

iSCSI Boot from SAN



Configuration Setup Guide

Version 1.0

iSCSI Boot from SAN



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Version 1.0

Note

Before using this information and the product it supports, read the @server information in "Notices," on page 19.

First Edition (June 2006)

This edition applies to Version 1.0 of IBM iSCSI Boot from SAN (product number 0000-000) and to all subsequent releases and modifications until otherwise indicated in new editions.

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Preface

The iSCSI Boot from SAN Configuration Setup Guide supports Version 1.0 of the IBM® iSCSI Boot from SAN application. This application provides the capability to boot a blade server from an iSCSI target using the basic network interface cards (NICs) included on the blade. No additional hardware or adapters are required. When employing iSCSI Boot from SAN, you do not have to install an internal disk in the blade.

About this guide

The purpose of this guide is to provide users of the iSCSI Boot from SAN application:

- An overview of how to setup a basic iSCSI boot SAN configuration.
- Details of the boot operation.

Who should read this guide

This guide is for system programmers and users working in an IBM BladeCenter environment and using iSCSI Boot from SAN on supported blades in an IBM® BladeCenter® chassis.

Chapter 1. Introduction

This section provides a quick overview of iSCSI Boot from SAN configuration.

Note: IBM strongly recommends that you start with this reference implementation to validate the iSCSI boot process and then expand your SAN appropriate to your environment.

iSCSI Boot from SAN configuration - Basic components

Figure 1 shows the basic components required for an iSCSI Boot from SAN configuration. The primary components are:

- IBM® BladeCenter®
- IBM Blades, Model 8843
- iSCSI Target
- Console
- Dynamic Host Configuration Protocol (DHCP) Server (optional)
- iSCSI Configuration Manager

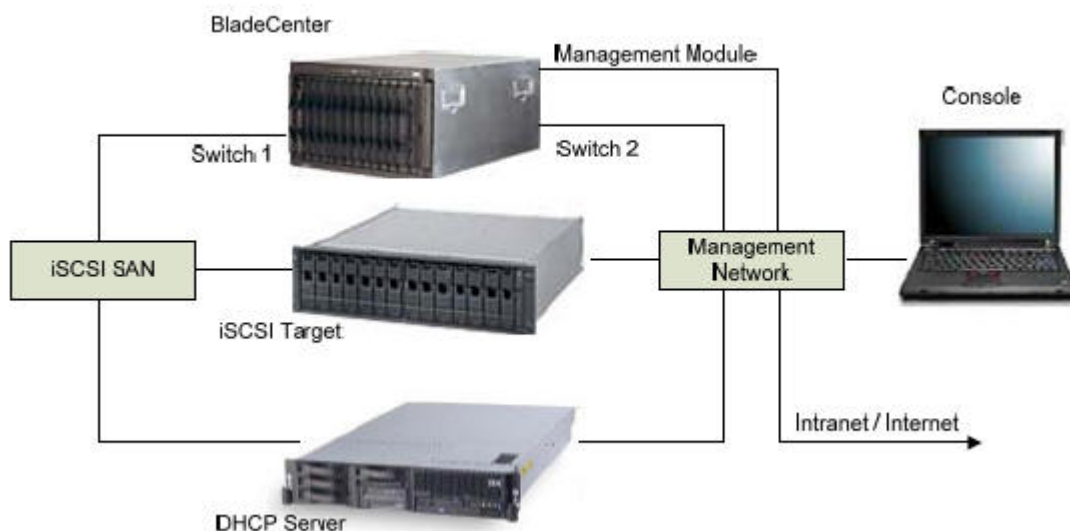


Figure 1. iSCSI Boot from SAN configuration - Basic components

The IBM BladeCenter contains a number of blades with no local disks. Each blade will boot from its own logical unit number (LUN) on the iSCSI target. The DHCP server provides network parameters. The console is used to manage the SAN.

