

IBM System Storage SAN Volume Controller



Master Console Guide

Version 4.3.1

Note:

Before using this information and the product it supports, read the information in **Environmental notices and statements** and **Notices**.

This edition applies to version 4, release 3, modification 1 of the IBM System Storage SAN Volume Controller and to all subsequent releases and modifications until otherwise indicated in new editions. The information in this guide was formerly provided in GC27-2132-02 and SC23-6628-02.

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Environmental notices and statements

You must become familiar with the environmental notices and statements.

The following topics describe the environmental notices and statements that are applicable to this product.

1089CORE

The following comments apply to the IBM® servers that have been designated as conforming to NEBS (Network Equipment-Building System) GR-1089-CORE.

Power and cabling information for NEBS (Network Equipment-Building System) GR-1089-CORE

The equipment is suitable for installation in the following:

- Network telecommunications facilities
- Locations where the NEC (National Electrical Code) applies

The intrabuilding ports of this equipment are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of this equipment *must not* be metallically connected to the interfaces that connect to the OSP (outside plant) or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

Note: All Ethernet cables must be shielded and grounded at both ends.

The ac-powered system does not require the use of an external surge protection device (SPD).

The dc-powered system employs an isolated DC return (DC-I) design. The DC battery return terminal *shall not* be connected to the chassis or frame ground.

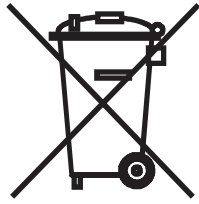
Product recycling and disposal

Ensure that you are aware of the materials that must be recycled.

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet sites at: www.ibm.com/ibm/recycle/us/index.shtml or www.ibm.com/ibm/environment/products/index.shtml.

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. IBM recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen responsablemente sus equipos cuando éstos ya no les sean útiles. IBM dispone de una serie de programas y servicios de devolución de productos en varios países, a fin de ayudar a los propietarios de equipos a reciclar sus productos de TI. Se puede encontrar

información sobre las ofertas de reciclado de productos de IBM en el sitio web de IBM: www.ibm.com/ibm/recycle/us/index.shtml or www.ibm.com/ibm/environment/products/index.shtml



Note:

This mark applies only to countries within the European Union (EU) and Norway.

Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'étiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown previously, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential affects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

Battery return program

This product may contain sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion batteries. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly.

Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, contact your local waste disposal facility or go to the following Web site:

www.ibm.com/ibm/environment/products/index.shtml

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and other battery packs from IBM Equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Please have the IBM part number listed on the battery available prior to your call.

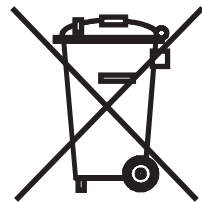
For Taiwan:



Please recycle batteries

廢電池請回收

For the European Union:



Note: This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Les batteries ou emballages pour batteries sont étiquetés conformément aux directives européennes 2006/66/EC, norme relative aux batteries et accumulateurs en usage et aux batteries et accumulateurs usés. Les directives déterminent la marche à suivre en vigueur dans l'Union Européenne pour le retour et le recyclage des batteries et accumulateurs usés. Cette étiquette est appliquée sur diverses batteries pour indiquer que la batterie ne doit pas être mise au rebut mais plutôt récupérée en fin de cycle de vie selon cette norme.

バッテリーあるいはバッテリー用のパッケージには、EU 諸国に対する廃電気電子機器指令 2006/66/EC のラベルが貼られています。この指令は、バッテリーと蓄電池、および廃棄バッテリーと蓄電池に関するものです。この指令は、使用済みバッテリーと蓄電池の回収とリサイクルの骨子を定めているもので、EU 諸国にわたって適用されます。このラベルは、使用済みになったときに指令に従って適正な処理をする必要があることを知らせるために種々のバッテリーに貼られています。

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, contact your local IBM representative.

Spain:

This notice is provided in accordance with Royal Decree 106/2008 of Spain: The retail price of batteries, accumulators and power cells includes the cost of the environmental management of their waste.

California:

Perchlorate Material - special handling may apply. See www.dtsc.ca.gov/hazardouswaste/perchlorate.

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5, Chapter 33. Best Management Practices for Perchlorate Materials. This product, part, or both may include a lithium manganese dioxide battery which contains a perchlorate substance.

Flat panel display

The fluorescent lamp or lamps in the liquid crystal display contain mercury. Dispose of it as required by local ordinances and regulations.

Monitors and workstations

New Jersey – For information about recycling covered electronic devices in the state of New Jersey, go to the New Jersey Department of Environmental Protection web site at www.state.nj.us/dep/dshw/recycle/Electronic_Waste/index.html

Oregon - For information about recycling covered electronic devices in the state of Oregon, go to the Oregon Department of Environmental Quality site at www.deq.state.or.us/lq/electronics.htm.

Washington - For information about recycling covered electronic devices in the State of Washington, contact the Washington Department of Ecology at 1-800Recycle or go to the Department of Ecology Web site at fortress.wa.gov/ecy/recycle/.

About this guide

This guide provides an overview of the characteristics and requirements of the master console, which can be a component of an IBM System Storage™ SAN Volume Controller system.

For SAN Volume Controller version 4.2.1 and earlier, the master console provides a single point from which to manage the SAN Volume Controller nodes. Although it can no longer be purchased, the master console can be upgraded to support clusters running the latest SAN Volume Controller software.

Who should use this guide?

The intended audience for this guide is the IBM service representative.

This guide should be read by the IBM service representative who is responsible for the initial installation of the SAN Volume Controller hardware, including the redundant ac-power switch and the uninterruptible power supply.

After the IBM service representative has installed the SAN Volume Controller hardware, the customers must use the *IBM System Storage SAN Volume Controller Software Installation and Configuration Guide* to install any additional software and to configure the SAN Volume Controller.

Emphasis

Different typefaces are used in this guide to show emphasis.

The following typefaces are used to show emphasis:

Boldface	Text in boldface represents menu items and command names.
<i>Italics</i>	Text in <i>italics</i> is used to emphasize a word. In command syntax, it is used for variables for which you supply actual values, such as a default directory or the name of a cluster.
Monospace	Text in monospace identifies the data or commands that you type, samples of command output, examples of program code or messages from the system, or names of command flags, parameters, arguments, and name-value pairs.

SAN Volume Controller library and related publications

A list of other publications that are related to this product are provided to you for your reference.

The tables in this section list and describe the following publications:

- The publications that make up the library for the IBM System Storage SAN Volume Controller
- Other IBM publications that relate to the SAN Volume Controller

SAN Volume Controller library

The following table lists and describes the publications that make up the SAN Volume Controller library. Unless otherwise noted, these publications are available in Adobe® portable document format (PDF) from the following Web site:

www.ibm.com/storage/support/2145

Title	Description	Order number
<i>IBM System Storage SAN Volume Controller Planning Guide</i>	This guide introduces the SAN Volume Controller and lists the features you can order. It also provides guidelines for planning the installation and configuration of the SAN Volume Controller.	GA32-0551
<i>IBM System Storage SAN Volume Controller Model 2145-8A4 Hardware Installation Guide</i>	This guide provides the instructions that the IBM service representative uses to install the hardware for SAN Volume Controller model 2145-8A4.	GC27-2219
<i>IBM System Storage SAN Volume Controller Model 2145-8G4 Hardware Installation Guide</i>	This guide provides the instructions that the IBM service representative uses to install the hardware for SAN Volume Controller model 2145-8G4.	GC27-2220
<i>IBM System Storage SAN Volume Controller Software Installation and Configuration Guide</i>	This guide provides guidelines for configuring your SAN Volume Controller. Instructions for backing up and restoring the cluster configuration, using and upgrading the SAN Volume Controller Console, using the CLI, upgrading the SAN Volume Controller software, and replacing or adding nodes to a cluster are included.	SC23-6628
<i>IBM System Storage SAN Volume Controller CIM Agent Developer's Guide</i>	This guide describes the concepts of the Common Information Model (CIM) environment. Steps about using the CIM agent object class instances to complete basic storage configuration tasks, establishing new Copy Services relationships, and performing CIM agent maintenance and diagnostic tasks are included.	SC23-6665

