteria and try again.
- 8 From the Patch Search Results list, select the APM you want, and click **Download**.
- 9 Click the name of the APM archive in the File Download dialog to begin the download.
- 10 Save the APM archive to your SAN host.
- 11 Extract the contents of the software bundle archive to your SAN host.
The archive contains software installation packages for all supported hardware platforms, as well as documentation, for the specified APM. Extract the package for your hardware platform and (optionally) the documentation.

Install the APM Software

The Pillar Axiom Path Manager (APM) 3.0 for Oracle Solaris 10 and Oracle Solaris 11 software uses the StorageTek Traffic Manager software (STMS), otherwise known as MPxIO, to support multiple physical paths to storage. The APM daemon works with STMS to make the LUNs visible to Oracle Solaris 10 and Oracle Solaris 11 without manual configuration.

Prerequisite:

Before you install APM, be sure to activate STMS by setting the following parameter in the `/kernel/drv/scsi_vhci.conf` file:

```
# mpxio global enable/disable switch:  
# setting mpxio-disable="no" will activate  
# I/O multipathing; setting mpxio-disable="yes"  
# disables this feature (do not remove this property).  
#  
mpxio-disable="no";
```

Follow these steps to install the software:

- 1 Log in as root.

- 2 Change to the directory where you saved the installation package.
- 3 Use one of the following commands to install the APM software, depending on the platform you are using.

- For SPARC platforms, use the following command:

```
pkgadd -d APM-sparc-version.pkg
```

- For i386 platforms, use the following command:

```
pkgadd -d APM-i386-version.pkg
```

Note: In the commands above, *version* is the name of the release version you downloaded.

Configure SAN Host Access to the Pillar Axiom LUNs

After you have installed the APM software, verify that the SAN host communicates effectively with the Pillar Axiom LUNs.

Use the Pillar Axiom Storage Services Manager to verify the LUN configuration.

- 1 In the Pillar Axiom Storage Services Manager, navigate to **Storage > SAN > Hosts**.
- 2 Verify that the individual entries for the host ports have been replaced with a single entry under the host name.

Examples:

Figure 2 Example host ports before APM installation

Host Name	Host Port	Type	AxiomONE Path Manager	Number of LUNs	Host Port Status
<input type="checkbox"/> Hostname Unknown	10:00:00:00:c9:36:84:6e	FC	Not Registered	0	Connected
<input type="checkbox"/> Hostname Unknown	10:00:00:00:c9:36:84:6f	FC	Not Registered	0	Connected
<input type="checkbox"/> Hostname Unknown	10:00:00:00:c9:36:85:20	FC	Not Registered	6	Connected
<input type="checkbox"/> Hostname Unknown	10:00:00:00:c9:41:32:c3	FC	Not Registered	0	Connected
<input type="checkbox"/> Hostname Unknown	10:00:00:00:c9:41:32:c4	FC	Not Registered	0	Connected
<input type="checkbox"/> ign.1987-05.com.cisco:01_eca9a9b9d555	192.168.2.93	iSCSI	Not Registered	0	Connected
	192.168.2.94	iSCSI			Connected

Figure 3 Example host ports after APM installation

Host Name	Host Port	Type	AxiomONE Path Manager	Number of LUNs	Host Port Status
<input type="checkbox"/> happy	10:00:00:00:c9:36:84:6e	FC	Communicating	0	Connected
	10:00:00:00:c9:36:84:6f	FC			Connected
	192.168.2.93	iSCSI			Connected
	192.168.2.94	iSCSI			Connected
<input type="checkbox"/> Hostname Unknown	10:00:00:00:c9:36:85:20	FC	Not Registered	6	Connected
<input type="checkbox"/> Hostname Unknown	10:00:00:00:c9:41:32:c3	FC	Not Registered	0	Connected
<input type="checkbox"/> Hostname Unknown	10:00:00:00:c9:41:32:c4	FC	Not Registered	0	Connected

Note: The Hosts page may display differently in your version of Pillar Axiom Storage Services Manager.

You will see one or more of the following **Pillar Axiom Path Manager Status** and **Host Port Status** messages on the Hosts page:

APM Status **Communicating:** The host control path is currently logged into the Pilot.

Note: **Communicating** status is required for the APM control path to report path status and use the Pillar Axiom system to collect APM diagnostic logs.

Not Registered: A control path from an APM host with this name has never logged into the Pilot.