For this introduction to the iSCSI Boot from SAN the configuration is set up as shown in Figure 1. There are two networks, the SAN network and the management network. The management network can be the same network as your intranet in most cases.

Master image creation

Once the SAN is up and running it is time to build a *master image*. This master image is an operating system installed on a local disk (of a blade) and configured for iSCSI Boot from SAN. You install Microsoft® Windows® 2003, x86 or x64, and bring it up to the latest service pack and Windows update levels. After you apply quick fix engineering (QFE) and install the iSCSI Firmware Initiator package, the system is prepared for imaging through system preparation (sysprep). For detailed steps, see the iSCSI Boot Windows Guide.

You perform master image creation just once for each blade model-operating system combination.

Image cloning

After master image creation, you use a disk cloning tool (such as DOS based Ghost 8.0) to transfer the clone image from the local disk to an iSCSI LUN on the iSCSI target (in this user's guide, we'll call the image on the target the *deployment image*). You must prepare the iSCSI target by allocating the necessary disk space and creating an iSCSI target. After you complete preparation of the target, you must configure DHCP or nonvolatile random access memory (NVRAM) with the networking parameters such as IP address and iSCSI target information.

You perform image cloning just once for each blade model-operating system combination.

Deployment

After you have a deployment image, you can start setting up blades with no local disks. Make sure the iSCSI target has a LUN duplication feature. You can call this LUN duplication feature *snap* or *flash copy*, or another appropriate term (consult your iSCSI target documentation for naming requirements). The LUN that results from the duplication step is the *client image*. After you establish a client image for a given blade, you must set up DHCP and NVRAM with the networking parameters such as IP address and iSCSI target information.

You perform deployment for each new blade.

Booting a blade

Note: Make sure that the blade powers are up and running.

The basic steps for a blade to boot using iSCSI are:

1. The firmware obtains networking parameters. The iSCSI Boot from SAN firmware in the blade uses one of two methods to obtain networking parameters:
 - a. DHCP
 - b. NVRAM
2. After the firmware obtains the networking parameters, it can log into the iSCSI target.
3. The firmware begins the boot process by loading and running the master boot record.

4. The operating system takes over and completes the bootstrap process.

Chapter 2. Console

The console system:

- Provides browser access to the BladeCenter MM Web interface.

Tip: The BladeCenter Web interface also provides a remote console capability for the blades.

- Runs the iSCSI Configuration Manager (Blade NVRAM configuration tool).
- Can provide browser access to the iSCSI target (see your iSCSI target documentation to verify whether your implementation supports this feature).

You must configure the console with:

1. Java™ 1.4.2 (latest release). It **must** be 1.4.2 (not 1.5).
2. iSCSI Configuration Manager

You will also need to add Microsoft iSCSI Initiator v2.02, which introduces boot support. Without Microsoft iSCSI Initiator v2.02, you will not be able to boot.

Chapter 3. Parameter methodology

The firmware must obtain various network parameters to initiate iSCSI Boot from SAN. This includes, but is not limited to, an IP address, subnet mask, iSCSI target IP, iSCSI target name, iSCSI LUN, and so on. You can obtain this information from DHCP or from internal NVRAM.

DHCP

In a DHCP configuration, you must create a reservation associating a media access control (MAC) address with an IP address. You use a DHCP option to provide the iSCSI target information.

NVRAM

In an NVRAM configuration the parameters required by the iSCSI boot process are stored in NVRAM.

Important: The NVRAM also specifies the **mode** to use, either DHCP or NVRAM. Thus, you must establish a valid NVRAM configuration using the IBM iSCSI Configuration Manager even if you select DHCP mode.

Chapter 4. SAN with DHCP

Figure 2 shows a SAN with DHCP configuration.



Figure 2. SAN with DHCP configuration

In a SAN with DHCP configuration, a DHCP server provides the networking parameters. A DHCP reservation is required for each blade. Each reservation has a DHCP option which specifies the iSCSI target boot LUN.

Specifying the DHCP option

You specify the DHCP option using one of two methods: *option 17* or *vendor options*.