Title	Description	Order number
<i>IBM System Storage SAN Volume Controller Command-Line Interface User's Guide</i>	This guide describes the commands that you can use from the SAN Volume Controller command-line interface (CLI).	SC26-7903
<i>IBM System Storage SAN Volume Controller Host Attachment Guide</i>	This guide provides guidelines for attaching the SAN Volume Controller to your host system.	SC26-7905
<i>IBM System Storage SAN Volume Controller Troubleshooting Guide</i>	This guide describes the features of each SAN Volume Controller model, explains how to use the front panel, and provides maintenance analysis procedures to help you diagnose and solve problems with the SAN Volume Controller.	GC27-2227
<i>IBM System Storage SAN Volume Controller Hardware Maintenance Guide</i>	This guide provides the instructions that the IBM service representative uses to service the SAN Volume Controller hardware, including the removal and replacement of parts.	GC27-2226
<i>IBM System Storage SAN Volume Controller Models 2145-8F2 and 2145-8F4 Hardware Installation Guide</i>	This guide provides the instructions that the IBM service representative uses to install the hardware for SAN Volume Controller models 2145-8F2 and 2145-8F4.	GC27-2221
<i>IBM System Storage SAN Volume Controller Model 2145-4F2 Hardware Installation Guide</i>	This guide provides the instructions that the IBM service representative uses to install the hardware for SAN Volume Controller model 2145-4F2.	GC27-2222
<i>IBM System Storage SAN Volume Controller Master Console Guide</i>	This guide describes how to install, maintain, and service the master console.	GC27-2223
<i>IBM Systems Safety Notices</i>	This guide contains translated caution and danger statements. Each caution and danger statement in the SAN Volume Controller documentation has a number that you can use to locate the corresponding statement in your language in the <i>IBM Systems Safety Notices</i> document.	G229-9054

Other IBM publications

The following table lists and describes other IBM publications that contain additional information that is related to the SAN Volume Controller.

You can download IBM eServer™ IBM xSeries® and IBM System x™ publications from the following Web site:

www.ibm.com/jct01004c/systems/support/

Title	Description	Order number
<i>IBM System Storage Productivity Center Introduction and Planning Guide</i>	This guide introduces the IBM System Storage Productivity Center hardware and software.	SC23-8824
<i>Read This First: Installing the IBM System Storage Productivity Center</i>	This guide describes how to install the IBM System Storage Productivity Center hardware.	GI11-8938
<i>IBM System Storage Productivity Center User's Guide</i>	This guide describes how to configure the IBM System Storage Productivity Center software.	SC27-2336
<i>IBM System Storage Multipath Subsystem Device Driver User's Guide</i>	This guide describes the IBM System Storage Multipath Subsystem Device Driver for IBM System Storage products and how to use it with the SAN Volume Controller.	GC52-1309
<i>IBM System Storage DS Storage Manager Version 10.30 Installation and Host Support Guide</i>	This guide provides information about how to plan, install, configure, and work with IBM System Storage DS™ Storage Manager.	GC53-1135
<i>IBM System Storage DS Storage Manager Version 10.30 Copy Services Guide</i>	This guide provides information about setting up, installing, configuring, and working with the three IBM System Storage DS Storage Manager premium features that assist with copy services: FlashCopy®, VolumeCopy, and the Enhanced Remote Mirroring Option.	GC53-1136
<i>IBM System Storage DS4000/DS5000 Fibre Channel and Serial ATA Intermix Premium Feature Installation Overview</i>	This overview describes how to install the IBM System Storage DS4000/DS5000 Fibre Channel and Serial ATA Intermix Premium Feature.	GC53-1137
<i>IBM System Storage DS5100 and DS5300 Installation, User's and Maintenance Guide</i>	This guide describes how to install and configure the IBM System Storage DS5100 and DS5300.	GC53-1140

Title	Description	Order number
<i>IBM System Storage EXP5000 Storage Expansion Enclosure Installation, User's, and Maintenance Guide</i>	This guide describes how to install and configure the IBM System Storage EXP5000 Storage Expansion Enclosure.	GC53-1141
<i>IBM System Storage DS Storage Manager Command-line Programming Guide</i>	This guide describes the commands that you can use from the IBM System Storage DS Storage Manager command-line interface.	GC52-1275
<i>IBM System Storage DS5000 Quick Start Guide: Quick Reference for the DS5100, DS5300 and EXP5000</i>	This guide provides information about setting up and installing the DS5100, DS5300 and EXP5000.	GC53-1134
<i>IBM TotalStorage DS4300 Fibre Channel Storage Subsystem Installation, User's, and Maintenance Guide</i>	This guide describes how to install and configure the IBM TotalStorage® DS4300 Fibre-Channel Storage Subsystem.	GC26-7722
<i>IBM eServer xSeries 306m (Types 8849 and 8491) Installation Guide</i>	This guide describes how to install the IBM eServer xSeries 306m, which is the hardware delivered for some versions of the hardware master console.	MIGR-61615
<i>IBM xSeries 306m (Types 8849 and 8491) User's Guide</i>	This guide describes how to use the IBM eServer xSeries 306m, which is the hardware delivered for some versions of the hardware master console.	MIGR-61901
<i>IBM xSeries 306m (Types 8849 and 8491) Problem Determination and Service Guide</i>	This guide can help you troubleshoot and resolve problems with the IBM eServer xSeries 306m, which is the hardware delivered for some versions of the hardware master console.	MIGR-62594
<i>IBM eServer xSeries 306 (Type 8836) Installation Guide</i>	This guide describes how to install the IBM eServer xSeries 306, which is the hardware delivered for some versions of the hardware master console.	MIGR-55080
<i>IBM eServer xSeries 306 (Type 8836) User's Guide</i>	This guide describes how to use the IBM eServer xSeries 306, which is the hardware delivered for some versions of the hardware master console.	MIGR-55079

Title	Description	Order number
<i>IBM eServer xSeries 306 (Types 1878, 8489 and 8836) Hardware Maintenance Manual and Troubleshooting Guide</i>	This guide can help you troubleshoot problems and maintain the IBM eServer xSeries 306, which is the hardware delivered for some versions of the hardware master console.	MIGR-54820
<i>IBM eServer xSeries 305 (Type 8673) Installation Guide</i>	This guide describes how to install the IBM eServer xSeries 305, which is the hardware delivered for some versions of the hardware master console.	MIGR-44200
<i>IBM eServer xSeries 305 (Type 8673) User's Guide</i>	This guide describes how to use the IBM eServer xSeries 305, which is the hardware delivered for some versions of the hardware master console.	MIGR-44199
<i>IBM eServer xSeries 305 (Type 8673) Hardware Maintenance Manual and Troubleshooting Guide</i>	This guide can help you troubleshoot problems and maintain the IBM eServer xSeries 305, which is the hardware delivered for some versions of the hardware master console.	MIGR-44094
<i>IBM TotalStorage 3534 Model F08 SAN Fibre Channel Switch User's Guide</i>	This guide introduces the IBM TotalStorage SAN Switch 3534 Model F08.	GC26-7454
<i>IBM System x3250 (Types 4364 and 4365) Installation Guide</i>	This guide describes how to install the IBM System x3250, which is the hardware delivered for some versions of the hardware master console.	MIGR-5069761
<i>IBM System x3250 (Types 4364 and 4365) User's Guide</i>	This guide describes how to use the IBM System x3250, which is the hardware delivered for some versions of the hardware master console.	MIGR-66373
<i>IBM System x3250 (Types 4364 and 4365) Problem Determination and Service Guide</i>	This guide can help you troubleshoot and resolve problems with the IBM System x3250, which is the hardware delivered for some versions of the hardware master console.	MIGR-66374
<i>IBM TotalStorage SAN Switch 2109 Model F16 User's Guide</i>	This guide introduces the IBM TotalStorage SAN Switch 2109 Model F16.	GC26-7439