Not Communicating: The APM host control path has previously logged into the Pilot, but it is not currently logged in.

Host Port Status **Connected:** The host SAN connection is logged in to the SAN Slammer.

Not connected: The host SAN connection is not logged in to the SAN Slammer.

See the Pillar Axiom Storage Services Manager Help for information about the remaining fields on the Hosts page.

- 3 Create any new LUNs on the Pillar Axiom system for this host, and set up any mappings of LUNs to the new host entry.
- 4 Verify that all mapped LUNs are available.

If the LUNs do not appear automatically on the host within one or two minutes, run the following command:

```
devfsadm
```

Result:

The LUNs should become available as drives on the host. If the drives do not appear, restart the host.

- 5 In the Pillar Axiom Storage Services Manager, navigate to the **Storage > SAN > Hosts** page.
- 6 Click the name of the new host and, on the Host Information page, verify the APM software version.
- 7 Click the **LUN Connections** tab and verify that the host and LUN connections are as expected.

The column titled **LUN Name on Host** should show the name that Oracle Solaris has allocated to the LUN device on the host.

Note: After you map a LUN to the host, it may take two or three minutes for APM to make the LUN accessible at the host and report its name and other information to the Pillar Axiom Storage Services Manager. You might need to refresh the Pillar Axiom Storage Services Manager screen to see the information when it is reported.

Result:

The **LUN Connections** tab should display the LUNs that are mapped to the host and the connection state between the host ports and the Slammer ports. If the APM control path is operational, the **LUN Connections** tab should also display the following:

- Each LUN name as allocated by Oracle Solaris on the host
- The numbers of optimized and non-optimized paths currently being controlled by APM

About Configuring Load Balancing

In the Pillar Axiom Path Manager (APM) software for Oracle Solaris 10 and Oracle Solaris 11, load balancing is configured using the StorageTek Traffic Manager software (STMS) mechanisms. Load balancing settings that are configured in the Pillar Axiom Storage Services Manager (GUI) are ignored by APM for Oracle Solaris 10 and Oracle Solaris 11.

Refer to the load balancing options and configuration mechanisms section of the document appropriate for your operating system:

Oracle Solaris 10	Oracle Solaris 11
Oracle Solaris SAN Configuration and Multipathing Guide (http://docs.oracle.com/cd/E18752_01/html/820-1931/index.html)	Oracle Solaris Administration: SAN Configuration and Multipathing (http://docs.oracle.com/cd/E23824_01/html/E23097/index.html)

About Path Selection

The StorageTek Traffic Management Software (STMS) selects the best paths to access Pillar AxiomLUNs.

Path selection is based on three factors:

- Optimization state
- Performance
- Availability

Path optimization is determined by the Slammer control unit (CU) the path uses. An *optimized path* is a path that connects through the Slammer CU on which the LUN is currently resident, or *homed*. A *non-optimized path* is a path that connects through the alternate Slammer CU. The LUN can be accessed through the alternate CU, but the LUN is not resident on the alternate CU. Optimized paths are always preferred, but if an optimized path is not available, the non-optimized path can be used temporarily.

Path performance is determined by how quickly and reliably a path can transfer I/O traffic to and from a LUN. Generally, Fibre Channel (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, and if that path stops working it is considered *unavailable*.

These factors are used to divide the paths to each Pillar Axiom LUN into groups.

STMS 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 which has paths available. Only paths from a single group will be 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. Once 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 might 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 Pillar Axiom system will attempt to reconfigure the LUNs

to use an optimized path. Once transfer to an optimized path succeeds, I/O performance will improve.

Upgrade from Earlier Versions of Pillar Axiom Path Manager

If you are upgrading to Pillar Axiom Path Manager (APM) 3.0 for Oracle Solaris 10 and Oracle Solaris 11 from an earlier version of APM, you must perform the following steps in order.

- 1 Uninstall the earlier version of APM.

Use the following command:

```
pkgrm axiompmd
```

- 2 Upgrade the Oracle Solaris operating system to the required software level.

Follow the Oracle instructions for installing any required upgrades or patches.

- 3 Install the APM 3.0 for Oracle Solaris 10 and Oracle Solaris 11 software.

Related concepts

- [About APM Software Installation](#)

Related references

- [Required Software](#)

Remove the APM Software (Optional)

Follow these instructions to uninstall the Pillar Axiom Path Manager (APM) software (if, for example, you are upgrading to a newer version).

