HP OpenVMS Software-Based iSCSI Initiator Technology Demonstration Kit Configuration and User's Guide

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This manual describes how to configure and use the HP OpenVMS Software-Based iSCSI Initiator Technology Demonstration Kit.

Revision/Update Information:	This is a new manual.
Software Version:	OpenVMS Version 8.3–1H1 for Integrity servers

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Preface

Intended Audience

This manual is intended for users of the HP OpenVMS Software-Based iSCSI Initiator Technology Demonstration Kit. Read this manual before you configure or use the iSCSI Initiator Technology Demonstration Kit.

Document Structure

This manual contains the following chapters:

- Chapter 1 provides an overview of iSCSI.

- Chapter 2 describes the hardware and software requirements for using the OpenVMS Software-Based iSCSI Initiator.

- Chapter 3 describes how to install and configure mpx100 targets.

- Chapter 4 describes how to configure and enable the OpenVMS Software-Based iSCSI Initiator.

- Chapter 5 describes how to configure the EVA storage controller and provides references for more information.

- Chapter 6 contains checklists for configuring the OpenVMS Software-Based iSCSI Initiator.

Related Documents

Following is a list of additional documents that are available in support of the iSCSI Initiator Technology Demonstration Kit.

- Internet Small Computer Systems Interface (iSCSI): RFC 3270

- Service Location Protocol: RFC 2608

- Internet Storage Name Service (iSNS): RFC 4171

- *HP StorageWorks EVA iSCSI Connectivity User Guide*, Fifth edition

For additional information about HP OpenVMS products and services, see the HP OpenVMS Systems website:

`http://www.hp.com/go/openvms`

Reader's Comments

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How to Order Additional Documentation

For information about how to order additional documentation, see the HP OpenVMS Systems Documentation Ordering page:

http://www.hp.com/go/openvms/doc/order

Conventions

The following conventions may be used in this manual:

Ctrl/*x*	A sequence such as Ctrl/*x* indicates that you must hold down the key labeled Ctrl while you press another key or a pointing device button.
PF1 *x*	A sequence such as PF1 *x* indicates that you must first press and release the key labeled PF1 and then press and release another key or a pointing device button.
Return	In examples, a key name enclosed in a box indicates that you press a key on the keyboard. (In text, a key name is not enclosed in a box.)
	In the HTML version of this document, this convention appears as brackets, rather than a box.
. . .	A horizontal ellipsis in examples indicates one of the following possibilities:
	• Additional optional arguments in a statement have been omitted.
	• The preceding item or items can be repeated one or more times.
	• Additional parameters, values, or other information can be entered.
. . .	A vertical ellipsis indicates the omission of items from a code example or command format; the items are omitted because they are not important to the topic being discussed.
( )	In command format descriptions, parentheses indicate that you must enclose choices in parentheses if you specify more than one.
[ ]	In command format descriptions, brackets indicate optional choices. You can choose one or more items or no items. Do not type the brackets on the command line. However, you must include the brackets in the syntax for OpenVMS directory specifications and for a substring specification in an assignment statement.

| | In command format descriptions, vertical bars separate choices within brackets or braces. Within brackets, the choices are optional; within braces, at least one choice is required. Do not type the vertical bars on the command line. |

{ } — In command format descriptions, braces indicate required choices; you must choose at least one of the items listed. Do not type the braces on the command line.

bold type — Bold type represents the introduction of a new term. It also represents the name of an argument, an attribute, or a reason.

italic type — Italic type indicates important information, complete titles of manuals, or variables. Variables include information that varies in system output (Internal error *number*), in command lines (/PRODUCER=*name*), and in command parameters in text (where *dd* represents the predefined code for the device type).

Example — This typeface indicates code examples, command examples, and interactive screen displays. In text, this type also identifies URLs, UNIX commands and pathnames, PC-based commands and folders, and certain elements of the C programming language.

UPPERCASE TYPE — Uppercase type indicates a command, the name of a routine, the name of a file, or the abbreviation for a system privilege.

- — A hyphen at the end of a command format description, command line, or code line indicates that the command or statement continues on the following line.

numbers — All numbers in text are assumed to be decimal unless otherwise noted. Nondecimal radixes—binary, octal, or hexadecimal—are explicitly indicated.

1
Overview

This chapter provides an overview of the iSCSI standard.