Title	Description	Order number
<i>IBM TotalStorage SAN Switch 2109 Model F32 User's Guide</i>	This guide introduces the IBM TotalStorage SAN Switch 2109 Model F32. It also describes the features of the switch and tells you where to find more information about those features.	GC26-7517

Some related publications are available from the following SAN Volume Controller support Web site:

www.ibm.com/storage/support/2145

Related Web sites

The following Web sites provide information about the SAN Volume Controller or related products or technologies:

Type of information	Web site
SAN Volume Controller support	www.ibm.com/storage/support/2145
Technical support for IBM storage products	www.ibm.com/storage/support/

How to order IBM publications

The IBM Publications Center is a worldwide central repository for IBM product publications and marketing material.

The IBM Publications Center offers customized search functions to help you find the publications that you need. Some publications are available for you to view or download at no charge. You can also order publications. The publications center displays prices in your local currency. You can access the IBM Publications Center through the following Web site:

www.ibm.com/shop/publications/order/

How to send your comments

Your feedback is important to help us provide the highest quality information. If you have any comments about this book or any other documentation, you can submit them in one of the following ways:

- E-mail

Submit your comments electronically to the following e-mail address:

starpubs@us.ibm.com

Be sure to include the name and order number of the book and, if applicable, the specific location of the text you are commenting on, such as a page number or table number.

- Mail

Fill out the Readers' Comments form (RCF) at the back of this book. If the RCF has been removed, you can address your comments to:

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Tucson, Arizona 85775-4401
U.S.A.

Chapter 1. Introducing the Master console

For SAN Volume Controller version 4.2.1 and earlier, the master console provides a single point from which to manage the SAN Volume Controller nodes. The master console could be purchased as a hardware product option (which includes the master console preinstalled software) or as a software-only option. Although it can no longer be purchased, the master console can be upgraded to support clusters running the latest SAN Volume Controller software.

Beginning with SAN Volume Controller version 4.3.0, the IBM System Storage Productivity Center (SSPC) is an integrated hardware and software solution that provides a single point of entry for managing SAN Volume Controller clusters, IBM System Storage DS8000 systems, and other components of your data storage infrastructure. For more information on SSPC, see the *IBM System Storage Productivity Center Introduction and Planning Guide*.

The two master console options are the same in function and software. However, the planning, installation, and configuration processes are slightly different:

Master console hardware option

The manufacturing plant installs the software on the hardware using the default settings. After the IBM service representative installs the hardware option, you must configure and customize the default factory settings.

Master console software-only option

You must provide your own hardware and perform both the installation and configuration processes.

The master console provides you with the following functions:

- A platform on which the subsystem configuration tools can be run
- A platform for remote service, which allows the desktop to be shared with remote IBM service personnel if assistance is required to resolve complex problems
- Access to the following components:
 - SAN Volume Controller Console, which is a graphical user interface application, through a Web browser
 - SAN Volume Controller command-line interface, through a Secure Shell (SSH) session

The master console can support up to two SAN Volume Controller clusters. Although multiple master console servers can access a single cluster, you cannot concurrently perform configuration and service tasks if multiple servers are accessing one cluster.

Master console hardware option components

Your master console software was preinstalled when you ordered the master console hardware option with your SAN Volume Controller.

The following components are included with the master console hardware option:

- 19-inch 1U rack-mounted IBM eServer xSeries server
- 19-inch 1U flat panel monitor and keyboard

Attention: If more than one power distribution bus is available, the two power connectors, one supplying the master console server and the other supplying the master console monitor, must be connected to the same power distribution bus.

The following software is preinstalled on the system:

- Microsoft® Windows® 2003 Standard Server Edition with the latest service pack
- PuTTY, a client for Telnet and Secure Shell (SSH) protocol communications
 - Putty.exe, the client software
 - Puttygen.exe, a utility for generating encryption keys
 - Plink.exe, the command-line interface to the PuTTY client software
- SAN Volume Controller Console
- Adobe Reader

The following Web site provides the current list of supported software versions:

www.ibm.com/storage/support/2145

After the master console hardware is installed, the customer must configure the software to meet their requirements.

Master console software components

The master console feature is a collection of different software components.

The master console includes the following software components:

- SAN Volume Controller Console and CIM agent
- PuTTY (SSH client software)

Note: Beginning with SAN Volume Controller version 4.3.1, a second CIM object manager (CIMOM) is also included with the SAN Volume Controller cluster. This CIMOM is intended for use by other storage management applications, such as IBM TotalStorage Productivity Center (TPC), which is installed on the same server as IBM System Storage Productivity Center. The SAN Volume Controller Console that is installed on the master console server continues to use the CIMOM on the master console server and an SSH connection to communicate with SAN Volume Controller.

Preparing your master console hardware option environment

If the master console hardware option is included with the SAN Volume Controller, ensure that your physical site meets the installation requirements for the master console hardware and the console monitor kit.

The following tables provide the physical characteristics and the environmental requirements for the master console hardware option:

Server dimensions and weight

Ensure that space is available in a rack that is capable of supporting the master console.

Height	Width	Depth	Maximum Weight
44 mm (1.7 in.)	480 mm (18.9 in.)	426 mm (16.8 in.)	12.7 kg (28 lb)

Master console kit dimensions and weight

Ensure that space is also available in the rack for the master console kit.

Height	Width	Depth	Maximum Weight
40 mm (1.6 in.)	480 mm (18.9 in.)	530 mm (20.9 in.)	17.0 kg (37.0 lb)

Server ac and input-voltage requirements

Ensure that your environment meets the following ac power and voltage requirements:

Power Supply	Electrical Input
203 watt (110 or 220 V ac auto-sensing)	Sine-wave input (47–63 Hz) required Input voltage low range: Minimum: 100 V ac Maximum: 127 V ac Input voltage high range: Minimum: 200 V ac Maximum: 240 V ac Input kilovolt-amperes (kVA), approximately: Minimum: 0.0870 kVA Maximum: 0.150 kVA

Server environmental requirements

Ensure that your environment falls within the following ranges:

Environment	Temperature	Altitude	Relative Humidity
Server On	10° to 35°C (50°F to 95°F)	0 to 914 m (2998.0 ft)	8% to 80%
Server Off	-40°C to 60°C (-104°F to 140°F)	Maximum: 2133 m (6998.0 ft)	8% to 80%

Server heat output

Approximate heat output in British thermal units (Btu) per hour:

- Minimum configuration: 87 watts (297 Btu)
- Maximum configuration: 150 watts (512 Btu)

Prerequisites for the software master console

Before you install the software master console, ensure that you have the prerequisite hardware and software.

Location requirements

The master console must be in the same room and within 50 feet of the SAN Volume Controller nodes.