The option 17 method is defined by the IETF RFC 4173, which can be found at the following Web address:

<http://www.ietf.org/rfc/rfc4173.txt>

You will need a copy to use as a complete detailed reference.

Briefly, option 17 is formatted as:

```
iscsi:<servername>:<protocol>:<port>:<LUN>:<targetname>
```

The vendor options method is an advanced method using DHCP.

Chapter 5. SAN without DHCP

Figure 3 shows a SAN without DHCP configuration.

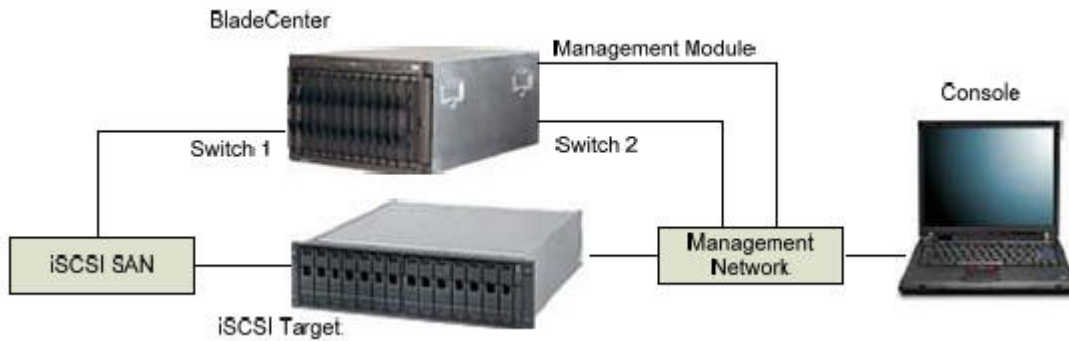


Figure 3. SAN without DHCP configuration

In a SAN without DHCP configuration the networking parameters are stored in blade NVRAM. The networking parameters that you determine are input to the IBM iSCSI Configuration Manager for storage into NVRAM.

Chapter 6. iSCSI Configuration Manager

The iSCSI Configuration Manager must be run for both DHCP and NVRAM modes. The iSCSI Configuration Manager downloads the NVRAM table into a system.

For details on the iSCSI Configuration Manager, see the iSCSI Configuration Manager User's Guide.

Chapter 7. iSCSI target

This section contains information related to iSCSI targets. Please refer to your iSCSI target documentation for specific requirements that apply to your implementation.

LUN types

If your iSCSI target has an option for LUN Type I, IBM suggests selecting *raw* or *image*, or whatever your device calls an **untyped collection of disk blocks**.

Access control

Your iSCSI target may provide a number of ways to set up access control for the system running iSCSI Boot from SAN, such as initiator IQN, MAC address, or IP address.

Chapter 8. Testing your SAN configuration

To test your SAN configuration, you can use one of the following optional methods: Microsoft Windows partition test or DOS test.

Important: When you use the tests in this section, make sure the system that you are using to test iSCSI Boot from SAN does not have a local disk installed.

Microsoft Windows partition test

1. Create a LUN and configure the SAN.
2. Attach to the LUN using the Microsoft Windows initiator from the console or other suitable system.
3. Run disk management.

My Computer -> Manage -> Disk Management

- a. If you create and initialize your LUN with all zeros, as is often the case, then Windows prompts you to initialize the disk and follow the prompts and defaults. See Figure 4.

