

Pillar Axiom Path Manager 3.1



Installation Guide
and Release
Notes

for AIX



PILLAR AXIOM

Part Number: E29109-01

APM 3.1

2012 March

Copyright © 2005, 2012, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT RIGHTS Programs, software, databases, and related documentation and technical data delivered to U.S. Government customers are "commercial computer software" or "commercial technical data" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, the use, duplication, disclosure, modification, and adaptation shall be subject to the restrictions and license terms set forth in the applicable Government contract, and, to the extent applicable by the terms of the Government contract, the additional rights set forth in FAR 52.227-19, Commercial Computer Software License (December 2007). Oracle USA, Inc., 500 Oracle Parkway, Redwood City, CA 94065.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

This software or hardware and documentation may provide access to or information on content, products and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.

Copyright © 2005, 2012, Oracle et/ou ses affiliés. Tous droits réservés.

Ce logiciel et la documentation qui l'accompagne sont protégés par les lois sur la propriété intellectuelle. Ils sont concédés sous licence et soumis à des restrictions d'utilisation et de divulgation. Sauf disposition de votre contrat de licence ou de la loi, vous ne pouvez pas copier, reproduire, traduire, diffuser, modifier, breveter, transmettre, distribuer, exposer, exécuter, publier ou afficher le logiciel, même partiellement, sous quelque forme et par quelque procédé que ce soit. Par ailleurs, il est interdit de procéder à toute ingénierie inverse du logiciel, de le désassembler ou de le décompiler, excepté à des fins d'interopérabilité avec des logiciels tiers ou tel que prescrit par la loi.

Les informations fournies dans ce document sont susceptibles de modification sans préavis. Par ailleurs, Oracle Corporation ne garantit pas qu'elles soient exemptes d'erreurs et vous invite, le cas échéant, à lui en faire part par écrit.

Si ce logiciel, ou la documentation qui l'accompagne, est concédé sous licence au Gouvernement des Etats-Unis, ou à toute entité qui délivre la licence de ce logiciel ou l'utilise pour le compte du Gouvernement des Etats-Unis, la notice suivante s'applique :

U.S. GOVERNMENT RIGHTS. Programs, software, databases, and related documentation and technical data delivered to U.S. Government customers are "commercial computer software" or "commercial technical data" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, the use, duplication, disclosure, modification, and adaptation shall be subject to the restrictions and license terms set forth in the applicable Government contract, and, to the extent applicable by the terms of the Government contract, the additional rights set forth in FAR 52.227-19, Commercial Computer Software License (December 2007). Oracle America, Inc., 500 Oracle Parkway, Redwood City, CA 94065.

Ce logiciel ou matériel a été développé pour un usage général dans le cadre d'applications de gestion des informations. Ce logiciel ou matériel n'est pas conçu ni n'est destiné à être utilisé dans des applications à risque, notamment dans des applications pouvant causer des dommages corporels. Si vous utilisez ce logiciel ou matériel dans le cadre d'applications dangereuses, il est de votre responsabilité de prendre toutes les mesures de secours, de sauvegarde, de redondance et autres mesures nécessaires à son utilisation dans des conditions optimales de sécurité. Oracle Corporation et ses affiliés déclinent toute responsabilité quant aux dommages causés par l'utilisation de ce logiciel ou matériel pour ce type d'applications.

Oracle et Java sont des marques déposées d'Oracle Corporation et/ou de ses affiliés. Tout autre nom mentionné peut correspondre à des marques appartenant à d'autres propriétaires qu'Oracle.

Ce logiciel ou matériel et la documentation qui l'accompagne peuvent fournir des informations ou des liens donnant accès à des contenus, des produits et des services émanant de tiers. Oracle Corporation et ses affiliés déclinent toute responsabilité ou garantie expresse quant aux contenus, produits ou services émanant de tiers. En aucun cas, Oracle Corporation et ses affiliés ne sauraient être tenus pour responsables des pertes subies, des coûts occasionnés ou des dommages causés par l'accès à des contenus, produits ou services tiers, ou à leur utilisation.

Table of Contents

Preface

Chapter 1 Introduction to Pillar Axiom Path Manager

Pillar Axiom Path Manager Requirements.	10
Pillar Axiom System Requirements.	10
Network Requirements.	10
Supported Versions of AIX.	11
Pillar Axiom Path Manager Architecture.	12
About the Pillar Axiom Path Manager Control Path.	14
About the Pillar Axiom Path Manager Data Path.	15
Pillar Axiom Path Manager 3.1 Features.	16
About Boot from SAN.	18
About APM and Virtual I/O Server.	19
Operating Limits.	20
Supported SAN Protocols.	21
Supported Fibre Channel Hardware.	21
Supported iSCSI Software and Hardware.	22
About Configuring iSCSI on AIX.	24
iSCSI Initiator Names.	25

Chapter 2 Install Pillar Axiom Path Manager

Download and Install the Pillar Axiom Path Manager Software.	27
Download the Pillar Axiom Path Manager Software.	27
Configure the SAN on the Pillar Axiom System.	28
Configure the iSCSI-to-Fibre Channel Router.	29
Install the Pillar Axiom Path Manager Software.	29
Install the Software Without Rebooting.	30
Confirm the Pillar Axiom Path Manager Installation.	31
Set Up a Bootable SAN-Attached Disk.	34
Clean Installation from CD.	34

Use AIX to Clone an Existing Boot Disk.	35
Install Pillar Axiom Path Manager on a Bootable Pillar Axiom LUN.	36
AIX Bootlist Considerations.	36
Install APM on Virtual I/O Servers.	38
About Load Balancing Configuration.	39
About Host Reconfiguration.	40
Change Fibre Channel or iSCSI Initiators.	40
About Changes to HBAs or IP Addresses.	42
Rename the Host.	42
Upgrade the Pillar Axiom Path Manager Software.	43
Upgrade the Software Without Rebooting.	44
Remove the Pillar Axiom Path Manager Software (Optional).	46
Chapter 3 Pillar Axiom Path Manager Release Notes	
New in this Release.	48
Known APM Issues.	49
Known Pillar Axiom Issues.	50
Resolved APM Issues.	57
Additional Notes.	59
Switch Login Mode Changes.	59
cfmgr.	59
Index.	60

List of Figures

Figure 1 APM interaction with a Pillar Axiom server.	13
Figure 2 Host ports before APM installation.	32
Figure 3 Host ports after APM installation.	32

List of Tables

Table 1 Oracle resources. 9

Table 2 APM interaction diagram key. 12

Table 3 APM 3.1 for AIX features. 16

Table 4 APM operating limits. 20

Table 5 Known issues. 49

Table 6 Known Pillar Axiom issues. 50

Table 7 Resolved issues. 57

Preface

Audience

The information in this document is for system administrators who want to use Oracle's Pillar Axiom Path Manager (APM) for AIX on POWER platforms.

Related Documentation

Refer to the following related documents:

- *Pillar Axiom Customer Release Notes*: Includes late-breaking important information about the installation and operation of the Pillar Axiom system.
- *Pillar Axiom Administrator's Guide*: Provides detailed information on creating and managing storage resources.
- *Pillar Axiom CLI Reference Guide* (for Pillar Axiom CLI) or *CLI Reference Guide* (for pdscli): Provides detailed information about functions available in the Pillar Axiom command line interfaces (CLIs).

Access Documentation

Technical documentation (including installation, service, cabling, integration, and administration guides) for Oracle's Pillar Axiom 600 storage system is available from several sources.

Pillar Axiom Storage Services Manager

Log in to the Pillar Axiom storage system. Navigate to the **Support** area in the Pillar Axiom Storage Services Manager and select the **Documentation** link.

Pillar Axiom HTTP access

For Pillar Axiom systems running release 5.0 (and higher) software, point your browser to `http://system-name-IP/documentation.php`, where *system-name-IP* is the name or the public IP address of your system.

- Internet** [Customer support portal](http://support-portal.pillarata.com/csportal/login.seam) (<http://support-portal.pillarata.com/csportal/login.seam>).

Log in and click **Documents** in the left navigation pane.
- Product CD-ROM** Insert the Technical Documentation CD-ROM (came with your Pillar Axiom system) into the CD player and open the DocMenu PDF.

Tip: To search all technical documents on the CD-ROM, click **Search all PDFs** in the top right corner.

Oracle Contacts

Table 1 Oracle resources

For help with...	Contact...
Support	https://support.oracle.com
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 Pillar Axiom Path Manager

Pillar Axiom Path Manager Requirements

The Pillar Axiom Path Manager software has the following system, network, and operating system requirements.

Pillar Axiom System Requirements

This release of Pillar Axiom Path Manager (APM) requires that version 3.5 or later of the Pillar Axiom software be correctly installed on your Pillar Axiom storage system before you install the APM software on the SAN host.

Verify that your system has the following:

- A Fibre Channel or iSCSI SAN Slammer
- A Fibre Channel or iSCSI protocol license
- Ethernet connections to the Pilot management ports

Network Requirements

The Pillar Axiom Path Manager (APM) software communicates with the Pilot over secure, encrypted XML.