Hardware prerequisites

The master console software can be installed on a rack-mounted, high-performance, highly-reliable Intel® server (such as the IBM eServer xSeries 3250 or equivalent) with the following options:

- One Intel Pentium® dual core processor, minimum 2.1 GHz
- Minimum of 4 GB of system memory
- Two IDE hard disk drives, minimum 160 GB each. During installation of the master console software, you will mirror these drives.
- One CD drive
- One Gigabit port for an Ethernet connection (fiber or copper)
- One keyboard, such as the Space Saver keyboard or equivalent
- One monitor, such as Netbay 1U Flat Panel Monitor Console kit without keyboard or equivalent
- One mouse or equivalent pointing device

Example hardware configuration

An example hardware configuration might consist of the following components:

- IBM xSeries 3250 server (1U)
- Intel Xeon 3.0 GHz processor
- 4 GB memory DIMM (256 MB comes with base unit)
- Two 160 GB IDE hard disk drives (one comes with base unit)
- One Gigabit 10/100/1000 Copper Ethernet port on planar
- NetBay 1U Flat Panel Monitor Console Kit with US keyboard

Software prerequisites

The software version of the master console requires that you obtain the following software:

- Operating system
 - The software version of the master console requires that one of the following operating systems is provided on your hardware platform:
 - Microsoft Windows Server 2003 Enterprise Edition
 - Microsoft Windows Server 2003 Standard Edition
 - Microsoft Windows 2000 Server 5.00.2195.

Note: The master console hardware option is shipped with Microsoft Windows Server 2003, Standard Edition pre-installed.

- Microsoft Windows Internet Explorer version 6 with Service Pack 1 or later
You can download Internet Explorer version 7 from the following Web site:
www.microsoft.com/windows/downloads/ie/getitnow.msp/
You can download Internet Explorer version 6 Service Pack 1 from the following Web site:
www.microsoft.com/windows/ie/ie6/downloads/

- Antivirus software (not required but necessary to ensure protection of your computer).

The following Web site provides the current list of supported software versions:

www.ibm.com/storage/support/2145

Chapter 2. Installing the master console

You must install the master console option that is included with your SAN Volume Controller system.

Installing the master console hardware

If your system includes the master console hardware product option, you must install it and perform initial hardware configuration for it.

Before you begin the installation, ensure that you have completed the following tasks:

- **Important:** Review and complete all of the safety checks that are detailed in the documentation for the master console IBM eServer xSeries hardware, the keyboard, and the display.
- Ensure that you have all the customer-completed information that you need, including the configuration data table, hardware location chart, and the cable connection table, which are provided at www.ibm.com/storage/support/2145. The *IBM System Storage SAN Volume Controller Planning Guide* provides guidelines for completing these tables and charts.

If you experience a problem with your master console, use the 2145 machine type and the serial number of the SAN Volume Controller node that was installed with the master console to open a hardware problem.

Perform the following steps to install the master console hardware option:

Note: Do not install the pull-out monitor and keyboard of the master console directly below a SAN Volume Controller node. The front panel of the node protrudes beyond the front of the rack and overlaps part of the monitor, which prevents you from being able to open it.

1. Install the master console hardware in the rack, following the hardware installation instructions that are provided by your xSeries Installation Guide and by the instructions that are provided with the mounting rails.

If there are any devices directly above and below the master console, it might be very difficult to reach in and connect the cables to the back of the server after it is placed in the rack. If that is the only available slot, connect the keyboard, mouse, monitor, and Ethernet cables at the back of the master console before you install it in the rack. Leave the other end of the Ethernet cable disconnected from the network until you are directed to connect it.

Important: Do not follow any *software* installation procedures in the xSeries Installation Guide.

2. Ensure that no cables are connected to the Ethernet ports.
3. Turn on the master console.
 - a. Type administrator in the User ID field.
 - b. Type password in the password field; this password applies to all required password fields. The master console continues to start.

Note: This process can take several minutes before all services are started and operations are completely responsive.

- c. Click **OK** if you receive any messages that a network interface card port is offline.
4. Check that the reference identification tag is securely fastened to the front panel of the master console. The tag indicates the machine type 2145 and the serial number of the SAN Volume Controller node that is being installed with the master console.
5. Connect the master console to the Ethernet port that is designated in the Cable connection table.

Installing antivirus software on the master console

To protect your workstations and your enterprise, install the latest patches for your Windows operating system and the latest levels of your antivirus software on the master console.

If the master console is either connected to your local area network or you have enabled remote support, you must install the latest levels of the antivirus software that your enterprise uses.

Installing the master console software

If you purchased the software-only master console option, you must install the master console software on your own hardware before you can configure and use the SAN Volume Controller. If you have purchased the master console hardware option and the IBM service representative has finished installing it, you can skip the master console software installation instructions and start configuring the master console.

Before you install the master console software, you must ensure that you have met all the prerequisites for installing the software as provided by the *IBM System Storage SAN Volume Controller Planning Guide*.

In addition, view the release notes for the master console software on the following IBM support Web site for the latest information:

www.ibm.com/storage/support/2145

You can use the installation wizard to help you install the master console software components instead of installing each component individually.

The following tasks are involved in the master console software installation process:

- **Task 1:** Install the master console software by using the installation wizard.
- **Task 2:** Mirror the boot drive.

Important: Other than antivirus software, ensure that the master console software is the only type of software that is installed on the hardware that you are using for the master console.

Using the master console installation wizard

You use the master console installation wizard to install all the master console components.

Before you install the master console software, ensure that your system meets the requirements that are provided in the *IBM System Storage SAN Volume Controller Planning Guide*.

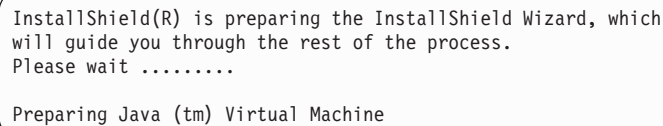
During the installation, the wizard installs the following master console components:

- SAN Volume Controller Console and CIM agent
- PuTTY

Perform the following steps to install the master console software:

1. Log on as a local administrator (for example, as the Administrator user) on the system where you want to install the master console software.
2. Insert the master console CD into the CD drive.
3. Click **Start** → **Run** to open the Run window.
4. Enter *drive*:\setup.exe, where *drive* is the letter of the drive in which you inserted the CD. Click **OK**.

The following message is briefly displayed:



InstallShield(R) is preparing the InstallShield Wizard, which will guide you through the rest of the process.
Please wait

Preparing Java (tm) Virtual Machine

You are then prompted to select the language to use for the installation wizard.

5. Select the language to use, and then click **OK**.
The Welcome panel is displayed.
6. Read the information on the Welcome panel, and then click **Next**.
The License Agreement panel is displayed.
7. Read the license agreement and perform one of the following actions:
 - Click **I accept the terms in the license agreement**, and then click **Next** to continue with the installation.
 - Click **I do not accept the terms of the license agreement**, and then click **Cancel** to exit the installation.

When you click **Next**, the wizard verifies that your system meets the hardware requirements for the installation.

Note: If your system does not meet hardware requirements, the wizard opens a panel that warns you about a decrease in the performance level if these requirements are not met. Click **OK** to close the warning panel.

A panel is displayed for you to select the destination directory for your master console software installation. By default, the master console software is installed in C:\Program Files\IBM\MasterConsole

8. Click **Next** to accept the default directory. If you want to change the directory, click **Browse**, select a different directory, and then click **Next**.

The installation wizard compares the list of components to be installed with the products that are already installed on your system. If the wizard finds that any master console components are already installed, it compares the versions and uses the following logic to determine which components to install:

- If the component is not installed or the installed version is an earlier version than the required version, the component is installed or upgraded by launching the component-specific installation program.
- If the component is installed at the same version level as the version that is installed by the installation wizard, the wizard does not install the component.
- If the installed component is a later version than the version to be installed, the installation wizard does not install the component, but a warning that

indicates that this version is not tested with the master console is displayed. Click **OK** if you see this warning. Decide whether you want to continue the installation or exit the installation so that you can first remove the later version from your system. If you remove the later version, restart the master console installation wizard after the removal.

- If a component is incorrectly installed on the system, you are asked to continue with the installation by reinstalling the component with the component-specific installer. If the reinstallation does not succeed, you must exit the master console installation wizard, manually remove the product from your system, and restart the master console installation wizard.