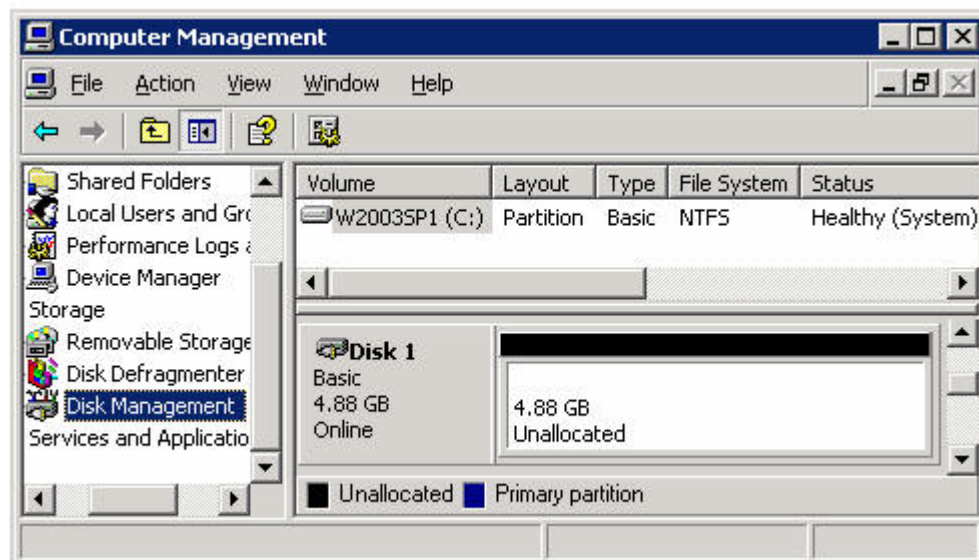


Figure 4. Disk management panel - A

- b. Right click on the white box (next to Disk 1 in Figure 4) and then partition, format, and mark active.

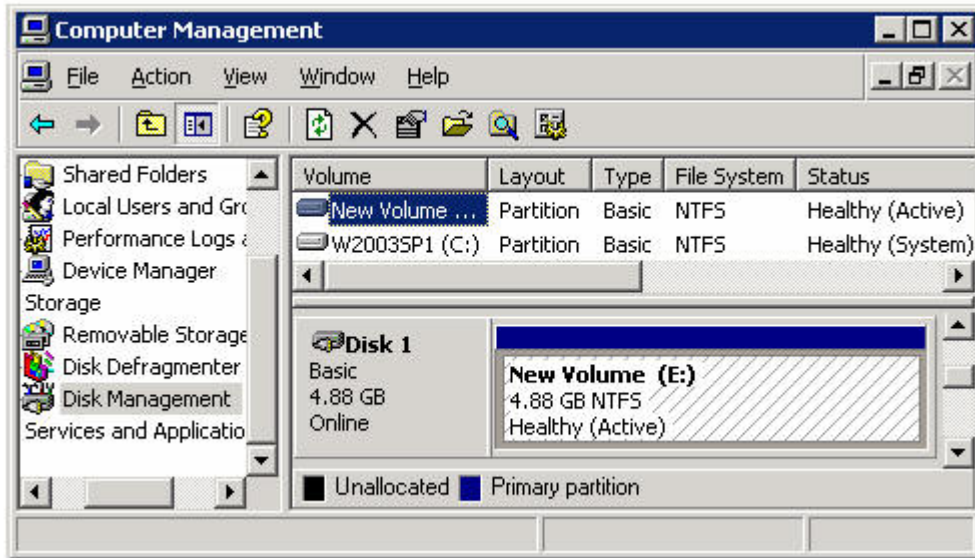


Figure 5. Disk management panel - B

4. Initiate iSCSI Boot from SAN.
5. The IBM iSCSI Firmware Initiator should log in successfully.
6. The empty Microsoft Windows partition should boot and display an error message.

DOS test

1. Set up the SAN with a LUN.
2. Initiate DOS.
3. Run F-disk and partition the drive.
 - a. Mark the partition active.
 - b. Reboot.
4. Initiate DOS.
5. Format c:/s.
6. Reboot.
 - a. You should boot into DOS and a C:\ prompt.

Appendix. Notices

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Glossary

Terms

This glossary defines technical terms and abbreviations used in this iSCSI configuration manager document. If you do not find the term you are looking for, view the IBM Glossary of Computing Terms, located at: <http://www.ibm.com/ibm/terminology>.