If the APM software is installed on a SAN host, that host 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 management Ethernet interfaces.

Tip: To check network connectivity, issue a simple `pdscli` or `axiomcli` request from the host to the Pillar Axiom system. Both `pdscli` and `axiomcli` use the same port and protocols as those used by APM. Refer to the *Pillar Axiom CLI Reference Guide* for details.

Supported Versions of AIX

Pillar Axiom Path Manager 3.1 for AIX requires one of the following versions of AIX:

- AIX 5L Version 5.3 at Technology Level 7 (5300-07) or later.
- AIX 5L Version 6.1 at Technology Level 3 (6100-03) or later.
- AIX 5L Version 7.1 at Technology Level 0 (7100-00) or later.
- Virtual I/O Server at version 1.5 (fix pack 10.1) or later.

Pillar Axiom Path Manager Architecture

The Pillar Axiom Path Manager (APM) software consists of a path control module (PCM) and a daemon. The PCM integrates with the AIX Multi-Path I/O (MPIO) subsystem. The PCM and daemon run on the host system to present multiple paths as single logical units.

APM prevents multiple paths from being presented as multiple disk drives. Every configured multipathed Pillar Axiom LUN will be presented as a single disk drive to the operating system. The driver supports failover across redundant paths. The daemon assists with driver configuration and uses the control path to send and receive information about the hosts. It runs as a background process at the user level and looks after management tasks. The daemon sends host attributes to the Pillar Axiom storage system. The software then 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.

[Figure 1: APM interaction with a Pillar Axiom server](#) illustrates how the APM software installed on a SAN host interacts with a Pillar Axiom storage system. Refer to the table below to determine the significance of the lines and colors in the figure.

Table 2 APM interaction diagram key





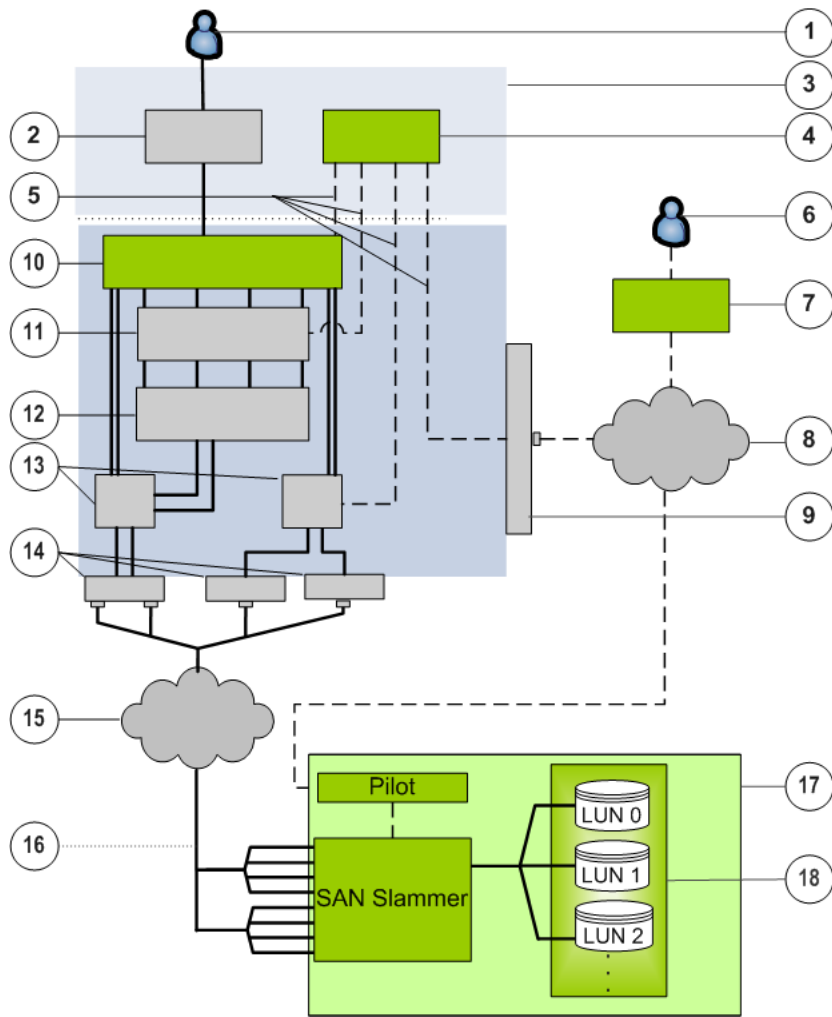
Graphic element	Description
—	Data path
----	Control path
	Pillar-supplied hardware and software
	Non-Pillar hardware and software
	SAN host kernel space
	SAN host user space

Figure 1 APM interaction with a Pillar Axiom server



Legend	
1 User	10 APM Path Control Module (PCM)
2 User application	11 iSCSI software initiator (iSCSI)
3 SAN host	12 TCP/IP driver (iSCSI)
4 APM daemon	13 HBA driver (FC or iSCSI) or NIC driver (iSCSI)
5 Control paths (all dashed lines)	14 HBA (FC or iSCSI) 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 server
9 Network card	18 Brick storage enclosure pool

About the Pillar Axiom Path Manager 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 running in the background to control multipathing and communication. The APM daemon uses the control path to:

- Get information from the Pilot management controller, such as the load balancing algorithm for each LUN.
- Get Fibre Channel (FC) and Internet Small Computer System Interface (iSCSI) port information from the host bus adapter (HBA) and converged network adapter (CNA) drivers, and from the iSCSI Software Initiator.
- Configure the APM Path Control Module.
- Send information such as host attributes and statistics to the Pilot management controller, and collect logs from the host on request.

The APM daemon sends a description of the host to the Pilot on each connected Pillar Axiom system. This description creates a definition for the host in the Pillar Axiom Storage Services Manager. The definition includes any FC ports in the host, and the name of the host's iSCSI initiator, if iSCSI is configured. The graphical user interface (GUI) and command line interface (CLI) list the port World Wide Names (WWNs) of the FC ports in the host and the Internet Protocol (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. The connections will appear to originate from the FC ports that are assigned on the switch to the host's iSCSI initiator. The WWNs of these ports are displayed as **Fibre Channel 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. The Slammer returns the IP address of its Pilot to the APM host over the data path as part of the connection sequence.

About the Pillar Axiom Path Manager Data Path

The Pillar Axiom Path Manager (APM) driver, a Path Control Module (PCM) that works with the AIX Multipath I/O (MPIO) driver, manages I/O to storage devices over the data path.

See Figure 1 for an illustration of how data flows from the host to the Pillar Axiom system.

The APM driver:

- 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 operating system as a single LUN or drive.
- Identifies and uses optimized data paths when possible. An optimized path provides the best performance and is the preferred path for data transfer.
- Determines which data paths to use.
- Provides load balancing across the best available paths.
- Handles data path failover.
- Manages data path errors.

Pillar Axiom Path Manager 3.1 Features

Pillar Axiom Path Manager (APM) is defined as:

Optional software installed on a storage area network (SAN) host to manage multiple paths to the Pillar Axiom system.

APM 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.

The function described in the last bullet enables the Pillar Axiom Storage Services Manager to report information about APM running on the host, such as the number of working paths, and, in some environments, to configure features such as load balancing.

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

Table 3 APM 3.1 for AIX 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 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, 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), the Pillar Axiom system sends a request to each connected APM host. The APM hosts collect useful

Table 3 APM 3.1 for AIX features (continued)

Feature	Benefit
	<p>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 Pillar 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 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 IP network infrastructure.</p> <p>Note: iSCSI connections to FC Slammers require iSCSI-to-FC routers.</p>
Support for Boot from SAN	Supports using a Pillar Axiom LUN on a Fibre Channel SAN as a boot disk. Booting from a Pillar Axiom LUN on an iSCSI SAN is not supported in this release.
Support for AIX features (refer to the IBM AIX documentation for details)	<ul style="list-style-type: none"> • High Availability Cluster Multi-Processing (HACMP) version 5.5 and later • PowerHA 6.1 • PowerHA SystemMirror 6.1 and 7.1 • Logical Partitioning (LPARs) • Virtual I/O Server • Dynamic Tracking of Fibre Channel devices • Fast I/O Failure for Fibre Channel devices

About Boot from SAN

This release of the Pillar Axiom Path Manager (APM) supports booting from a Fibre Channel-attached disk.

There are two methods from which you can choose:

- Clean installation from the AIX CD—This method involves loading the AIX OS onto a Pillar Axiom LUN, then configuring the APM software on that LUN. You must install APM *after* completing this procedure. See [Clean Installation from CD](#).
- Use AIX to clone an existing boot disk—This method involves cloning an existing bootable hard disk using the `alt_clone` command to copy an existing operating system disk onto a Pillar Axiom LUN. You can perform this procedure before or after you install APM. See [Use AIX to Clone an Existing Boot Disk](#).