After the wizard performs the comparison, the Product List panel is displayed. This panel provides the following information:

- Versions of existing master console components
- Required versions
- Actions to be done by the installation wizard or by you

If you need to refer to the installation product list later, this information is saved on your system in the *MasterConsoleProducts.htm* file. This file is located in the directory that you specified for the master console installation.

9. After you have reviewed the information presented in the Product List panel, click **Next**.

The PuTTY installation panel is displayed.

10. Click **Next** to begin the installation of PuTTY.

11. Click **Next** when the wizard indicates that PuTTY has been installed.

The installation wizard validates the installation of PuTTY. If the validation is not successful, an error panel is displayed and you must exit the wizard, correct the errors, and restart the installation wizard.

12. Before continuing with the installation wizard, create an SSH key pair using PuTTY. Follow the instructions that are described in the “Generating an SSH key pair using PuTTY” on page 17 topic. After you have created the SSH key pair, return to these instructions.

The next part of the installation wizard uses the generated SSH key pair to install the SAN Volume Controller Console.

13. Click **Next** to launch the SAN Volume Controller Console installation program.

The SAN Volume Controller Console installation program opens in a new window.

Important: Do not close the main master console installation wizard panel while you complete the SAN Volume Controller Console installation program.

14. From the SAN Volume Controller Console installation program, perform the following steps to install the SAN Volume Controller Console:
 - a. Click **Next** in the Welcome panel.
 - b. Click **I accept the terms of the license agreement**, and then click **Next** in the License Agreement panel.
 - c. Click **Next** in the Destination Directory panel to accept the default directory.
 - d. Enter the private key that you created in step 12 (the default key name is *icat.ppk*), and then click **Next**.
 - e. Click **Next** in the CIMOM ports panel to accept the default ports.
 - f. Click **Next** to accept the default ports for the embedded WebSphere® Application Server.

- g. Click **Install** in the installation confirmation panel to install the SAN Volume Controller Console.
 - h. (Optional) Click **View post installation tasks** to view the steps that you must later perform to access the SAN Volume Controller Console.
 - i. Click **Finish** to complete the installation and close the SAN Volume Controller Console installation program.
The SAN Volume Controller Console installation program closes and control is returned to the main master console installation wizard.
15. In the main master console installation wizard, click **Next**.
The wizard validates the installation of the SAN Volume Controller Console. If the validation is successful, the Finish panel is displayed. If the validation fails, an error panel is displayed. If errors are found, exit the wizard, correct the errors, and restart the master console installation wizard.
 16. Review the master console installation log (mclog.txt) to ensure that all components are properly installed. The log file is located in *installation_directory*\logs, where *installation_directory* is the directory where the master console was installed. The default installation directory is C:\Program Files\IBM\MasterConsole.
 17. Click **Finish** to complete the installation.
 18. If a system restart is required, accept the prompt to complete the master console installation process.

Mirroring the boot drive

You can use the Microsoft Windows software mirroring capability to mirror the boot drive on the master console system.

Note: The master console hardware option is delivered with the boot drive already mirrored.

Before you mirror the boot drive, ensure that you meet the following prerequisites:

- You must have a second drive that is as large or larger than your original boot drive.
- If the target disk has a partition that is assigned to it (that is, it already has a drive letter), perform the following steps to remove the partition:
 1. Back up any necessary data on the existing partition. When you remove an existing partition, you lose any data that is on it.
 2. Remove the partitioning by right-clicking **My Computer**, selecting **Manage** → **Storage** → **Disk Management**, right-clicking the target disk drive, and then selecting **Delete Partition**.

Perform the following steps to mirror the boot drive:

1. Right-click **My Computer** on the desktop.
2. Click **Manage**.
3. Click **Storage** → **Disk Management**.
4. Right-click the disk icon for the system disk.
5. Convert the disk to a dynamic disk by performing the following actions:

For Windows 2000 systems:

 - a. Click **Upgrade to dynamic disk** and then click **OK**.
 - b. Right-click the disk icon for the disk that you want to become the mirror of the system disk.

- c. Click **Upgrade to dynamic disk** and then click **OK**.
- d. If you receive a warning, click **Yes**.
- e. If your system restarts, restart the Disk Management utility.

For Windows 2003 systems:

- a. Click **Convert to dynamic disk**.
 - b. Select both drives and click **OK**.
 - c. Click **Convert**.
 - d. Click **Yes** to continue when you receive an operating system boot warning.
 - e. Click **Yes** to unmount file systems and to continue.
 - f. Allow the system to reboot.
 - g. Restart the Disk Management utility
6. For Windows 2000 systems, right-click the disk icon for the system disk or, for Windows 2003 systems, right-click the system disk partition.
 7. Click **Add Mirror**.
 8. Select the disk that you want to become the mirror of the system disk, and then click **Add Mirror**.
 9. Click **OK** to continue when you receive a warning indicating that you must update the boot.ini file.
 10. Perform the following steps to update the boot.ini file:
 - a. Double-click **My Computer** on the desktop.
 - b. Click **Tools** → **Folder options**.
 - c. Click the **View** tab.
 - d. In the **Advanced settings** list, perform one of the following actions, depending on your operating system:
 - For Windows 2000 systems, select **Show hidden files and folders**.
 - For Windows 2003 systems, select **Show hidden files and folders** and clear the **Hide protected operating system files** option. Click **Yes** when you receive a warning.
 - e. In the My Computer window, click **Local disk (C:)**.
 - f. Open the C:\boot.ini file in a text editor.

Attention: Be cautious when you edit this file and make only the specified changes. Do not modify any other lines in this file.
 - g. In the operating system section, add **Primary** to the end of the operating description for the system disk.
 - h. Copy the line for the system disk, change **Primary** to **Secondary**, and change the system disk (for example, **rdisk(0)**) to mirrored disk (for example, **rdisk(1)**). The file looks similar to one of following examples.

Windows 2000 example:

```
[boot loader]
timeout=30 default=multi(0)disk(0)rdisk(0)partition(1)\WINNT
[operating systems]
multi(0)disk(0)rdisk(0)partition(1)\WINNT="Microsoft Windows 2000 Advanced
  Server Primary" /fastdetect
multi(0)disk(0)rdisk(1)partition(1)\WINNT="Microsoft Windows 2000 Advanced
  Server Secondary" /fastdetect
```

Windows 2003 example:

```
[boot loader]
timeout=30
default=multi(0)disk(0)rdisk(0)partition(1)\WINDOWS
[operating systems]
multi(0)disk(0)rdisk(0)partition(1)\WINDOWS="Windows Server 2003,
Standard Primary" /fastdetect
multi(0)disk(0)rdisk(1)partition(1)\WINDOWS="Windows Server 2003,
Standard Secondary" /fastdetect
```

- i. Save and close the file.
- j. Restart the machine.
After the machine completes the Power On Self Test (POST), the system prompts you to select the Windows operating system to use for the boot process
- k. Select the secondary operating system and press Enter to verify that the machine successfully restarts from the mirrored drive.
- l. Restart the machine again.
After the machine completes the POST, the system again prompts you to select the Microsoft Windows operating system to use for the boot process.
- m. Select your operating system and press Enter to verify that the machine successfully restarts from the system drive.

Chapter 3. Configuring the master console

You can configure the master console to access the SAN Volume Controller Console and the SAN Volume Controller command-line interface (CLI). If you installed the master console on your own hardware, you have already performed some of these steps during the installation process.

If you purchased the hardware master console and experience a problem, use the 2145 machine type and the serial number of a SAN Volume Controller node that was installed with the master console to open a hardware problem.

Perform the following steps to configure the master console:

1. Log on as a local administrator (for example, as the Administrator user) to the system where the master console software is installed.