Selection of Terms: A term is a word or group of words to be defined. In this glossary, the singular form of the noun and the infinitive form of the verb are the terms most often selected to be defined. If the term may be abbreviated, the abbreviation is indicated. The abbreviation is also defined in its proper place in the glossary.

A

ASYNC

See **asynchronous**. See also **synchronous**.

asynchronous

Pertaining to events that are not synchronized in time or do not occur in regular or predictable time intervals. See also. See also **synchronous**.

B

Basic Input/Output System (BIOS)

The code that controls basic hardware operations, such as interactions with diskette drives, hard disk drives, and the keyboard.

baud The number of changes in signal levels, frequency, or phase per second on a communication channel. If each baud represents 1 bit of data, baud is the same as bits per second. However, it is possible for one signal change (1 baud) to equal more than 1 bit of data.

BIOS See **Basic Input/Output System**.

bits per second (bps)

In serial transmission, the instantaneous bit speed with which a device or channel transmits a character.

bps See **bits per second**.

C

cache Memory used to improve access times to

instructions, data, or both. Data that resides in cache memory is normally a copy of data that resides elsewhere in slower, less expensive storage, such as on a disk or on another network node.

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

A class of medium access procedures that allows multiple stations to access the medium at will, without explicit prior coordination, and avoids contention by way of carrier sense and deference. Contention is resolved by way of collision detection and transmission.

CHAP See **Challenge Handshake Authentication Protocol**.

Challenge Handshake Authentication Protocol (CHAP)

An authentication protocol that protects against eavesdropping by encrypting the user name and password.

chassis

The metal frame in which various electronic components are mounted.

client/server

Pertaining to the model of interaction in distributed data processing in which a program on one computer sends a request to a program on another computer and awaits a response. The requesting program is called a client; the answering program is called a server.

collision avoidance

In carrier sense multiple access with collision avoidance (CSMA/CA), the process of sending a jam signal and waiting for a variable time before transmitting data. The process is designed to avoid two or more simultaneous transmissions.

CRU See **customer-replaceable unit**.

CSMA/CD

See **Carrier Sense Multiple Access with Collision Detection**.

customer-replaceable unit (CRU)

An assembly or part that a customer can replace.

D

device parity protection

A function that protects data stored on a disk-unit subsystem from being lost because of the failure of a single disk unit in the subsystem. When a disk-unit subsystem has device parity protection and one of the disk units in the subsystem fails, the subsystem continues to run. The disk-unit subsystem reconstructs the data after the disk unit is repaired or replaced. See also Redundant Array of Independent Disks.

DHCP See **Dynamic Host Configuration Protocol**.

DIMM

See **dual inline memory module**.

document type definition (DTD)

The rules that specify the structure for a particular class of SGML or XML documents. The DTD defines the structure with elements, attributes, and notations, and it establishes constraints for how each element, attribute, and notation can be used within the particular class of documents.

drive bay

A receptacle in an appliance for a hard-disk-drive module. The drive bays are in storage units that can be located in a different rack from the appliance.

DTD See **document type definition**.

Dynamic Host Configuration Protocol (DHCP)

A communications protocol that is used to centrally manage configuration information. For example, DHCP automatically assigns IP addresses to computers in a network.

dual inline memory module (DIMM)

A small circuit board with memory-integrated circuits containing signal and power pins on both sides of the board.

E

EISA See **Extended Industry Standard Architecture**.

electrostatic discharge

An undesirable discharge of static electricity that can damage equipment and degrade electrical circuitry.

engine

The unit that contains the processors that respond to requests for data from clients. The operating software for the IBM TotalStorage appliance resides in the engine. See also storage port.

Ethernet

A packet-based networking technology for local area networks (LANs) that allows multiple access and handles contention by using Carrier Sense Multiple Access with Collision Detection (CSMA/CD) as the access method. Ethernet is standardized in the IEEE 802.3 specification.

expansion slot

In personal-computer systems, one of several receptacles in the rear panel of the system unit into which a user can install an adapter.