Either method will set up a bootable disk. Choose the best method for your situation.

After you have used one of these methods to create a bootable Pillar Axiom LUN, you can use the facilities of the Pillar Axiom system to make copies or clones of that LUN.

Important! When you use the Pillar Axiom system to copy a LUN to use as a boot disk, make sure AIX is not using the disk. If a Pillar Axiom LUN is the boot LUN for an AIX system, and you want to use the features of the Pillar Axiom system to copy or clone that LUN, you should first shut the AIX system down or boot it from a different disk. Copies of AIX boot LUNs taken while AIX is booted from them cannot be reliably used as boot LUNs.

About APM and Virtual I/O Server

Pillar Axiom Path Manager (APM) supports Virtual I/O Server version 1.5 (fix pack 10.1) and later.

When you install APM on Virtual I/O Server, multi-pathed Pillar Axiom LUNs that are mapped to the Virtual I/O Server can be virtualized as SCSI devices for access by client partitions in the same way as other disks. APM is installed on the Virtual I/O Servers, not in the client partitions. See [Install APM on Virtual I/O Servers](#) for details.

If your system has more than one Virtual I/O Server, APM can be installed on each server. The Pillar Axiom LUNs can be mapped to all the Virtual I/O Servers. Each server exposes a virtual view of each LUN to the client partitions. In this configuration, the client partitions can access the LUNs through multiple Virtual I/O Servers—that is, the client partitions have multiple virtual paths to each LUN. To manage these multiple paths to the virtual LUNs, AIX in the client partitions uses Multipath I/O (MPIO) with the default Path Control Module (PCM) in failover mode. APM cannot be used in the client partitions to manage these virtual paths.

With multiple Virtual I/O Servers, MPIO with the default PCM is used in the clients to manage the paths to the virtual disks presented by APM in the Virtual I/O Servers.

Since APM is installed on the Virtual I/O Servers, the Virtual I/O Servers show up as hosts in the Pillar Axiom system, so the LUNs must be mapped to those Virtual I/O Server hosts. In a system with multiple Virtual I/O Servers, the LUNs should be mapped to all the Virtual I/O Servers on the system. The normal Virtual I/O Server facilities are used to make the LUNs visible from the Virtual I/O Servers to the individual client partitions.

Operating Limits

Pillar Axiom Path Manager (APM) provides access over multiple data paths to LUNs defined on a Pillar Axiom system. APM, AIX, and the Pillar Axiom software limit the following aspects of this access.

Table 4 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 visible from 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.

Supported SAN Protocols

Pillar Axiom Path Manager (APM) 3.1 supports Fibre Channel (FC) and Internet Small Computer System Interface (iSCSI) connections to the Pillar Axiom system.

Supported Fibre Channel Hardware

Before you install the Pillar Axiom Path Manager (APM) software on the host, verify that your Fibre Channel SAN components are supported.

The following sections list tested and approved hardware compatible with the Pillar Axiom storage system at the time of this release.

Supported Fibre Channel Host Bus Adapters

APM for AIX supports the following IBM Fibre Channel host bus adapters (HBAs):

- 5273
- 5276
- 5716
- 5735
- 5758
- 5759
- 5773
- 5774
- 6239

Installation instructions and drivers for these HBAs are available from the [IBM support download page](http://www.ibm.com/support) (<http://www.ibm.com/support>).

About Fibre Channel Settings

AIX provides two configuration options to modify the behavior of the Fibre Channel (FC) drivers when events occur in the SAN. These options are *Fast I/O Failure* and *Dynamic Tracking*. We recommend that you enable both of these options for all FC ports used to connect to the Pillar Axiom system, unless other software or hardware components using these ports require a different setting.

More information about these two options can be found in the [AIX documentation](http://publib.boulder.ibm.com/infocenter/pseries/v5r3/topic/com.ibm.aix.prftungd/doc/prftungd/log_vol_disk_io_perf.htm) (http://publib.boulder.ibm.com/infocenter/pseries/v5r3/topic/com.ibm.aix.prftungd/doc/prftungd/log_vol_disk_io_perf.htm).

Supported Fibre Channel Switches

For a list of supported Fibre Channel switches, you can:

- Call Technical Support.
- Refer to the *Pillar Axiom Support and Interoperability Guide*, which can be found on the [Oracle Pillar Customer Support](http://support.pillardata.com/) website: (<http://support.pillardata.com/>).

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

Supported iSCSI Software and Hardware

Pillar Axiom Path Manager (APM) 3.1 for AIX supports the following Internet Small Computer System Interface (iSCSI) software and hardware:

- The iSCSI software initiator included in your AIX distribution.
- The iSCSI-to-Fibre Channel routing features of the Cisco MDS 9000 family of routers and switches.
- The iSCSI host bus adapters (HBAs) and Transmission Control Protocol (TCP) Offload Engines (TOEs) listed in [Supported iSCSI HBAs](#).

Supported iSCSI HBAs

Pillar Axiom Path Manager (APM) supports the following IBM Internet Small Computer System Interface (iSCSI) host bus adapters (HBAs) and Transmission Control Protocol (TCP) Offload Engines (TOEs):

- 1986
- 1987
- 5713
- 5714

Supported iSCSI-to-Fibre Channel Routers

iSCSI-to-Fibre Channel (FC) routing features enable a host to use Internet Small Computer System Interface (iSCSI) to access LUNs on Pillar Axiom FC Slammers.

Pillar Axiom Path Manager (APM) supports the iSCSI-to-FC routing features of the Cisco MDS 9000 family of multilayer directors and fabric switches. The only supported iSCSI-to-FC routing solution is the solution provided by this family of switches.

The iSCSI-to-FC features were tested on Cisco MDS SAN-OS Release 3.0 (2a).

For more information on these features, refer to the [Cisco documentation](http://www.cisco.com/) (<http://www.cisco.com/>).

See [Configure the iSCSI-to-Fibre Channel Router](#) for the steps required to use the Cisco MDS switch as an iSCSI-to-FC router with APM and the Pillar Axiom system.

Supported iSCSI Switches

For a list of supported iSCSI switches, you can:

- Call Technical Support at the number listed in [Oracle Contacts](#).

- Refer to the *Pillar Axiom Support and Interoperability Guide*, which can be found on the [Oracle Pillar Customer Support](http://support.pillardata.com/) website (<http://support.pillardata.com/>).

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

About Configuring iSCSI on AIX

Pillar Axiom Path Manager (APM) 3.1 for AIX supports Internet Small Computer System Interface (iSCSI) connections. The following information will help you configure iSCSI to work with APM and your Pillar Axiom storage system.

The unit of configuration for iSCSI on AIX is a logical device called an *iSCSI protocol device*. One iSCSI protocol device represents the iSCSI software initiator, which operates over the normal Transmission Control Protocol (TCP) / Internet Protocol (IP) stack and the network interface cards (NICs) that TCP/IP is configured to use. Each iSCSI TCP Offload Engine (TOE) or host bus adapter (HBA) port also has its own iSCSI protocol device.

Each iSCSI protocol device can connect to a maximum of one port on each iSCSI target. A Pillar Axiom system is a single iSCSI target with multiple iSCSI ports. This means that each iSCSI protocol device can connect to only one Slammer port on a Pillar Axiom system. To make multipath connections to a Pillar Axiom LUN, the host must have a minimum of two iSCSI protocol devices. For example, these protocol devices could be one of:

- The software initiator and one HBA
- Two HBAs

This would allow two connections to the Pillar Axiom system, which would be enough to enable minimal multipathing for a single-Slammer Pillar Axiom system.

To enable multipathing, the target discovery policy for each iSCSI protocol device must be configured to ensure that they discover the appropriate Slammer ports. For example, with two iSCSI protocol devices, one should be configured to only discover a port on one Slammer control unit (CU), and the other should be configured to discover a port on the other CU.

There are several ways to configure target discovery (or explicitly configure target ports) for each iSCSI protocol device, a few of which are documented in the AIX documentation. The ability of APM to automatically discover the management IP addresses of attached Pillar Axiom systems varies with how target discovery is configured.

- If an iSCSI protocol device is configured to use the file or Object Data Manager (ODM) discovery policies, APM will be able to discover Pillar Axiom Pilots without additional configuration. As long as it is possible to make an iSCSI connection between the relevant host and Slammer ports, APM will automatically find the Pilot IP address.
- For discovery policies other than file or ODM, the iSCSI protocol device must first bring an iSCSI LUN on the Pillar Axiom system online. This involves typing in the initiator name of the iSCSI protocol device at the Pillar Axiom system and mapping a LUN to it, or making a LUN globally visible over iSCSI from the Pillar Axiom system, and then running the `cfgmgr` command on the host.

APM will be able to discover the Pillar Axiom system management address, even if the LUN itself is deleted or unmapped at the Pillar Axiom system, as long as the following conditions are true:

- The configuration information exists on the host for an iSCSI LUN on the Pillar Axiom system.
- It is possible to make an iSCSI connection between the relevant host and Slammer ports.