1.1 What Is iSCSI?

Internet Small Computer Systems Interface, or iSCSI, is an emerging Internet Protocol-based storage interconnect standard developed by the Internet Engineering Task Force (IETF). Like Fibre Channel, iSCSI is one of a number of standards developed to map the SCSI protocol over a particular transport mechanism.

iSCSI is modeled as a client/server architecture. In this architecture, the client uses encapsulated SCSI commands to request service from a data storage device (the server). In iSCSI terminology, the client is known as the "initiator" and the server is known as the "target." Beginning with OpenVMS Version 8.3-1H1, OpenVMS includes a Software-Based iSCSI Initiator Technology Demonstration Kit (TDK). This kit provides a low-performance iSCSI initiator intended to give OpenVMS users a low-cost avenue for gaining experience with the iSCSI technology.

1.2 Implementing iSCSI

iSCSI can be implemented either with hardware acceleration or simply by using the existing TCP/IP stack and network interface cards (NICs) available on the target operating system. The TDK provides an iSCSI solution that uses the latter methodology.

The OpenVMS Software-Based iSCSI Initiator sits between the user-level application and an interface into the TCP/IP stack. It is responsible for receiving application requests and encapsulating them as proper iSCSI packets. These packets are then supplied to the TCP/IP stack for transmission over the network to the target. Packets received from iSCSI targets are fed back through the TCP/IP stack to the iSCSI initiator. The initiator is responsible for unpacking these packets, processing them as necessary and returning the results to the user´s application.

The iSCSI solution supplied in the TDK is intended for users who require inexpensive, low-performance access to their existing Fibre Channel storage area network (SAN). This storage access option is appropriate for nodes that do not currently have access to the SAN because of such variables as the high cost of a Fibre Channel adapter or the node´s proximity to the SAN itself.

2
iSCSI System Requirements

This chapter describes the hardware and software requirements for using the OpenVMS Software-Based iSCSI Initiator.

2.1 Hardware Requirements

The following sections describe hardware requirements for using iSCSI.

2.1.1 Architecture

The software supplied in the TDK is supported on both Alpha and I64 architectures. Note that because OpenVMS Version 8.3-1H1 is an I64-only release, Alpha support will not be made available until the next Alpha release.

2.1.2 iSCSI Targets

At this time, the only supported iSCSI target is the HP StorageWorks EVA iSCSI Connectivity Option (mpx100). The mpx100 provides iSCSI access to EVA-based storage.

2.1.3 NICs

The platform on which the initiator is installed must contain at least one supported NIC. Though not required, HP strongly recommends that the NIC be capable of and configured for a minimum link speed of 1Gb.

2.1.4 Network Switches

For best performance, the network switches to which the iSCSI-related NICs are connected require the following capabilities:

- Support for the maximum link speed of the NICs
- Support for jumbo frames
- Support for VLANs

2.2 Software Requirements

The following sections describe software requirements for using iSCSI.

2.2.1 OpenVMS Version

The OpenVMS Software-Based iSCSI Initiator TDK is available on OpenVMS Version 8.3-1H1 and later. Because OpenVMS Version 8.3-1H1 is an I64-only release, Alpha support will be available with the next Alpha release.

2.2.2 TCP/IP Services

The OpenVMS Software-Based iSCSI Initiator utilizes HP TCP/IP Services for OpenVMS. Non-HP TCP/IP products are not supported and do not work with the initiator.

3
Configuring iSCSI Targets

Before you configure and load the initiator software on the OpenVMS hosts, you must install and configure the mpx100. The following sections give a brief overview of the mpx100 installation. For connectivity rules and complete instructions on installing and configuring the mpx100, see the *HP StorageWorks EVA iSCSI Connectivity User Guide*.

The mpx100 is currently the only iSCSI target supported for use with the OpenVMS Software-Based iSCSI Initiator. The mpx100 provides for iSCSI connectivity to the EVA family of Fibre Channel storage arrays. The complete solution uses the mpx100 hardware along with a supported EVA storage array, the Command View EVA management software, and the HP StorageWorks mpx Manager GUI.

3.1 mpx100 Installation and Configuration Considerations

The following sections describe some of the significant issues to consider before you install and configure the mpx100.

3.1.1 Direct-Connect and Fabric-Attach Configurations

OpenVMS supports the mpx100 in both direct-connect and fabric-attach configurations. With direct connect, the mpx100 (or the redundant mpx100 pair) is directly connected to the host ports of the EVA´s HSV controllers. When connected in this fashion, those host ports are no longer connected to the SAN and therefore are available only for iSCSI traffic.