Note: If you installed the software master console, skip to step 3 because you already performed the tasks described in step 2 before or during the installation of the master console software.
2. If you purchased a hardware master console, perform the following configuration steps:
 - a. Optionally, reconfigure the master console host name. When you receive the hardware master console, the host name is preconfigured as mannode. If you choose to change this name see “Changing the master console host name” on page 16 for more information.
 - b. Configure the internal IP network connection (Local Area Network). “Configuring the internal IP network connection” on page 16 provides more details for this step.
 - c. Configure the browser. “Checking your Web browser and settings before accessing the SAN Volume Controller Console” on page 19 provides more details for this step.
 - d. Generate an SSH key pair using the PuTTYgen. “Generating an SSH key pair using PuTTY” on page 17 provides more details for this step.
3. For a software master console or a hardware master console, perform the following configuration steps:
 - a. Configure a default PuTTY session for command-line interface (CLI) access. “Configuring a PuTTY session for the CLI” on page 18 provides more details for this step.
 - b. Store keys in the SAN Volume Controller Console software. “Storing the private SSH key in the SAN Volume Controller Console software” on page 18 provides more details for this step.
 - c. Install your chosen antivirus software on the master console system.

Configuring the host name

If you installed the master console software on your own hardware, you must set up the master console host name using the IP configuration information that you have specified during planning.

Note: If you have a hardware master console, the host name is preconfigured as mannode.

Perform the following steps to configure the host name for the master console:

1. From the desktop, right-click the **My Computer** icon and select **Properties**.
2. Click the **Network Identification** tab.
3. Click **Properties**.
4. Enter the master console name in the **Computer name** field.
5. Click **More**.
6. Enter the full path information in the **Primary DNS suffix for this computer** field.
7. Click **OK** until you return to the desktop.
8. Restart the master console.

Changing the master console host name

You can change the master console host name anytime. When you change the host name, you must also be sure that other master console applications are updated to use the new name.

Perform the following steps to change the host name and to update the name in other master console applications:

1. Right-click on **My Computer** from the desktop.
2. Click **Properties**.
3. Click **Computer Name**.
4. Click **Change**.
5. Type the master console host name in the **Computer name** field.
6. Click **More**.
7. Type the full path information in the **Primary DNS suffix of this computer** field.
8. Click **OK** until you return to the desktop.
9. Click **Yes** to restart the master console system so that the change to the host name is applied.

Configuring the internal IP network connection

Before you can use the master console, you must configure the internal IP network connection.

If you are using the master console on an IPv6 network, you must ensure that it is configured to run IPv6. See the Microsoft knowledge base for more information on setting up IPv6 on your operating system.

Perform the following steps to configure the Local Area Connection:

1. From the desktop, right-click **My Network Places**.
2. Click **Properties**.
3. Right-click **Local Area Connection**.
4. Click **Properties**.
5. Click **Internet Protocol (TCP/IP)**.
6. Click **Properties**.
7. Type all required information for the IP and DNS addresses.

Note: You do not have to use a static TCP/IP address. If you only want to access the master console directly, you can use a DHCP TCP/IP

address. If you use a DHCP TCP/IP address, ensure that the properties are set to DHCP. To access the master console remotely, you must use a static IP address.

8. Click **OK** until you return to the desktop.
9. Connect the Ethernet port to the network.

Generating an SSH key pair using PuTTY

You must generate a Secure Shell (SSH) key pair to use the SAN Volume Controller Console and the command-line interface (CLI).

Perform the following steps to generate SSH keys on the IBM System Storage Productivity Center (SSPC) or master console using the PuTTY key generator (PuTTYgen):

1. Start PuTTYgen by clicking **Start** → **Programs** → **PuTTY** → **PuTTYgen**. The PuTTY Key Generator panel is displayed.
2. Click **SSH-2 RSA** as the type of key to generate.

Note: Leave the number of bits in a generated key value at 1024.

3. Click **Generate** and then move the cursor around the blank area of the Key section to generate the random characters that create a unique key. When the key has been completely generated, the information about the new key is displayed in the Key section.

Attention: Do not modify the Key fingerprint or the Key comment fields; this can cause your key to no longer be valid.

4. (Optional) If you are generating SSH keys for a computer other than the SSPC or master console, enter a passphrase in the **Key passphrase** and **Confirm passphrase** fields. The passphrase encrypts the key on the disk; therefore, it is not possible to use the key without first entering the passphrase.

Attention: If you are generating the key pair for the SSPC or master console, do not enter anything in the Key passphrase or the Confirm passphrase fields.

5. Save the public key by performing the following steps:
 - a. Click **Save public key**. You are prompted for the name and location of the public key.
 - b. Type `icat.pub` as the name of the public key and specify the location where you want to save the public key. For example, you can create a directory on your computer called `keys` to store both the public and private keys.
 - c. Click **Save**.
6. Save the private key by performing the following steps:
 - a. Click **Save private key**. The PuTTYgen Warning panel is displayed.
 - b. Click **Yes** to save the private key without a passphrase.
 - c. Type `icat` as the name of the private key, and specify the location where you want to save the private key. For example, you can create a directory on your computer called `keys` to store both the public and private keys. It is recommended that you save your public and private keys in the same location.
 - d. Click **Save**.
7. Close the PuTTY Key Generator window.

Storing the private SSH key in the SAN Volume Controller Console software

For both the hardware and software versions of the IBM System Storage Productivity Center or master console, when the SSH keys that are used to communicate with the SAN Volume Controller node are generated or changed, you must store a copy of the new private key in the SAN Volume Controller Console software.

Perform the following steps to store a copy of the new private key in the SAN Volume Controller Console software:

1. Open a command prompt window.
2. Type the following command:

```
copy path\icat.ppk C:\Program Files\IBM\svccconsole\cimom
```

where *path* is the path where you stored the SSH private key when it was generated and *C:\Program Files\IBM\svccconsole\cimom* is the location where you installed the SAN Volume Controller Console.

Important: Directory names with embedded spaces must be surrounded by double quotation marks.

3. Close the command prompt window.

Configuring a PuTTY session for the CLI

You must configure a PuTTY session using the Secure Shell (SSH) key pair that you have generated before you can use the command-line interface (CLI).

Attention: Do not run scripts that create child processes that run in the background and call SAN Volume Controller commands. This can cause the system to lose access to data and cause data to be lost.

Perform the following steps to configure a PuTTY session for the CLI:

1. Select **Start** → **Programs** → **PuTTY** → **PuTTY**. The PuTTY Configuration window opens.
2. Click **Session** in the Category navigation tree. The Basic options for your PuTTY session are displayed.
3. Click **SSH** as the Protocol option.
4. Click **Only on clean exit** as the Close window on exit option. This ensures that connection errors are displayed.
5. Click **Connection** → **SSH** in the Category navigation tree. The options controlling SSH connections are displayed.
6. Click **2** as the Preferred SSH protocol version.
7. Click **Connection** → **SSH** → **Auth** in the Category navigation tree. The Options controller SSH authentication are displayed.
8. Click **Browse** or type the fully qualified file name and location of the SSH client and private key in the **Private key file for authentication** field. The file that you specify in this field is the one that you stored in the SAN Volume Controller software (for example, C:\Program Files\IBM\svccconsole\cimom\icat.ppk).
9. Click **Session** in the Category navigation tree. The Basic options for your PuTTY session are displayed.

10. Click **Default Settings** and then click **Save**.
11. Type the name or IP address of the SAN Volume Controller cluster in the **Host Name (or IP Address)** field.
12. Type 22 in the **Port** field. The SAN Volume Controller cluster uses the standard SSH port.
13. Type the name that you want to use to associate with this session in the **Saved Sessions** field. For example, you can name the session SAN Volume Controller Cluster 1.
14. Click **Save**.

You have now configured a PuTTY session for the CLI.

Routing configuration

You can add a route to your DNS server and Gateway IP.

Perform the following steps if you do not know the IP address of the master console gateway:

1. Open a command prompt window.
2. Issue the following command:

```
route print
```

At the bottom of the table the gateway is specified as the Default Gateway.