Important! AIX does not currently support the configuration of combo LUNs.

Combo LUNs are LUNs that are accessible through both Fibre Channel and iSCSI. A LUN on a Pillar Axiom system must not be made visible to AIX over Fibre Channel and iSCSI at the same time or the LUN configuration at the host will become confused and behave unpredictably.

If a LUN has been accessible by the host in the past over one protocol, and the same LUN is to be made accessible over the other protocol, then the LUN's existing configuration information should be deleted from AIX before making it accessible over the new protocol. The configuration information is deleted by using the `rmdev` command:

Example:

```
rmdev -l hdiskx -d
```

Where *hdiskx* is the name and number of an hdisk device.

iSCSI Initiator Names

In AIX, an iSCSI initiator name must be configured for the iSCSI software initiator and for each iSCSI HBA.

The iSCSI Standard, [RFC 3720](http://tools.ietf.org/html/rfc3720) (<http://tools.ietf.org/html/rfc3720>), places requirements on the format of the iSCSI initiator names. Pillar Axiom Path Manager (APM) depends on these requirements being met for it to work properly with iSCSI on AIX. In particular, the following rules should be followed:

- 1 iSCSI initiator names must be unique to each host. iSCSI initiators within a single host can each have their own names or they can all share the same name, but an iSCSI initiator name used on one host must not be used on any other host that accesses the same Pillar Axiom system.
- 2 iSCSI initiator names must be different from host names. An iSCSI initiator name must not be the same as any host name visible to the Pillar Axiom system.
- 3 iSCSI initiator names must be configured in AIX in the “normalized” string format described in [RFC 3722](http://tools.ietf.org/html/rfc3722) (<http://tools.ietf.org/html/rfc3722>). For example, names containing only lower case characters, numbers, and the dash, dot and colon characters from the ASCII character set meet this requirement.

See [RFC 3720](http://tools.ietf.org/html/rfc3720#section-3.2.6) (<http://tools.ietf.org/html/rfc3720#section-3.2.6>) for more information on iSCSI names.

CHAPTER 2

Install Pillar Axiom Path Manager

Download and Install the Pillar Axiom Path Manager Software

To use the APM software, you must download the software, configure the SAN before you begin installation, install the software, and then complete the installation by confirming LUN access.

Important! If you want to set up a bootable SAN-attached disk, decide which method to use before you install.

- 1 [Download the Pillar Axiom Path Manager Software.](#)
 - 2 [Configure the SAN on the Pillar Axiom System.](#)
 - 3 [Install the Pillar Axiom Path Manager Software.](#)
 - 4 [Confirm the Pillar Axiom Path Manager Installation.](#)
- To upgrade the APM software, see [Upgrade the Pillar Axiom Path Manager Software.](#)
 - To remove the APM software from your host, see [Remove the Pillar Axiom Path Manager Software \(Optional\).](#)

Download the Pillar Axiom Path Manager Software

Before you download the APM software, verify that your system meets the requirements that are listed in [Pillar Axiom Path Manager Requirements.](#)

- 1 Go to the [Pillar Support](http://supportportal.pillardata.com/csportal/login.seam) website (<http://supportportal.pillardata.com/csportal/login.seam>) and log in.
- 2 Click **Software Downloads** and **Pillar Axiom Path Manager** in the left navigation pane.
- 3 Navigate to the name of the installation package for your operating system and hardware platform in the right-hand content pane.

- 4 Click the **Download** link in the Software Download Information panel to begin the download.
- 5 Follow the online instructions to download and save the package to your SAN host.

Configure the SAN on the Pillar Axiom System

- 1 Verify that the required Fibre Channel or iSCSI adapters and any required software are installed on the host according to the vendor's instructions.
- 2 Set up the SAN (physical connectivity and any required switch zoning) so that there is a path through the SAN between an HBA port on the host and a Slammer port on each Pillar Axiom system.
- 3 For each connected host Fibre Channel port, check the **Storage > SAN > Hosts** page for the following:
 - The host port should appear as an entry with the **Host Name** set to **Host Unknown**.
 - The HBA port name should be set to its port World Wide Name (WWN).

Note: After you install the software, see [Confirm the Pillar Axiom Path Manager Installation](#). You must complete the configuration for the software to work correctly.

- 4 Choose one of the following depending on your SAN protocol configuration:
 - If you are using iSCSI as your SAN protocol, and you have configured iSCSI with the file or Object Data Manager (ODM) discovery policy (see [About Configuring iSCSI on AIX](#)), no further action is required.
 - If you are using Fibre Channel as your SAN protocol, or if you have configured iSCSI with a discovery policy other than file or ODM, verify that at least one LUN is visible to at least one port in 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 APM software is installed on the host.
 - If you decide that this LUN is temporary, delete it after you install the software.

Configure the iSCSI-to-Fibre Channel Router

This release supports the iSCSI-to-Fibre Channel routing features of the Cisco MDS 9000 family of multi-layer directors and fabric switches. These features require configuration to work with the Pillar Axiom Path Manager (APM) and the Pillar Axiom system.

For more information on these features, refer to the [Cisco documentation](http://www.cisco.com/univercd/cc/td/doc/product/sn5000/mds9000/3_0/fmcfg/index.htm) (http://www.cisco.com/univercd/cc/td/doc/product/sn5000/mds9000/3_0/fmcfg/index.htm).

- 1 Present the Pillar Axiom Slammer storage controller ports as iSCSI targets.

Choose **Dynamic Mapping** or **Static Mapping**. However, we recommend that you use dynamic mapping because the main Cisco features for static mapping requirements are supplied by APM and the Pillar Axiom Storage Services Manager.

- 2 Present the iSCSI hosts as virtual Fibre Channel hosts.

The hosts must be presented in transparent initiator mode (not in proxy-initiator mode). When you assign World Wide Names (WWNs) for the iSCSI initiators, use the static mapping mechanism.

After you configure the switch, APM on the iSCSI hosts interacts with the Pillar Axiom systems in exactly the same way as when both hosts and Slammers use the same SAN protocol.

Install the Pillar Axiom Path Manager Software

- 1 Log in as `root`.
- 2 Change to the directory containing the APM software.
- 3 Run the following command to create or update the Table of Contents (`.toc`) file that describes the software packages in the APM directory.

```
# inutoc .
```

- 4 Use one of the normal AIX methods to install the software.

Choose one of:

- `installp` – Installs the software from the command line.
- `smit` – Starts the System Management Interface Tool (SMIT).

- `smitty` – Starts the ASCII terminal version of the System Management Interface Tool (SMITTY).

Note: If you use `smit` or `smitty`, follow the prompts on the Install Software menu.

- 5 As it finishes, the installer instructs you to reboot the host. Choose one of:
 - If the system is using a Pillar AxiomLUN as the boot disk, reboot the system now, and continue at step 5 of [Install Pillar Axiom Path Manager on a Bootable Pillar Axiom LUN](#).
 - If the system is not using a Pillar AxiomLUN as the boot disk, connect any additional paths to your LUNs, and make any new LUNs visible to the host.
 - If you want to complete the installation without rebooting the host, see [Install the Software Without Rebooting](#).

Install the Software Without Rebooting

Follow these instructions to install Pillar Axiom Path Manager without rebooting.

- 1 Follow the steps in [Install the Pillar Axiom Path Manager Software](#).
- 2 Remove the configuration information and device definition from AIX for any Pillar Axiom LUN disk devices.

Use the `rmdev` command to remove the configuration and definition:

Example:

```
# rmdev -l hdiskx -d
```

Where *hdiskx* is the name and number of the device to be deleted.

Note: The devices for Pillar Axiom LUNs have a description of `Other FC SCSI Disk Drive` or `Other iSCSI Disk Drive`. Confirm that the disk devices you are removing are for Pillar Axiom LUNs, because other disk devices could be using these descriptions, too.

- 3 Create the configuration entries for the new multipath devices for the LUNs, and bring the paths and LUNs online.

Use the following command to create and activate the new configuration:

```
# cfmgr
```

It may be necessary to run `cfgmgr` more than once to bring all LUNs and paths online.

- 4 Start the APM daemon to complete the task

Run the following command to start the daemon

```
# startsrc -s axiompmd
```

Confirm the Pillar Axiom Path Manager Installation

Follow this procedure to ensure that the Pillar Axiom Path Manager (APM) software is installed correctly and working on your system.