In fabric-attach configurations, the mpx100 Fibre Channel ports are connected to SAN switch ports. Thus, the EVA host ports are shared between the mpx100 and other members of the SAN. Note that an mpx100 (or a redundant mpx100 pair) is allowed to provide connectivity to only a single EVA storage system. Additionally, each mpx100 Fibre Channel port is allowed to connect to a maximum of one EVA port. Therefore, when using fabric-attach mode, the mpx100 Fibre Channel ports must be configured or zoned to see a single EVA port.

3.1.2 mpx100 Management Port

Communication between the mpx100 and both Command View EVA and the HP StorageWorks mpx Manager GUI occurs via the mpx100´s IP management port. Note that a fixed IP address is required for the management port. OpenVMS currently does not support the use of DHCP for the mpx100´s management port.

3.1.3 mpx100 Firmware

The latest available mpx100 firmware should be installed prior to utilizing the device. The firmware can be downloaded from the HP StorageWorks EVA iSCSI Connectivity Option page on the HP website:

```
http://www.hp.com
```

The mpx100 firmware can be updated using either the HP StorageWorks mpx Manager GUI (available for download from the HP website) or the mpx100´s CLI.

Complete instructions for performing the update can be found in the *HP StorageWorks EVA iSCSI Connectivity User Guide*.

3.1.4 mpx100 iSCSI Ports

Each of the two iSCSI ports on the mpx100 requires a fixed IP address, a subnet mask, and (if appropriate) a gateway IP address. Additional elements to consider when configuring the mpx100 TCP/IP ports include the following:

- VLAN: If you use a Virtual LAN (VLAN) for iSCSI traffic, configure the iSCSI ports with the chosen VLAN ID number. For additional information, see Section 4.2.

- iSNS: The OpenVMS Software-Based iSCSI Initiator supports two methods for target discovery: manual and iSNS (see Section 4.4). If you use iSNS, configure each of the mpx100´s two iSCSI ports with the IP address of the iSNS server.

  Additionally, if you use iSNS on mpx100s that are in a redundant configuration (two mpx100s providing connectivity to the same EVA), give each mpx100 a unique symbolic name and enable the "IQN uses Symbolic Name" option. This ensures that the two mpx100s register unique target names with the iSNS server. Failure to perform this step results in unreliable storage discovery and configuration. For more information about iSNS, see Section 4.4.2.

- Ethernet jumbo frames: In most environments Ethernet jumbo frames improve the performance of iSCSI. Jumbo frames allow more data to be carried by each TCP/IP packet, thereby cutting down on TCP/IP overhead. If you use jumbo frames, configure each OpenVMS host, each network switch between the host and target, and each of the mpx100´s iSCSI ports to use jumbo frames.

- Additional settings: The OpenVMS Software-Based iSCSI initiator does not currently support header/data digests or CHAP (Challenge-Handshake Authentication Protocol). Do not enable these iSCSI port settings on the mpx100.

4

Configuring the Initiator

Beginning with OpenVMS Version 8.3-1H1, the OpenVMS Software-Based iSCSI Initiator TDK is included as part of the standard OpenVMS installation. The following sections describe the requirements for configuring and enabling the initiator.

4.1 Configuring TCP/IP Services for OpenVMS

Before starting the iSCSI initiator, TCP/IP Services for OpenVMS must be properly configured and enabled. As indicated in Section 2.2.2, the initiator functions only with the TCP/IP stack provided by HP TCP/IP Services for OpenVMS. Only the basic TCP/IP core functionality needs to be configured.

Pay particular attention to the system´s host name, which is a defining element in the iSCSI initiator name (a unique name assigned to each host running the iSCSI initiator software). TCP/IP must be running and the host name must be set before the iSCSI initiator is loaded. For complete information about configuring TCP/IP Services, see *HP TCP/IP Services for OpenVMS Installation and Configuration*.

4.2 VLANs

Though not mandatory, if the initiator will be operating on a shared network (a network not dedicated solely to storage), HP suggests that storage traffic be isolated to a dedicated Virtual LAN (VLAN). The VLAN logically isolates storage traffic into its own subnet.

To configure and utilize a VLAN, the hosts, network switches, and targets must all support IEEE 802.1Q. For information about configuring VLANs on the OpenVMS hosts, see the *HP OpenVMS Version 8.3 New Features and Documentation Overview* and the *HP OpenVMS System Management Utilities Reference Manual*. For information about configuring VLANs on the network switches, see your switch manufacturer´s documentation. VLAN configuration on the mpx100 targets is performed during their installation and configuration (see Section 3.1.4).