For every DNS server that is used by the master console, a specific route must be configured. You must configure a specific route for every device that you want to manage from the master console.

Note: If these routes are not configured, the master console cannot contact devices that are on a different subnet.

Perform the following steps to add the route for your DNS server:

1. Issue the following command:

```
route -p add DNS_Server_IP_Address MASK Gateway_IP_Address
```

Where *DNS_Server_IP_Address* is the DNS server IP address for Local Area Connection 2 and *Gateway_IP_Address* is the IP address of the gateway for Local Area Connection 2.

2. Issue the following command to add the routes for the other managed devices:

```
route -p add DNS_Server_IP_Address MASK Gateway_IP_Address
```

Where *DNS_Server_IP_Address* is the DNS server IP address of the device that you want to manage and *Gateway_IP_Address* is the IP address of the gateway for the device that you want to manage.

Checking your Web browser and settings before accessing the SAN Volume Controller Console

To access the SAN Volume Controller Console, you must ensure that your Web browser is supported and set to allow pop-up windows.

See the SAN Volume Controller Console support information on the following Web site for the supported operating systems and Web browsers:

www.ibm.com/storage/support/2145

Perform the following steps to configure your Web browser:

1. Ensure that the Web browser is not set to block or suppress pop-up windows.

Note: If you are using Internet Explorer 7.0 and receive a message that a pop-up window has been blocked, click the Information Bar at the top of the browser and select **Always allow popups** from this site. If you receive a message that content was blocked because it was not signed by a valid security certificate, click the Information Bar at the top of the screen and select **Show blocked** content.

2. Ensure that you have not installed any applications on the Web browser that block or suppress pop-up windows. If such an application is installed with the Web browser, uninstall it or turn it off.
3. Disable the proxy setting by performing the following steps:

For Netscape:

- a. Open your Netscape browser and click **Edit** → **Preferences**. The Preferences window displays.
- b. From the left side category, click **Advanced** to expand the secondary options. The suboption Proxies displays.
- c. Click **Proxies**. The Proxies window displays.
- d. Select **Direct connection to Internet**.

For Internet Explorer:

- a. Click **Tools** → **Internet Options** → **Connections** → **LAN Settings**.
- b. Click to clear the **Use a proxy server** box.
4. (Optional) Perform the following steps to add password protection so that your password does not display when you type it in:

For Netscape:

- a. Start a Netscape session.
- b. Click **Edit** → **Preferences** from the menu bar.
- c. Click **Privacy and Security**.
- d. Click **Web Passwords**.
- e. Ensure that the **Remember passwords for sites that require me to log in** box is unchecked.
- f. Click **OK**.

For Internet Explorer:

- a. Start an Internet Explorer session.
- b. Click **Tools** → **Internet Options** from the menu bar. The Internet Options panel is displayed.
- c. Click the **Content** tab.
- d. Click **AutoComplete**. The AutoComplete Settings panel is displayed.
- e. Ensure that the **User names and passwords on forms** box is unchecked.
- f. Click **OK**.

Chapter 4. Maintaining the master console software

The topics in this section help you maintain the master console software on your system.

You can perform any of the following activities to maintain your master console software:

- Upgrade all of some of the master console components, including the SAN Volume Controller Console, using the master console installation program.
- Upgrade only the SAN Volume Controller Console component by using a downloaded installation wizard.
- Uninstall individual master console software components.

Upgrading the master console software

The topics in this section guide you through the upgrade process for the master console software using the master console installation program.

Prerequisites for upgrading the master console

This topic provides an overview of the prerequisites for upgrading the master console.

Before you upgrade the master console, you must meet the following prerequisites:

- Ensure that your system meets the master console hardware and software requirements provided in the *IBM System Storage SAN Volume Controller Hardware Installation Guide*.
- You must be logged into the master console server using a user ID with administrative privileges.
- If you are upgrading the master console software from version 3.2 or an earlier version, you might be required to uninstall some components that were previously included with the master console. Table 1 provides a list of master console components that are not supported beginning with version 4.2 and the prerequisite actions to take.

Table 1. Unsupported components and actions to take prior to upgrading

Component	Action
IBM Tivoli® Storage Area Network Manager (Tivoli SAN Manager) Agent	You must manually uninstall the Tivoli SAN Manager Agent. The “Uninstalling Tivoli SAN Manager Agent” on page 24 topic provides instructions for uninstalling this component.
IBM Tivoli SAN Manager	You must manually uninstall the Tivoli SAN Manager. The “Uninstalling Tivoli SAN Manager” on page 25 topic provides instructions for uninstalling this component.
DS4000 Storage Manager Client (FAStT Storage Manager Client)	Unless you currently use the DS4000 Storage Manager Client, uninstall it to free up resources on the server. “Uninstalling the DS4000 Storage Manager Client (FAStT Storage Manager Client)” on page 25 provides instructions for uninstalling this component.

Table 1. Unsupported components and actions to take prior to upgrading (continued)

Component	Action
IBM Connection Manager	The IBM Connection Manager is automatically uninstalled during the master console upgrade process. You do not need to take any action.
IBM Director	The upgrade process works best if you uninstall the IBM Director before you upgrade the master console software, but this is not mandatory.

Upgrading using the master console installation wizard

After you upgrade the SAN Volume Controller Console to V4.2.1 you can use the master console installation wizard to upgrade all the master console components to version 4.2.1.

Upgrade the master console software before you upgrade the SAN Volume Controller cluster software to version 4.2.1.

Before you begin the upgrade process, ensure that you have performed the following actions:

- Logged in using a user ID with administrative privileges.
- Uninstalled any components that are not supported by the new version. For more information, see “Prerequisites for upgrading the master console” on page 21.

Perform the following steps to upgrade the master console software:

1. Insert the master console software installation CD in the CD drive.
2. Click **Start** → **Run** to open the Run window.
3. Enter *drive*:\setup.exe, where *drive* is the letter of the drive in which you inserted the CD. Click **OK**.

The following message is briefly displayed:

InstallShield(R) is preparing the InstallShield Wizard, which will guide you through the rest of the process.
Please wait

Preparing Java (tm) Virtual Machine

You are then prompted to select the language to use for the installation wizard.

4. Select the language to use, and then click **OK**.
The Welcome panel is displayed.
5. Read the information on the Welcome panel, and then click **Next**.
The License Agreement panel is displayed.
6. Read the license agreement and perform one of the following actions:
 - Click **I accept the terms in the license agreement**, and then click **Next** to continue with the installation.
 - Click **I do not accept the terms of the license agreement**, and then click **Cancel** to exit the installation.

When you click **Next**, the wizard verifies that your system meets the hardware requirements for the installation.

Note: If your system does not meet hardware requirements, the wizard opens a panel that warns you about a decrease in the performance level if these requirements are not met. Click **OK** to close the warning panel.

A panel that shows you the destination directories for your master console software installation is displayed.

7. Click **Next**.

The installation wizard compares the list of components to be installed with the products that are already installed on your system. If the wizard finds that any master console components are already installed, it compares the versions and uses the following logic to determine which components to install:

- If the component is not installed or the installed version is an earlier version than the required version, the component is installed or upgraded by launching the component-specific installation program.
- If the component is installed at the same version level as the version that is installed by the installation wizard, the wizard does not install the component.
- If the installed component is a later version than the version to be installed, the installation wizard does not install the component, but a warning that indicates that this version is not tested with the master console is displayed. Click **OK** if you see this warning. Decide whether you want to continue the installation or exit the installation so that you can first remove the later version from your system. If you remove the later version, restart the master console installation wizard after the removal.
- If a component is incorrectly installed on the system, you are asked to continue with the installation by reinstalling the component with the component-specific installer. If the reinstallation does not succeed, you must exit the master console installation wizard, manually remove the product from your system, and restart the master console installation wizard.