Before the APM software is installed, a device will be present for each path to a LUN. These devices are labeled `Other FC SCSI Disk Drive` or `Other iSCSI Disk Drive` on the AIX host. The installation will automatically assign one device for each LUN, labeled `MPIO Pillar Axiom FC SCSI Disk Drive` or `MPIO Pillar Axiom iSCSI Disk Drive` on the AIX host. Do the following after you install the software:

- 1 Use the following command to verify that one device is assigned to each LUN:

```
lsdev -c disk
```

Example:

Sample command output before APM installation (two paths per LUN):

```
hdisk0 Available 07-08-00-3,0 16 Bit LVD SCSI Disk Drive
hdisk1 Available 07-08-00-8,0 16 Bit LVD SCSI Disk Drive
hdisk2 Available 03-08-02 Other FC SCSI Disk Drive
hdisk3 Available 03-08-02 Other FC SCSI Disk Drive
hdisk4 Available 01-09-01 Other iSCSI Disk Drive
hdisk5 Available 01-09-01 Other iSCSI Disk Drive
```

Sample command output after APM installation (two paths per LUN):

```
hdisk0 Available 07-08-00-3,0 16 Bit LVD SCSI Disk Drive
hdisk1 Available 07-08-00-8,0 16 Bit LVD SCSI Disk Drive
hdisk2 Available 04-08-02
      MPIO Pillar Axiom FC SCSI Disk Drive
hdisk3 Defined 03-08-02 Other FC SCSI Disk Drive
hdisk4 Available 01-09-01
      MPIO Pillar Axiom iSCSI Disk Drive
hdisk5 Defined 01-09-01 Other iSCSI Disk Drive
```

Note that the device for one path to each LUN has been converted into a device for the multipath LUN, and that devices for any other paths to each

LUN are left in the `Defined` state. Any redundant `Defined` devices can be removed using the `rmdev` command.

Tip: These redundant devices will not be created if you ensure that there is only one path to each LUN before you install APM.

- 2 Use **Storage > SAN > Hosts** in the Pillar Axiom Storage Services Manager to verify that individual entries for host ports have been replaced with a single entry under the host name.

Example:

Figure 2 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"/> iqn.1987-05.com.cisco:01.eca9a9b8d555	192.168.2.93	iSCSI	Not Registered	0	Connected
	192.168.2.94	iSCSI			Connected

Figure 3 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 **AxiomONE 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, configure load balancing, 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 If necessary, use the **Settings** tab for the host in the Pillar Axiom Storage Services Manager to change the load balancing algorithm used on this host for each LUN (optional). If you do not change the settings now, you can change the settings later.

See [About Load Balancing Configuration](#) for load balancing setting details.

The LUNs on your Pillar Axiom System are now available for use as physical volumes on your AIX host. You can now use normal AIX administration procedures to bring them into use. For example, you could use the System Storage Management page in `smitt` or `smitty` to assign the LUNs to volume groups.

Tip: The host information in the Pillar Axiom Storage Services Manager will also tell you which AIX device name has been allocated to which LUN.

The display of host information in the Pillar Axiom Storage Services Manager includes a count of the number of optimized and non-optimized paths to each LUN. For AIX hosts, this count is only valid when a LUN is in use on the host, such as when it is a member of a varied-on volume group. When a LUN is not in use, this count is displayed as 0/0.

Set Up a Bootable SAN-Attached Disk

See [About Boot from SAN](#) for a description of the two methods for setting up a bootable SAN-attached disk. Follow the instructions for the method that is best for your situation.

Clean Installation from CD

This approach configures your system to boot from a SAN-attached disk by installing AIX from a CD onto a LUN.

Perform this procedure while installing the AIX operating system from the CD.

- 1 In the Pillar Axiom Storage Services Manager, create a LUN and map it to the system.
- 2 Enter the `cfgmgr` command and verify that the LUN is visible to the system.
- 3 Use the `lspv` command to list the physical volumes and note the volume IDs.
- 4 Stop AIX.
- 5 Verify that there is only one path to the Pillar Axiom system by switch zoning or removing the Fibre Channel connections.

Important! There must be exactly one path to the new boot LUN. If you boot from the LUN when there is more than one path to the boot LUN, some configuration commands might fail.

- 6 Begin the AIX installation from the CD. Change the installation destination to the Pillar Axiom LUN, and follow the prompts to install AIX.
- 7 Reboot AIX.
Note: If the system boots from the internal drive, alter the bootlist to boot from the new LUN. See [AIX Bootlist Considerations](#) for details.
- 8 Install any necessary AIX patches. For patch information, refer to the [IBM Web site](http://www.ibm.com/support/fixcentral) (<http://www.ibm.com/support/fixcentral>).
- 9 Install Pillar Axiom Path Manager. See [Install Pillar Axiom Path Manager on a Bootable Pillar Axiom LUN](#).

Use AIX to Clone an Existing Boot Disk

This approach configures your system to boot from a SAN-attached disk by using AIX to copy the current root volume group onto a LUN.

- If you install the Pillar Axiom Path Manager (APM) on the system before cloning the current boot LUN onto a Pillar Axiom LUN, APM will already be installed and running when you boot from the LUN.
 - If you clone a system that does not have APM installed, then install APM on the new boot LUN after booting from it.
- 1 In the Pillar Axiom Storage Services Manager, create a LUN and map it to the system.
 - 2 If APM is not installed on the system, ensure that there is only a single path connected between the host and the new LUN.
 - 3 Enter the `cfgmgr` command and verify the LUN is visible to the system.
 - 4 Run the following command:

```
smit alt_clone
```

Note: If `smit` doesn't have the `alt_clone` shortcut, you must load the `bos.alt_disk_install.rte` fileset from the AIX installation CD.

- 5 In the template, enter the target disk to install.

Most of the remaining fields should stay at their default values, but you may want to change the following settings (optional):

- **Verbose Output**
- **Reboot when Complete**
- **Set bootlist to boot from this disk on next reboot**

Refer to the AIX documentation for more information.

- 6 Press Return to begin the copy process.

After the copy finishes, you can boot from the destination LUN. When you are ready to boot from the new LUN, use the `bootlist` command to make sure that the LUN comes first in the list, and then reboot the system. See [AIX Bootlist Considerations](#) for details.

Install Pillar Axiom Path Manager on a Bootable Pillar Axiom LUN

Follow these steps to install the Pillar Axiom Path Manager (APM) on a system with a Pillar Axiom LUN boot disk.

- 1 Make sure that only a single path is connected between the host and the boot LUN.
- 2 Unmap any other Pillar Axiom LUNs from the host.
- 3 Install the APM software.
See [Install the Pillar Axiom Path Manager Software](#).
- 4 Reboot the system without reconnecting any paths to Pillar Axiom LUNs.

Result:

The only Pillar Axiom LUN visible to the host during this first reboot must be the single path to the boot LUN.

- 5 After the system boots, connect any additional paths to the boot LUN, and map in any other required Pillar Axiom LUNs.
- 6 Bring the additional paths and LUNs online by rebooting the system again or running the `cfgmgr` command.

It may be necessary to run `cfgmgr` more than once to bring all paths online.

AIX Bootlist Considerations

When you have multiple paths to a boot LUN on a Pillar Axiom system, the Pillar Axiom Path Manager (APM) ensures that the system uses an alternative path to the LUN if one fails while AIX is running. However, APM is not involved when the system starts booting.

The system firmware uses a list of paths to boot devices known as the *bootlist*. It tries each entry in the bootlist in turn until it is able to boot the system from one of the devices. If you wish to be able to boot from a multipathed LUN when some paths have failed, you must make sure that multiple paths to the LUN appear in the bootlist.

The bootlist is set up in AIX using the `bootlist` command. For example, the following command requests AIX to set the bootlist up so that the system attempts to boot from `hdisk3`, but if it fails to do so it should try `hdisk5`.

```
bootlist -m normal -o hdisk3 hdisk5
```

There are two important points to note when setting the bootlist with multipathed devices:

- If the disk names you pass to the `bootlist` command are for multipathed disks, the command will convert each disk name into a list of all paths to that disk which are in the available state at the time.

In the example above, if there are eight available paths to `hdisk3` the command attempts to create a bootlist consisting of the eight paths to `hdisk3` followed by however many paths there are to `hdisk5`. It is not possible to control the order of individual paths to a multipathed disk.

- Only a limited number of entries are allowed in the bootlist.

The number allowed depends on the hardware model of your system. Some systems allow five entries, for example. In the example above where there are eight available paths to `hdisk3` and the system allows five entries in the bootlist, the command would set up a bootlist containing five paths to `hdisk3` (chosen effectively at random out of the eight available) and no paths to `hdisk5`.

After you install APM on a system booted from a Pillar Axiom LUN, we recommend that you use the `bootlist` command to set the bootlist appropriately for your situation. Although you cannot control the order in which individual paths to a LUN will be placed in the list, you can control how many paths get added, and which ones. The `bootlist` command only adds paths that are in the available state. You could use the `rmpath` command to temporarily make some paths unavailable while setting up the bootlist. Alternatively, you could use port masking on the Pillar Axiom storage system, or configuration utilities on your SAN switches, to temporarily remove paths from the configuration, then reboot the host to take the paths out of the available state.

Install APM on Virtual I/O Servers

Install Pillar Axiom Path Manager (APM) on Virtual I/O Servers, not in client partitions.