4.3 Ethernet Jumbo Frames

If you use Ethernet jumbo frames for iSCSI traffic, you must enable them on the initiators (OpenVMS hosts), network switches, and targets. To enable jumbo frames systemwide on an OpenVMS host node using the LAN_FLAGS system parameter, see the *HP OpenVMS System Management Utilities Reference Manual*. To enable jumbo frames on a per-device basis, see the *HP OpenVMS System Manager´s Manual*.

4.4 Target Discovery

The OpenVMS Software-Based iSCSI Initiator supports two target-discovery mechanisms: manual and iSNS. At least one of these methods must be configured on each iSCSI-enabled OpenVMS host.

4.4.1 Manual Target Discovery

With manual target discovery, the initiator is supplied with a list of IP addresses for each iSCSI target port. Each mpx100 has two iSCSI target ports (the management port is not an iSCSI target port). An initiator using this discovery method periodically polls each target port in its manual discovery list to gather a list of accessible storage devices.

To create a manual target list,
copy the SYS$COMMON:[SYSMGR]ISCSI$MANUAL_TARGETS.TEMPLATE
file to the SYS$COMMON:[SYSMGR]ISCSI$MANUAL_TARGETS.DAT directory.
(You can use the directory SYS$SPECIFIC:[SYSMGR] if the file is to be node specific rather than clusterwide). Edit the new file and add a list of the IP names or addresses of the iSCSI target ports to probe for available storage devices. The header included in this file defines the proper format for these addresses.

---------------------------------- **Note** ----------------------------------

- Regardless of whether IP addresses or IP names are used in the manual target data file, every iSCSI target port must be known to TCP/IP. Use the TCPIP SHOW HOST command to determine whether the target port is known to TCP/IP. To add the host to the local TCP/IP hosts database, use the TCPIP SET HOST command. The iSCSI initiator does not probe ports not known to TCP/IP.

- The default TCP/IP port used for iSCSI traffic is 3260. If a nondefault port is to be used, the addresses listed in the manual targets file must include the port number. The header included in this file defines the format that must be used when including a port number. There is no need to include the port number if the default is used.

  Additionally, if a nondefault port number is to be used, the iSCSI ports on the mpx100 must be configured with that nondefault port number. For additional information, see the *HP StorageWorks EVA iSCSI Connectivity User Guide*.

- The OpenVMS Software-Based iSCSI Initiator does not currently support IPv6. All IP addresses must be IPv4.

The manual target list is automatically loaded when the iSCSI initiator is started. By default, changes to this file do not take effect until the system is rebooted or until the initiator is stopped and restarted. To manually force the initiator to recognize additions to the manual target list while the initiator is running, enter the following command:

```
$ mcr iscsi$control_program manual
```

Target ports that were added to this file since the initiator was started are added to the list of target ports that are periodically scanned by the initiator. Note that target ports that were removed from this file are not removed from the initiators scan list until the system is rebooted or until the initiator is stopped and restarted.

4.4.2 iSNS Target Discovery

The Internet Storage Name Service (iSNS) protocol provides a target discovery mechanism similar to the discovery services found in Fibre Channel. Among the capabilities provided by iSNS is the ability for storage targets to register with an iSNS server. Acting as iSNS clients, initiators are then able to query this server to retrieve a list of potential targets. The initiator can use this list to query the individual targets to find their storage devices.

The use of iSNS requires the availability of an iSNS server that is network accessible by both the storage targets and the initiators (OpenVMS hosts). Currently, the Microsoft® iSNS Server is the only iSNS server supported for use with the OpenVMS Software-Based iSCSI Initiator.

To use iSNS target discovery, both the initiators and targets must be properly configured with the IP address of the iSNS server. For information about how to configure the mpx100 for iSNS, see Section 3.1.4 and the *HP StorageWorks EVA iSCSI Connectivity User Guide*.

To configure the OpenVMS initiators for iSNS, copy the SYS$COMMON:[SYSMGR]ISCSI$ISNS_SERVERS.TEMPLATE file to the SYS$COMMON:[SYSMGR]ISCSI$ISNS_SERVERS.DAT directory. (You can use the SYS$SPECIFIC:[SYSMGR] directory if the file is to be node-specific rather than clusterwide.) Edit the new file and add a list of the IP names or addresses of the iSNS servers to probe for available targets. The header included in this file defines the proper format for these addresses.

_____ **Note** _____

- Regardless of whether IP addresses or IP names are used in the iSNS server data file, every iSNS server listed must be known to TCP/IP. Use the TCPIP SHOW HOST command to determine whether the server is known to TCP/IP. To add the server to the local TCP/IP hosts database, use the TCPIP SET HOST command. The iSCSI initiator does not query a server not known to TCP/IP.