Extended Industry Standard Architecture (EISA)

The PC bus standard that extends the AT bus (ISA bus) to 32 bits and provides support for bus master. It was announced in 1988 as a 32-bit alternative to the Micro Channel that would preserve investment in existing boards. PC and AT adapters (ISA adapters) can plug into an EISA bus.

extensible markup language (XML)

A standard metalanguage for defining markup languages that is based on Standard Generalized Markup Language (SGML).

F

File Transfer Protocol (FTP)

In the Internet suite of protocols, an application layer protocol that uses TCP and Telnet services to transfer bulk-data files between machines or hosts.

FTP See **File Transfer Protocol**.

G

GBIC See **gigabit interface converter**.

gigabit interface converter (GBIC)

An encoding/decoding device that is a class-1 laser component assembly with transmitting and receiving receptacles that connect to fiber-optic cables. GBICs perform a serial optical-to-electrical and electrical-to-optical conversion of the signal. The GBICs in the switch can be hot-swapped.

H

host In TCP/IP, any system that has at least one Internet address associated with it.

I

iLUN See iSCSI client logical-unit number.

initiator

In Small Computer System Interface (SCSI) technology, the part of a host computer that communicates with its attached targets.

Internet Protocol (IP)

A protocol that routes data through a network or interconnected networks. This protocol acts as an intermediary between the higher protocol layers and the physical network.

interrupt request (IRQ)

An input found on a processor that causes it to suspend normal instruction execution temporarily and to start executing an interrupt handler routine.

IP See **Internet Protocol**.

IRQ See **interrupt request**.

iSCSI client logical-unit number (iLUN).

A unique number that is assigned to each virtual logical unit number (VLUN). The iLUN for a single client starts at zero and increments sequentially.

iSCSI configuration manager

A standalone Java application you can use to configure initiators on supported blades in an IBM BladeCenter chassis.

J

Java An object-oriented programming language for portable interpretive code that supports interaction among remote objects. Java was developed and specified by Sun Microsystems, Incorporated.

Java virtual machine (JVM)

A software implementation of a processor that runs compiled Java code (applets and applications).

jumper

A connector between two pins on a network adapter that enables or disables an adapter option, feature, or parameter value.

JVM See **Java virtual machine**.

L

LAN See **local area network**.

local area network (LAN)

A network that connects several devices in a limited area (such as a single building or campus) and that can be connected to a larger network.

logical drive

A unit of virtual storage that is made available to the network through virtual logical unit numbers (VLUNs) and iSCSI client logical-unit number (iLUNs). A logical drive consists of one or more physical disks that are combined using Redundant Array of Independent Disks (RAID) technology.

logical unit (LU)

An access point through which a user or application program accesses the SNA network to communicate with another user or application program.

logical unit number (LUN)

In the Small Computer System Interface (SCSI) standard, a unique identifier used to differentiate devices, each of which is a logical unit (LU).

LU See **logical unit**.

LUN See **logical unit number**.

M

megahertz (MHz)

A unit measure of frequency.

MHz See **megahertz**.

modulation

(1) The process by which a characteristic of a carrier is varied in accordance with a characteristic of an information-bearing signal. (2) The process by which a message signal is impressed upon a carrier signal so that the carrier is altered to represent the message signal.

multicast address

A type of IP address that identifies a group of interfaces and permits all of the systems that are in that group to receive the same packet of information.

N

N See **newton**.

network interface controller (NIC)

Hardware that provides the interface control between system main storage and external high-speed link (HSL) ports.

newton (N)

The unit of force required to impart an acceleration of one meter per second per second to a mass of one kilogram.

NIC See **network interface controller**

Nonvolatile Random Access Memory (NVRAM)

Random access memory (storage) that retains its contents after the electrical power to the machine is shut off.

NVRAM

See **Nonvolatile Random Access Memory**.