When you uninstall APM, the ability to manage multiple paths to Pillar Axiom LUNs through APM is removed. Support for multiple paths is still available through the StorageTek Traffic Management Software (STMS).

- 1 Log in as root.
- 2 Remove the software.

Run the following command:

```
pkgrm axiompmd
```

CHAPTER 3

APM Release Notes

New in This Release

Pillar Axiom Path Manager 3.0 supports both Fibre Channel (FC) and iSCSI connections on Oracle Solaris 10 and Oracle Solaris 11 operating systems.

Known APM Issues

The following Pillar Axiom Path Manager (APM) issues are known in this release.

Table 9 Known APM issues

Issue	Workaround or planned fix
<p>[13745390] Oracle Solaris 9 and 10 only: When the TCP/IP connection between the daemon and the Pilot is lost (for example, if you restart the Pillar Axiom system, or if the Pillar Axiom Management IP is changed), the Pillar Axiom Storage Services Manager will show the host as Not Communicating. The daemon may not automatically re-establish communication until the TCP KEEPALIVE period has expired on the host. By default this period is two hours. You can reconfigure the host to change this period, but doing so will affect all programs on the host that use TCP KEEPALIVE. Before changing this value, you should ensure that the chosen value is acceptable to all programs that depend on it.</p>	<p>Force communications to be re-established by restarting the daemon on the host.</p>

Known Pillar Axiom Issues

The following issues might be associated with the version of the Pillar Axiom software you are using.

Table 10 Known Pillar Axiom issues

Issue	Workaround or planned fix
<p>[13759030] If an iSCSI initiator is connected to a port on a Slammer, and that Slammer CU is powered off, the LUN and Host GUI pages continue to show the connection status for the iSCSI initiator as <code>Connected</code>.</p>	<p>This issue is fixed in release 5.0 of the Pillar Axiom software.</p>
<p>[13759805] If more than 256 SAN LUNs are configured on a Pillar Axiom system, the Pillar Axiom Storage Services Manager may send invalid messages to the APM daemon running on SAN host systems. When this happens, the control path connection between APM and the Pillar Axiom will continually move between <code>Communicating</code> and <code>Not Communicating</code> states. This prevents features that depend on the APM control path (such as setting the load balancing algorithm) from working properly. The data path, which manages LUN access from the host, is not affected.</p>	<p>This issue is fixed in release 5.0 of the Pillar Axiom software.</p>
<p>[13764561] The Pillar Axiom Storage Services Manager (GUI) sometimes continues to display host paths that are no longer valid after APM stops. This is because APM is no longer communicating path information to the GUI, so the GUI continues to display the host paths as they were while APM was running.</p>	<p>None.</p> <p>This issue will be fixed in a future release of the Pillar Axiom software.</p>
<p>[13764609, 13762326] While the system is recovering from temporary</p>	<p>This issue is fixed in release 4.5.1 and 5.2.1 of the Pillar Axiom software.</p>

Table 10 Known Pillar Axiom issues (continued)

Issue	Workaround or planned fix
use of non-optimized paths to the alternate CU on a Slammer, you may notice a decrease in I/O performance between a LUN and a Slammer CU.	<p>If the Pillar Axiom system is running a release earlier than 4.5.1 or 5.2.1, you can take the following actions:</p> <ol style="list-style-type: none"><li>1 Follow the instructions in the <i>Pillar Axiom Administrator's Guide</i> to rehome the LUN to the alternate CU on that Slammer.<li>2 Rehome the LUN again to the original CU on that Slammer. <p>Contact Oracle Customer Support for assistance.</p>

Known Operating System Issues

The following operating system issues can have an impact on running Pillar Axiom Path Manager (APM) on Oracle Solaris systems.

Solaris Issues

The following issues are being tracked by the Solaris development team. They will be resolved in future updates and patches to the Oracle Solaris 10 and Oracle Solaris 11 operating systems.