- The default TCP/IP port used for iSNS traffic is 3205. This port number cannot be configured.

- The OpenVMS Software-Based iSCSI Initiator does not currently support IPv6. All IP addresses must be IPv4.

_____

The iSNS server list is automatically loaded when the iSCSI initiator is started. By default, changes to this file do not take effect until the system is rebooted or until the initiator is stopped and restarted. To manually force the initiator to recognize additions to the iSNS server list while the initiator is running, enter the following command:

```
$ mcr iscsi$control_program isns
```

iSNS servers that were added to this file since the initiator was started are added to the list of servers that are periodically queried by the initiator. Note that servers that were removed from this file are not removed from the initiators scan list until the system is rebooted or the initiator is stopped and restarted.

4.5 Starting the iSCSI Initiator

After configuring the hosts and targets, start the OpenVMS Software-Based iSCSI Initiator by executing the DCL command procedure SYS$STARTUP:ISCSI$INITIATOR_STARTUP.COM. To start the iSCSI initiator each time the host is booted, add the following line to SYS$MANAGER:SYSTARTUP_VMS.COM:

```
$ @SYS$STARTUP:ISCSI$INITIATOR_STARTUP.COM
```

Note that TCP/IP must be fully loaded before the iSCSI initiator is started.

4.6 Stopping the iSCSI Initiator

Generally, you do not need to stop the iSCSI initiator after it has been loaded. However, if you need do so, run the DCL command procedure SYS$STARTUP:ISCSI$INITIATOR_SHUTDOWN.COM.

Note that if TCP/IP Services is stopped on a system running the iSCSI initiator, the initiator is automatically stopped and unloaded as part of the rundown of TCP/IP. After restarting TCP/IP, you must manually restart the iSCSI initiator as described in Section 4.5.

Note

HP strongly recommends that traffic to all iSCSI target storage devices be quieted prior to shutting down the initiator.

Note

Booting is not supported through OpenVMS Software-Based iSCSI Initiator disk paths.

5

Configuring EVA Storage

Once the iSCSI hosts and target mpx100s are configured, you must configure the EVA storage controller to recognize the mpx100, and new or existing logical unit numbers (LUNs) must be presented to the OpenVMS hosts (iSCSI initiators). The exact procedure for doing this varies depending on the version of Command View EVA that is in use. To configure EVA storage, see the *HP StorageWorks EVA iSCSI Connectivity User Guide*.

6

Configuration Checklists

The following procedures provide an overview of the OpenVMS Software-Based iSCSI Initiator configuration requirements and restrictions.

6.1 Network Services

Using jumbo frames?	If yes, ensure that all switches in host-to-target path are jumbo-frame capable. Configure according to manufacturer´s instructions.
Using VLANs?	If yes, ensure that all switches in the host-to-target path are VLAN capable. Select VLAN ID and configure the switches according to the manufacturer´s instructions.
Using iSNS?	If yes, install and configure a Microsoft iSNS server.

6.2 HP StorageWorks EVA iSCSI Connectivity Option (mpx100)

- Install according to the manufacturer´s instructions.
- Configure according to the user´s guide, including:
  - Update firmware (if necessary).
  - Management port static IP address (DHCP not supported).
  - Enable `IQN uses Symbolic Name´ and assign unique symbolic name (mandatory in redundant configuration when using iSNS).
  - Configure each iSCSI port. Note that OpenVMS does not support CHAP and header and data digests. .
    - IP address
    - Subnet mask
    - Gateway (if necessary)
    - iSNS IP address (optional)
    - VLAN ID (optional)
    - Enable jumbo frames (optional)

6.3 Fibre Channel SAN

- Zone mpx100 ports into the SAN per the mpx100 connectivity rules (fabric-attach mode only)

6.4 OpenVMS Host

- Configure TCP/IP:
    - Must use HP TCP/IP Services for OpenVMS .
    - IPv6 not supported.
- Configure VLANs (optional).
- Enable jumbo frames (optional).
- Create or configure manual targets file (if manual target discovery will be used):
    - IP names/addresses listed in this file must be known to TCP/IP stack (use TCPIP SET/SHOW HOST).
- Create or configure iSNS servers file (if iSNS target discovery will be used):
    - IP names/addresses listed in this file must be known to TCP/IP stack (use TCPIP SET/SHOW HOST).
- Add iSCSI startup command to system startup procedure:
    - Must be after startup of TCP/IP.

6.5 Configure EVA

- Use Command View EVA to discover mpx100s.
- Present new and existing LUNs to iSCSI initiators.

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