Virtual I/O Server is based on AIX, but normally gives you a restricted shell interface with a limited set of specialized commands. You cannot log in directly as root.

- 1 Log in to Virtual I/O Server as the prime administrator (padmin).
- 2 Run the following command:

```
oem_setup_env
```

Result:

This puts you into a normal shell logged in as root.

- 3 Follow the normal APM installation process.
See [Install the Pillar Axiom Path Manager Software](#).

About Load Balancing Configuration

Pillar Axiom Path Manager (APM) can be configured for static or round-robin load balancing. You configure load balancing separately for each LUN.

Each LUN can be accessed through two Slammer control units (CUs). Paths to the CU on which the LUN is currently resident are more efficient, and are known as *optimized paths*. Both load balancing algorithms will use only optimized paths if any are available.

In static load balancing, the software selects the best available path and all commands are sent over that path until the path is no longer operational. Then, a failover to another appropriate path is initiated.

In round-robin load balancing, commands are sent by turn over the best available paths. This ensures that LUN commands are evenly distributed over any path that is available to access the LUNs.

Load balancing allows the paths to share load in different ways:

- Balances access to a LUN across all optimized Slammer ports available for that LUN
- Balances access from a host across the host's HBA channels

To configure static or round-robin load balancing through the Pillar Axiom Storage Services Manager, see the *Pillar Axiom Administrator's Guide*.

About Host Reconfiguration

Once you have installed Pillar Axiom Path Manager (APM) and the host is using LUNs from a Pillar Axiom system, you may find it necessary to reconfigure the host.

Reconfiguring the host in any of the following ways will affect how the Pillar Axiom recognizes connections from the host.

- Add, remove, or replace a Fibre Channel (FC) 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.

Change Fibre Channel or iSCSI Initiators

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, have an effect on how the Pillar Axiom system recognizes connections from the host. When the SAN initiators used by the host are changed, the Pillar Axiom system's definition of the host needs to be updated to match, and any LUN mappings to the host need to be adjusted. Pillar Axiom Path Manager (APM) does most of this automatically if you follow these steps.

- 1 Make the changes to the configuration.

APM will usually ensure that the changes are automatically passed to the Pillar Axiom management software when the APM daemon is restarted.

If you have replaced all the FC HBAs in the host, you must make a LUN on the Pillar Axiom 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 APM

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 in Step 1 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 APM daemon after the reconfiguration is completed (and after setting up the mapping described in Step 1 if necessary). Use the following commands to stop and start the APM daemon:

```
stopsrc -s axiompmd
startsrc -s axiompmd
```

The APM daemon will discover the change when it starts up after the system reboot or after being explicitly restarted. It will update the Pillar Axiom management software and the LUN mappings to the host will be automatically adjusted to match the new SAN connections from the host.

Important! Removing or replacing FC HBAs on systems running Release 4.0 or later of the Pillar Axiom software may remove all LUN mappings to the host. Use the following procedure to avoid removing all LUN mappings:

- 1 Before removing the old HBAs, stop the APM daemon and delete the host entry in the Pillar Axiom system.
- 2 Create a temporary host entry in the Pillar Axiom system and associate the old HBAs with it.
- 3 Make the changes to the HBAs in the host.
- 4 Add all the HBAs now in the host to the temporary host entry created in step 2.
- 5 Start the APM daemon on the host. Choose one of:
 - Reboot the host.
 - Restart the daemon if the host was not shut down.

Once the daemon connects to the Pillar Axiom system, it will recreate its host entry and transfer the mappings from the temporary entry created in step 2.

- 6 Delete the temporary host entry created in step 2.

About Changes to HBAs or IP Addresses

If you change an iSCSI HBA without changing the iSCSI initiator name associated with it, or change the IP addresses that the host uses to make iSCSI connections to the Pillar Axiom system, then no other actions are needed.

Rename the Host

Follow these instructions if you want to rename the host.

- 1 Stop the Pillar Axiom Path Manager (APM) daemon.

Use the following command:

```
stopsrc -s axiompmd
```

- 2 Delete the host's entry in the Pillar AxiomGUI.

- 3 Rename the host.

- 4 Choose one of:

- Reboot the host.
- Use the following command to start the APM daemon:

```
startsrc -s axiompmd
```

Upgrade the Pillar Axiom Path Manager Software

The simplest procedure for upgrading requires you to reboot the system. If the system is not using a Pillar Axiom LUN as the boot disk, it is possible to upgrade without rebooting.

- 1 Follow the steps in [Download the Pillar Axiom Path Manager Software](#) to download the new version.
- 2 Follow Steps 1 through 4 in [Install the Pillar Axiom Path Manager Software](#).
- 3 Choose one of:
 - Restart the host.
 - To avoid restarting the host, follow the steps in [Upgrade the Software Without Rebooting](#).

Note: You do not need to disconnect or connect paths during an upgrade.

Upgrade the Software Without Rebooting

Follow these instructions to upgrade the Pillar Axiom Path Manager (APM) software without rebooting.

- 1 Log in as root.
- 2 Take all Pillar Axiom LUNs out of use on the host.

Example:

Vary off any volume groups using Pillar Axiom LUNs. The Pillar Axiom GUI shows path counts of 0 when these LUNs are out of use.

- 3 Remove the configuration from AIX for all Pillar Axiom LUN disk devices.

These devices have the description `MPIO Pillar Axiom FC SCSI Disk Drive` or `MPIO Pillar Axiom iSCSI Disk Drive`.

Use the following command to remove the Pillar Axiom LUNs:

```
# rmdev -l hdiskx
```

Where *hdiskx* is the name and number of the device.

Tip: If the command fails, it will most likely be because the device is still in use. Take the device out of use, and then repeat the command. The **LUN Name on Host** column in the Pillar Axiom GUI will be empty when the device configuration has been removed from the host.

Important! Do not proceed further until all Pillar Axiom LUNs have been taken out of use and their device configuration has been removed from the host.

- 4 Install the APM software.

Follow Steps 2 through 4 in [Install the Pillar Axiom Path Manager Software](#).

Important! Do not reboot the host.

- 5 Recreate the configuration for the LUNs, and bring the paths and LUNs online. .

Use the following command to create and activate the new configuration:

```
# cfmgr
```

It may be necessary to run `cfmgr` more than once to bring all LUNs and paths online.

- 6 Start the APM daemon to complete the task.

Run the following command to start the daemon:

```
# startsrc -s axiompmd
```

Tip: After you start the daemon, the **Host Information** pages in the Pillar Axiom GUI could take a minute or two to display updates. The version of APM currently running on the host is shown in the **Identity** tab.

Note: You do not need to disconnect or connect paths during an upgrade.

Remove the Pillar Axiom Path Manager Software (Optional)

To completely remove the Pillar Axiom Path Manager (APM) software from your system, follow these steps:

- 1 If possible, ensure that any Pillar Axiom LUNs are not in use by AIX. For example, any volume groups that include a Pillar Axiom LUN should be *varied off* with the `varyoffvg` command. This is not possible if the system is booted from a Pillar Axiom LUN since the boot LUN will always be in use.
- 2 Use facilities such as port masking on the Pillar Axiom system, and switch configuration to ensure that there is only one path for each LUN between the host and the Pillar Axiom. This is particularly important for the boot LUN if the system is booted from a Pillar Axiom LUN.
- 3 Use one of the normal AIX methods to remove the `axiompm.PCM` software package.

Example:

Choose one of:

- From the command line, enter:

```
installp -ug axiompm.PCM
```

- From smit (System Management Interface Tool) or smitty (ASCII terminal version of the System Management Interface Tool):
 - a Go to the Software Installation and Maintenance option.
 - b Select Software Maintenance and Utilities.
 - c Choose Remove Installed Software.
 - d In the Software Name field, enter

```
axiompm.PCM
```

- 4 Reboot the system.

Note: If the system is currently booted from a Pillar Axiom LUN, the following message may be displayed a number of times while the software is being removed:

```
unable to identify boot disk
```

This message can safely be ignored.

If any Pillar Axiom LUN is busy during the uninstall (which is always the case if the system is booted from a Pillar Axiom LUN) an error message will be displayed during the uninstall for each busy LUN as follows:

```
Method error (/usr/lib/methods/ucfgdevice):
    0514-062 Cannot perform the requested function because
    the specified device is busy.
```

In this case, after the reboot some configuration commands will cause error messages. For example:

```
# lsdev -c disk
lsdev: 0514-521 Cannot find information in the predefined
device
configuration database for the customized device
hdisk7.
hdisk0 Available 06-08-01-3,0 16 Bit LVD SCSI Disk Drive
hdisk1 Available 06-08-01-4,0 16 Bit LVD SCSI Disk Drive
hdisk6 Available 07-08-02 Other FC SCSI Disk Drive
hdisk7 Defined 07-09-02 N/A
hdisk8 Available 07-08-02 Other FC SCSI Disk Drive
```

To correct this, simply follow the instructions below to install the APM software package again and immediately remove it again. You do not need to make any changes to the SAN configuration.