Description	Workaround
<p>[CR7015025, CR7132051] The <code>mpathadm show logical-unit <logical unit name></code> and <code>mpathadm show lu <logical unit name></code> commands display a listing of Target Ports. This listing does not always include all the associated target ports for LUNs on Pillar Axiom systems with multiple Slammers, or on FC and iSCSI Combo LUNs. These <code>mpathadm</code> issues cause incorrect optimized and non-optimized path counts for the LUN in the Pillar Axiom GUI and CLI.</p>	<p>Consider the optimized and non-optimized path counts displayed in the Pillar Axiom GUI and CLI as a hint that some path failures might have occurred. Use the Solaris <code>luxadm display pathname</code> and <code>iscsiadm list target -S</code> commands to determine the State and Class values for these paths.</p>
<p>[CR7018339, CR7052875, CR7163760] After one or all of the primary or optimized target ports of a LUN are masked out, I/O to the LUN might fail instead of failing over to other available paths.</p>	<p>None. Consider disabling ports from switches connected to the target ports of the LUN.</p>
<p>[CR7098456] The primary or secondary Class values of paths in an OFFLINE state are not always updated to reflect the current optimized or non-optimized Target Port Group Access State values for these paths.</p>	<p>Disregard Class values of paths in an OFFLINE state.</p>
<p>[CR7096875, CR7103144, CR7161424] The <code>mpathadm</code> commands do not always show updated access state values for paths to cold-plug or hot-plug Pillar Axiom LUN paths on a newly installed host. The <code>mpathadm show logical-unit <logical unit name></code> and <code>mpathadm show lu <logical unit name></code> commands</p>	<p>Consider the optimized and non-optimized path counts displayed in the Pillar Axiom GUI and CLI as a hint that some path failures might have occurred. Use the Solaris <code>luxadm display</code></p>

Description	Workaround
<p>might show values that can cause incorrect optimized and non-optimized path counts for the LUN in the Pillar Axiom GUI and CLI.</p> <p>After a Slammer control unit (CU) fails and recovers, the <code>cfgadm -alo show_SCSI_LUN</code> command might show the paths to the CU as unusable, and the OS might no longer attempt to detect recovery for these paths. This Solaris MPxIO issue prevents I/O from failing back to these paths after the CU comes back online.</p>	<p><code>pathname</code> and <code>iscsiadm list target -S</code> commands to determine the State and Class values for these paths.</p>
<p>[CR7142342] After one or all optimized paths fail, the access state values for these paths from the <code>mpathadm show logical-unit <logical unit name></code> and <code>mpathadm show lu <logical unit name></code> commands might not be updated. These <code>mpathadm</code> issues cause incorrect optimized and non-optimized path counts for the LUN in the Pillar Axiom GUI and CLI.</p>	<p>Consider the optimized and non-optimized path counts displayed in the Pillar Axiom GUI and CLI as a hint that some path failures might have occurred. Use the Solaris <code>luxadm display pathname</code> and <code>iscsiadm list target -S</code> commands to determine the State and Class values for these paths.</p>

Brocade FCoE Speed Reporting

The device driver for Brocade converged network adapters (CNAs) reports incorrect or unknown connection speed information for Fibre Channel over Ethernet (FCoE) connections.

Brocade SR 706175 indicates that this problem will be fixed in release 3.1 and later of the Brocade device driver.

Path Failures on Paths Not in Use

StorageTek Traffic Management Software (STMS) does not regularly check the status of paths it is not currently using, so STMS might not report that these paths have failed.

For example, if optimized paths to a LUN are available, STMS may not report that any non-optimized paths to the LUN have failed. This may cause the counts

of available paths in the Pillar Axiom Storage Services Manager to be overly optimistic for non-optimized paths.

Resolved APM Issues

The issues listed in the following table have been resolved in the current release of Pillar Axiom Path Manager (APM).

Table 11 Resolved APM issues

Issue
<p>[13745389] The APM daemon does not always automatically reconnect to the Pilot when its control path connection is dropped after the Pillar Axiom management IP address is changed. The Pillar Axiom Storage Services Manager will show the host as <code>Not Communicating</code>.</p>
<p>[13745390] When the TCP/IP connection between the APM daemon and the Pilot is lost (if, for example, you restart the Pillar Axiom system, or if the Pillar Axiom management IP address is changed), the APM daemon might not recognize that the connection has been lost until after the TCP KEEPALIVE period has expired on the host. By default this period is two hours. The daemon will not attempt to reconnect to the Pilot until it recognizes that the connection has been lost. During this period the Pillar Axiom Storage Services Manager will show the host as <code>Not Communicating</code>.</p> <p>Note: This issue is resolved in Oracle Solaris 11 with this version of APM, but for Oracle Solaris 10 it remains a known issue.</p>
<p>[13750581] Host LUN names are not being populated in the Axiom GUI reliably.</p>

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