P

path (1) In a network environment, the route between any two nodes. (2) The route through a file system to a specific file. (3) In VSAM, a named logical entity that is composed of one or more clusters and provides access to the records of a base cluster either directly or through an alternate index.

path group

A collection of equivalent paths. Storage devices may have one - n path groups.

PCI See **Peripheral Component Interconnect**.

Peripheral Component Interconnect (PCI)

A local bus that provides a high-speed data path between the processor and attached devices.

R

RAID See **Redundant Array of Independent Disks**. See also **device parity protection**.

Redundant Array of Independent Disks (RAID)

A collection of two or more disk physical drives that present to the host an image of one or more logical disk drives. In the event of a single physical device failure, the data can be read or regenerated from the other disk drives in the array due to data redundancy. See also **device parity protection**.

S

SAN See **storage area network**.

SCSI See **Small Computer System Interface**.

Service Location Protocol (SLP)

An Internet protocol that identifies and uses network hosts without having to designate a specific network host name.

Simple Network Management Protocol (SNMP)

A set of protocols for monitoring systems and devices in complex networks. Information about managed devices is defined and stored in a Management Information Base (MIB).

SLP See **Service Location Protocol**.

Small Computer System Interface (SCSI)

An ANSI-standard electronic interface that allows personal computers to communicate with peripheral hardware, such as disk drives, tape drives, CD-ROM drives, printers, and scanners faster and more flexibly than previous interfaces.

SNMP

See **Simple Network Management Protocol**.

storage area network (SAN)

A dedicated storage network tailored to a specific environment, combining servers, storage products, networking products, software, and services.

storage client network

A classic, interconnected, fibre-channel fabric with a single, fibre-channel, fabric name.

storage controller

A device, such as a Redundant Array of Independent Disks (RAID) controller, that creates and manages other storage devices.

storage network

An arrangement that provides shared access to a set of logical unit numbers (LUNs) across one - n storage client networks.

storage port

An engine's connection point to a storage client network. A storage port is a member of a single fabric. See also **engine**.

storage unit

Hardware that contains one or more drive bays, power supplies, and a network interface. Some storage units contain Redundant Array of Independent Disks

(RAID) controllers; in this case, the storage unit is accessed by the appliance.

synchronous

Pertaining to two or more processes that depend upon the occurrences of specific events, such as a common timing signal. See also asynchronous.

T

Target A collection of logical units (LUs) that are directly addressable on the network. The target corresponds to the server in a client-server model.

Telnet In TCP/IP, a protocol that provides remote-terminal connection service. It allows users of one host to log on to a remote host and interact as if they were directly attached terminal users of that host.

U

UDP See **User Datagram Protocol**.

Universal Serial Bus (USB)

A serial-interface standard for telephony and multimedia connections to personal computers.

USB See **Universal Serial Bus**.

UFiT See **User Friendly Instance Tag**.

User Datagram Protocol (UDP)

An Internet protocol that provides unreliable, connectionless datagram service. It enables an application program on one machine or process to send a datagram to an application program on another machine or process.

V

virtual local area network (VLAN)

A logical association of switch ports based upon a set of rules or criteria, such as Medium Access Control (MAC) addresses, protocols, network address, or multicast address. This concept permits the LAN to be segmented again without requiring physical rearrangement.

vital product data (VPD)

A structured description of a device or program. For devices, it is recorded in the device at manufacture and includes at least the type, model, serial number, and installed features. It may include the manufacturer's ID and other fields. For

programs, it is compiled as a data area accompanying the program and includes the name of the licensed program or Licensed Internal Code group, the release and modification, the program module names, the national language or languages selected, and possibly other fields. Vital product data is transferred from the device to the system and stored for display. Vital product data is also visible on the device name plate or a similar tag.

virtual logical unit number (VLUN)

A subset of a logical drive.

VLAN See **virtual local area network**.

VLUN See **virtual logical unit number**.

VPD See **vital product data**.

X

XML See **Extensible Markup Language**.

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