Important! Do not reboot the host during this sequence.

- 1 Follow the steps in [Install the Pillar Axiom Path Manager Software](#). Do not reboot the host when instructed to do so.
- 2 Follow the steps above to remove the package again. You do not need to reboot the host at the end.

The configuration commands will no longer produce errors. For example:

```
# lsdev -c disk
hdisk0 Available 06-08-01-3,0 16 Bit LVD SCSI Disk Drive
hdisk1 Available 06-08-01-4,0 16 Bit LVD SCSI Disk Drive
hdisk6 Available 07-08-02 Other FC SCSI Disk Drive
hdisk8 Available 07-08-02 Other FC SCSI Disk Drive
```

CHAPTER 3

Pillar Axiom Path Manager Release Notes

New in this Release

The following features are new in this release:

- Support for AIX 7.1
- Support for PowerHA 6.1 and PowerHA System Mirror releases 6.1 and 7.1
- Instructions for installing or updating software without rebooting
- Corrections for known issues

Known APM Issues

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

Table 5 Known issues

Issue	Workaround or planned fix
If an iSCSI initiator name is configured in AIX using a string in a format other than that defined by RFC 3722, APM will not correctly associate that initiator name with the host entry in the Pillar Axiom Storage Services Manager.	Use the normalized and generalized character set specified by RFC 3722 when configuring iSCSI initiator names in AIX.

Known Pillar Axiom Issues

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

Table 6 Known Pillar Axiom issues

Issue	Workaround or planned fix
<p>When a Fibre Channel HBA is removed from a host running APM, it remains associated with that host.</p> <p>If the HBA is moved to a host that is either not running APM or on which APM is shown as not communicating with the Pillar Axiom Pilot, any LUNs mapped to the host will continue to be accessible through the HBA ports. The GUI and CLI will continue to report the HBA as being present in the original host.</p> <p>If the HBA is moved to a host where APM is running and communicating with the Pilot, its association and mappings for the old host will be removed, and the mappings for the new host will be applied.</p>	<p>This issue is fixed in release 4.0 of the Pillar Axiom software.</p>
<p>If you use the GUI or CLI to change the default configured Slammer control unit (CU) of a LUN to the other CU on the Slammer, the Slammer port mask for the LUN will be reversed. For example, if CU0 Port 0 is enabled and Port 1 is excluded, and the LUN is moved to CU1, then CU1 Port 0 will become excluded and CU1 Port 1 will become enabled.</p>	<p>This issue is fixed in release 4.0.0 of the Pillar Axiom software.</p> <p>If the Pillar Axiom system is running a release earlier than 4.0.0, after you change the default configured Slammer CU for a LUN, be sure to update the LUN port mask to the required value.</p>
<p>If an APM host uses iSCSI to connect to a Pillar Axiom system, and it uses an iSCSI initiator name that is the same as its host name, then the entry for that host in the Pillar Axiom Storage Services Manager will be continually</p>	<p>This issue is fixed in release 4.1 of the Pillar Axiom software.</p> <p>If the Pillar Axiom system is running a release earlier than 4.1, ensure that the iSCSI initiator names configured on</p>

Table 6 Known Pillar Axiom issues (continued)

Issue	Workaround or planned fix
<p>deleted and recreated, causing the host entry to disappear and reappear intermittently.</p>	<p>hosts that use iSCSI to connect to a Pillar Axiom system are different from all host names used by APM hosts, including virtual machine hosts, connected to that Pillar Axiom system. The iSCSI standards require that iSCSI names follow particular formats, as specified in RFC 3720: (http://tools.ietf.org/html/rfc3720#section-3.2.6).</p> <p>If hosts are configured to use iSCSI initiator names that conform to these requirements, it is extremely unlikely that they will be the same as any host name.</p>
<p>If all paths to a LUN's configured Slammer control unit (CU) fail, APM will re-route all traffic through the non-optimized paths to the LUN's alternate CU. In response, the Pillar Axiom system will initially log events indicating non-optimized access, then when this traffic continues it will temporarily move the LUN to the alternate CU. This process leaves the host using optimized paths to the LUN, but the LUN is resident on a CU other than its configured home.</p> <p>Normally, the system will attempt to move the LUN back to its configured CU from time to time, and if the paths to the other CU have recovered the traffic will transfer back and the system returns to its normal configured state. However, if the Pilot software is restarted while a LUN is in this temporary state, as might happen during a software update that includes the option to update the Pilot software, two problems occur:</p> <ol style="list-style-type: none"> 1 The graphical user interface (GUI) and command line interface (CLI) wrongly report that the 	<p>This issue is fixed in release 4.0 of the Pillar Axiom software.</p>

Table 6 Known Pillar Axiom issues (continued)

Issue	Workaround or planned fix
<p>LUN's current CU is its configured CU.</p> <p>2 Non-optimized access events are no longer logged for the LUN, and the system does not attempt to move the LUN back to its configured CU.</p> <p>If subsequent path failures and recoveries cause traffic to be sent to the CU on which the LUN is not resident, the system will not move the LUN to the CU receiving the traffic. This means that all traffic to the LUN would have non-optimized access, which decreases performance, and this non-optimized access would not be logged.</p>	
<p>When a LUN is created on a Pillar Axiom system, its load balancing attribute is set to round-robin by default. If the LUN is then mapped to a host running APM, the load balancing attribute setting can change to static when APM on the host first communicates with the Pillar Axiom system after detecting the LUN. Instead, this attribute should be set to round-robin when the LUN is first created, and should change only if an administrator changes it using the GUI or CLI.</p>	<p>This issue is fixed in Pillar Axiom software release 4.0. If the Pillar Axiom system is running a release earlier than 4.0, check that the load balancing attribute for the LUN is still set to the desired value after APM on the host has detected the LUN and its LUN name on Host has been reported in the GUI. If the setting has changed, change it back to the desired value, which can then be correctly saved.</p>
<p>If an iSCSI initiator is added to a SAN host that has authentication enabled, authentication will not be enabled for that initiator. Also, if an iSCSI initiator with authentication enabled on a previous SAN host is moved to another host with or without authentication enabled, the initiator will retain its original configuration.</p>	<p>This issue is fixed in Pillar Axiom software release 4.0.</p> <p>If the Pillar Axiom system is running a release earlier than 4.0, disable then re-enable authentication for the host after iSCSI initiators are added to or moved between SAN hosts.</p>

Table 6 Known Pillar Axiom issues (continued)

Issue	Workaround or planned fix
The GUI and CLI may show incorrect link speeds for SAN hosts with 8 Gb/s HBAs.	This issue is fixed in release 4.1 of the Pillar Axiom software.
After recovery from a Slammer control unit (CU) failure, the Pillar Axiom system may become incapable of automatically moving LUNs between the CUs on that Slammer. When the system attempts to move the LUNs automatically in response to non-optimized access from a host, the attempts fail, and non-optimized access persists.	<p>This issue is fixed in release 4.1 of the Pillar Axiom software.</p> <p>If the Pillar Axiom system is running a release earlier than 4.1, use the GUI or CLI to re-assign the LUNs to the CUs through which access is currently taking place. Alternatively, restart the Pillar Axiom system to restore optimized access.</p>
When an iSCSI initiator name is changed or removed on an APM host, the GUI and CLI may continue to associate the old name with the host.	<p>This issue is fixed in release 4.2 of the Pillar Axiom software.</p> <p>If the Pillar Axiom system is running a release earlier than 4.2:</p> <ol style="list-style-type: none"> 1 Stop the APM daemon on the host. 2 When the Pillar Axiom system reports the host as Not Connected, delete the host. <p>This will preserve LUN mappings to the initiators.</p> <ol style="list-style-type: none"> 3 Restart the APM daemon.
When a Pilot restart occurs on a Pillar Axiom system running release 4.0 (4.0.4 or later) or release 4.1 (4.1.0 or later) of the Pillar Axiom software, all LUNs on the system move from their current Slammer control unit (CU) to the other Slammer CU. As a result, the optimization of all paths to the LUNs changes.	<p>This issue is fixed in release 4.1.4 of the Pillar Axiom software.</p> <p>If the Pillar Axiom system is running a release earlier than 4.1.4, and if all relevant SAN hosts have paths to both CUs on the Slammers, and those paths are managed by an ALUA-aware path management system such as Pillar Axiom Path Manager, it should not be necessary to take any action. The LUNs will remain balanced across the CUs, and the path management software will ensure that only optimized paths to the LUNs are used. Be aware</p>

Table 6 Known Pillar Axiom issues (continued)

Issue	Workaround or planned fix
<p>Note: A non-disruptive upgrade to release 4.0 (4.0.4 or later) or release 4.1 (4.1.0 or later) of the Pillar Axiom software will cause a Pilot restart, which will trigger this problem.</p>	<p>that traffic may be moved to alternate paths when a Pilot restart occurs. Other hosts may need their path configuration to be changed to ensure that they access each LUN through its new current home CU. Alternatively, all LUNs can be moved back to their default configured CU by restarting the Pillar Axiom system.</p>
<p>The load balancing configuration displayed in the GUI or CLI can be different from the load balancing setting that the Pillar Axiom system sends to APM on the SAN host. This happens because, occasionally in the course of updating its configuration records to describe the new host, the Pillar Axiom system creates duplicate internal records.</p>	<p>This issue is fixed in Release 4.2.3 and later of the Pillar Axiom software.</p>
<p>A change in the number of reported iSCSI initiator IQNs can cause the loss of all SAN Zonings.</p> <p>If an APM host connects to the Pillar Axiom system using more than one iSCSI Initiator name, and is subsequently reconfigured to have fewer iSCSI Initiator names, some or all LUN mappings over iSCSI to that host may be lost. The Pillar Axiom Storage Services Manager will still show iSCSI mappings to the host, but these mappings will not be activated and the host will be unable to access the LUNs over some or all iSCSI connections.</p>	<p>This issue is fixed in release 4.3 of the Pillar Axiom software.</p> <p>If the Pillar Axiom system is running a release earlier than 4.3, use the Axiom GUI or CLI to delete the mappings to the host for the affected LUNs, and then recreate the mappings.</p>
<p>In the GUI, LUN host connections in a disconnected state may display Protocol Disabled instead of Not Connected status in the View Connections screen.</p>	<p>This issue is fixed in release 4.3 of the Pillar Axiom software.</p>
<p>When a LUN connection protocol has been disabled, the connection status for</p>	<p>This issue is fixed in release 4.0 of the Pillar Axiom software.</p>

Table 6 Known Pillar Axiom issues (continued)

Issue	Workaround or planned fix
the LUN that appears in the Pillar Axiom GUI will be invalid.	If the Pillar Axiom system is using a release earlier than 4.0, ignore the protocol-specific connection status of any LUN for which that connection protocol has been disabled.
If an iSCSI initiator is connected to port on a Slammer, and that Slammer is failed over, the LUN and Host GUI pages continue to show the connection status for the iSCSI initiator as Connected.	This issue will be fixed in a future release of the Pillar Axiom software.
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 Axiom will continually move between <i>Communicating</i> and <i>Not Communicating</i> 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.	This issue will be fixed in a future release of the Pillar Axiom software.
When a Fibre Channel (FC) HBA is replaced or removed from an APM host, and the Pillar Axiom system is running release 4.0 or later, the LUN mappings are removed from all FC ports in the host. The mappings still appear in the GUI to be mapped to the host but they are not actually mapped to the host's FC ports.	<ol style="list-style-type: none"> 1 Before removing the old HBAs, stop the APM daemon and delete the host entry in the Pillar Axiom system. 2 Create a temporary host entry in the Pillar Axiom system and associate the old HBAs with it. 3 Make the changes to the HBAs in the host. 4 Add all the HBAs now in the host to the temporary host entry created in step 2.

Table 6 Known Pillar Axiom issues (continued)

Issue	Workaround or planned fix
	<p>5 Start the APM daemon on the host. Choose one of:</p> <ul style="list-style-type: none">• Reboot the host.• Restart the daemon if the host was not shut down. <p>Once the daemon connects to the Pillar Axiom system, it will recreate its host entry and transfer the mappings from the temporary entry created in step 2.</p> <p>6 Delete the temporary host entry created in step 2.</p> <p>This issue will be fixed in a future release of the Pillar Axiom software.</p>

Resolved APM Issues

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

Table 7 Resolved issues

Issue
APM sometimes failed to respond in a reasonable time to changes in path optimization, causing NOAs and LUNs to appear on the wrong Slammer control unit (CU).
The full performance benefits of a new version of APM were not realized after upgrading from a previous version because the NACA setting that was turned off during the previous installation remained off.
Uninstalling and upgrading APM for AIX left ODM entries behind in the PdPathAt class, causing entries to accumulate unexpectedly.
A user login language setting other than <code>en-us</code> caused the AIX host not to display a description of Pillar Axiom disks in <code>lsdev</code> .
The System Management Interface Tool (SMIT) page displayed incorrect path information for Pillar Axiom LUNs.
The APM driver caused a kernel memory leak and stopped updating LUN information for the host in the Pillar Axiom graphical user interface (GUI) or command line interface (CLI) when all Pillar Axiom disks were removed and recreated.
APM installed successfully on a system without the <code>devices.common.IBM.fc.hba-api</code> package installed, though the APM daemon required that package.
Occasionally the APM daemon would exit unexpectedly immediately after being started, creating a <code>coredump</code> file.
APM information returned by the Pillar Axiom GUI and CLI for an AIX host running APM includes LUN name and number of optimized and non-optimized paths to the LUN. However, the information displays reliably for up to 50 LUNs only.
If an FC dynamic tracking event occurs while a LUN is open but no user I/O is happening (for example, if dynamic tracking is enabled for an FC controller, a volume group on a LUN is varied on, and a cable from the Slammer is moved to a

Table 7 Resolved issues (continued)

Issue
different port on a switch) then paths to the LUN may be marked as failed and remain failed until the LUN is closed.

Additional Notes

Switch Login Mode Changes

Occasionally, a supported IBM Fibre Channel host bus adapter (HBA) logs into the switch in loop mode instead of fabric mode. When this happens, AIX cannot communicate using the HBA.

To correct this problem, lock the switch port into F-port mode.

cfmgr

Occasionally, the AIX `cfmgr` command does not detect and enable all available paths to devices such as Pillar Axiom LUNs when it runs.

It may be necessary to run `cfmgr` more than once for it to bring all LUNs and paths online.

Index

A

additional notes *59*

AIX

- bootlist considerations *36*
- supported versions *11*

APM

- control path *14*
- data path *15*
- definition *16*
- features *16*
- how to
 - confirm software installation *31*
 - download software *27*
 - install on bootable Pillar Axiom LUN *36*
 - install software *29*
 - remove software *46*
 - uninstall software *46*
 - upgrade software *43*
- install on Virtual I/O Server *38*
- interaction with Pillar Axiom *12*
- known issues *49*
- operating limits *20*
- Virtual I/O Server *19*

audience *8*

B

boot from SAN

- about *18*
- how to
 - clean install from CD *34*
 - clone existing boot disk *35*

bootlist

- considerations *36*

C

Cisco MDS switch

- configure *29*

configure

- SAN on the Pillar Axiom *28*

contact information *9*

contacts, Oracle *9*

customer support *9*

D

documentation *9*

- accessing *8*
- feedback *9*

download

- APM software *27*

E

education programs *9*

experience

- required *8*

F

features

- APM *16*
- new in this release *48*

feedback, documentation *9*

Fibre Channel

- iSCSI-to-FC routers *23*
- protocol *21*
- supported HBAs *21*
- supported switches *22*

H

HBAs

- Fibre Channel *21*
- iSCSI *23*

host

- rename *42*

I

install APM software *29*

install APM software without rebooting *30*

install boot from SAN

- how to
 - clean install from CD *34*
 - clone existing boot disk *35*
 - install APM on bootable LUN *36*

install Pillar Axiom Path Manager software without rebooting *30*

iSCSI

- how to

- configure Cisco MDS switch *29*
- configure iSCSI-to-FC router *29*
- protocol *21*
- supported HBAs *23*
- supported routers *23*
- supported switches *23*
- iSCSI HBA
 - name *25*
- iSCSI initiator
 - name *25*
- iSCSI-to-FC router
 - configure *29*
- issues
 - additional notes *59*
 - APM *49*
 - Pillar Axiom *50*
 - resolved *57*

L

- load balancing configuration
 - round-robin *39*
 - static *39*

N

- name
 - iSCSI HBA *25*
 - iSCSI initiator *25*
- new in this release *48*
- no reboot *30*

O

- online documents *8*
- online help *9*
- Oracle Technical Network (OTN) *9*

P

- Pillar Axiom
 - interaction with APM *12*
 - known issues *50*
- product support *9*

R

- release notes
 - additional notes *59*
 - APM issues *49*
 - Pillar Axiom issues *50*
 - resolved issues *57*
- rename host *42*
- requisite reading *8*
- resolved issues *57*
- round-robin load balancing *39*
- routers
 - iSCSI-to-FC *23, 29*

S

- sales information *9*

- SAN
 - how to
 - configure on the Pillar Axiom *28*
- SAN protocols *21*
- software (APM)
 - confirm installation *31*
 - download *27*
 - install *29*
 - remove *46*
 - upgrade *43*
- static load balancing *39*
- Support portal *9*
- switches
 - Cisco MDS *29*
 - Fibre Channel *22*
 - iSCSI *23*

T

- technical documents
 - accessing *8*
- technical support *9*
- training programs *9*

U

- upgrade APM software *43*

V

- Virtual I/O Server
 - install APM *38*
- Virtual I/O Server
 - about *19*