After the wizard performs the comparison, the Product List panel is displayed. This panel provides the following information:

- Versions of existing master console components
- Required versions
- Actions to be done by the installation wizard or by you

8. From the List of products panel, click **Next** to continue upgrading the products.

The installation wizard launches the necessary component-specific installation programs.

Note: Upgrades to the master console software components are also available at the following Web site: www.ibm.com/storage/support/2145. Instructions for downloading and installing upgraded software packages are available at this site too.

9. Follow the instructions on the panels for each master console component that must be upgraded. Click **Finish** when all the components have been installed.

10. If a system restart is required, accept the prompt to complete the master console installation process.

11. Review the master console installation log (mclog.txt) to ensure that all components are properly installed. The log file is located in *installation_directory*\logs, where *installation_directory* is the directory where the master console was installed. The default installation directory is C:\Program Files\IBM\MasterConsole.

Uninstalling master console software

To uninstall the master console software, you must remove the components separately.

Because of product dependencies, you must uninstall the software packages in a specific order. If you have any of the following components and plan to uninstall them, be sure to uninstall them in the following order.

Note: Some of the components that are listed were distributed in previous versions of the master console.

1. IBM Director
2. Tivoli SAN Manager Agent
3. Tivoli SAN Manager
4. DS4000 Storage Manager Client (FAStT Storage Manager Client)
5. Some of the listed components that were distributed in previous versions of the SAN Volume Controller Console.
6. PuTTY
7. Adobe Acrobat Reader
8. Master console

Note: When you remove the master console, you remove some documentation, support utilities, and icons. The documentation that is uninstalled with the master console option is located in *<destination_location>\Documents*, where *<destination_location>* is the location where the master console was installed on the system. The default location is *system_drive\Program Files\IBM\MasterConsole*.

Uninstalling IBM Director

This topic describes how to uninstall IBM Director from the master console using the Add/Remove Programs dialog panel.

This procedure assumes that you have accessed the Add/Remove Programs dialog panel.

Perform the following steps to uninstall IBM Director:

1. In the Add/Remove Programs panel, scroll to **IBM Director**, and click to select it.
2. Click **Change/Remove**.
3. Navigate through the uninstallation wizard, selecting the **Next** button of each window.
4. Wait for the program to be removed, and then click **Finish**.
5. If you are prompted to reboot the system, answer **yes** to reboot the system and complete the removal of the product.

Uninstalling Tivoli SAN Manager Agent

This topic describes how to uninstall Tivoli SAN Manager Agent from your master console hardware using the Add/Remove Programs dialog panel.

This procedure assumes that you have accessed the Add/Remove Programs dialog panel.

Perform the following steps to uninstall the Tivoli SAN Manager Agent:

1. In the Add/Remove Programs panel, scroll to **IBM Tivoli Storage Area Network Manager - Agent**, and click to select it.
2. Click **Change/Remove**.
3. Navigate through the uninstallation wizard, selecting the **Next** button of each window.
4. Wait for the program to be removed, and then click **Finish**.
5. If you are prompted to reboot the system, answer **yes** to reboot the system and complete the removal of the product.

Uninstalling Tivoli SAN Manager

This topic describes how to uninstall Tivoli SAN Manager from your master console hardware using the Add/Remove Programs dialog panel.

This procedure assumes that you have performed the following actions:

- Uninstalled the Tivoli SAN Manager Agent
- Accessed the Add/Remove Programs dialog panel

Perform the following steps to uninstall the Tivoli SAN Manager:

1. In the Add/Remove Programs panel, scroll to **IBM Tivoli Storage Area Network Manager - Manager**, and click to select it.
2. Click **Change/Remove**.
3. Navigate through the uninstallation wizard, selecting the **Next** button of each window.
4. Wait for the program to be removed, and then click **Finish**.
5. If you are prompted to reboot the system, answer **yes** to reboot the system and complete the removal of the product.
6. Remove the directory where the Tivoli SAN Manager and the Tivoli SAN Manager Agent were installed. By default, this directory is C:\Tivoli.

Uninstalling the DS4000 Storage Manager Client (FAST Storage Manager Client)

This topic describes how to uninstall the DS4000 Storage Manager Client (FAST Storage Manager Client) from the master console using the Add/Remove Programs dialog panel.

This procedure assumes that you have accessed the Add/Remove Programs dialog panel.

Perform the following steps to uninstall the DS4000 Storage Manager Client (FAST Storage Manager Client):

1. In the Add/Remove Programs panel, scroll to the product name, and click to select it.
2. Click **Change/Remove**.
3. Navigate through the uninstallation wizard, selecting the **Next** button of each window.
4. Wait for the program to be removed, and then click **Finish**.
5. If you are prompted to reboot the system, answer **yes** to reboot the system and complete the removal of the product.

Uninstalling PuTTY

This topic describes how to uninstall PuTTY from the master console using the Add/Remove Programs dialog panel.

This procedure assumes that you have accessed the Add/Remove Programs dialog panel.

Perform the following steps to uninstall PuTTY:

1. In the Add/Remove Programs panel, scroll to **PuTTY**, and click to select it.
2. Click **Change/Remove**.
3. Navigate through the uninstallation wizard, selecting the **Next** button of each window.
4. Wait for the program to be removed, and then click **Finish**

Uninstalling Adobe Reader

You can uninstall Adobe Reader from the master console.

Perform the following steps to uninstall Adobe Reader:

1. Open the Add or Remove Programs window from the Windows Control Panel.
2. Find and select the line for Adobe Reader in the Add or Remove Programs window.
3. Click **Remove** or **Change**.
4. Navigate through the uninstallation wizard, selecting the **Next** button of each window.
5. Wait for the program to be removed, and then click **Finish**.

Uninstalling the master console

This topic describes how to uninstall the master console.

This procedure assumes that you have opened the Microsoft Windows Add or Remove Programs dialog box.

Perform the following steps to uninstall the master console:

1. Find and select **IBM System Storage Master Console for SAN Volume Controller** in the Add or Remove Programs window.
2. Click **Remove** or **Change**.
3. Navigate through the uninstallation wizard, selecting the **Next** button of each window.
4. Wait for the program to be removed, and then click **Finish**
5. If you are prompted to reboot the system, answer **yes** to reboot the system and complete the removal of the product.

To complete the removal process, you can remove the directory where the master console was installed. The default is *system_drive*\Program Files\IBM\Master Console.

Chapter 5. Troubleshooting the master console

These topics provide information that can help you troubleshoot and resolve problems with the master console server.

In addition to troubleshooting on your own, you can also request an Assist On-site session with an IBM service representative.

For SAN Volume Controller version 4.2.1 and earlier, the master console provides a single point from which to manage the SAN Volume Controller nodes. An existing master console can be upgraded to support clusters that are running the latest SAN Volume Controller software.

Beginning with SAN Volume Controller version 4.3.0, the IBM System Storage Productivity Center (SSPC) is an integrated hardware and software solution that provides a single point of entry for managing SAN Volume Controller clusters, IBM System Storage DS8000 systems, and other components of your data storage infrastructure.

Use the following topics to resolve problems with the master console server.

Clearing the Microsoft Windows event logs

When you change the IBM System Storage Productivity Center or master console IP address or host name, you might create entries in the Microsoft Windows event logs.

Clear all three logs to ensure that these log entries do not cause confusion when you try to isolate problems.

The following procedure assumes that your Windows desktop is displayed.

Perform the following steps to clear the event logs:

1. Right-click **My Computer** and select **Manage**.
2. Expand **Event Viewer**.
3. Right-click **Application** and select **Clear All Events**. Click **No** when you are asked if you want to save the log before clearing.
4. Right-click **Security** and select **Clear All Events**. Click **No** when you are asked if you want to save the log before clearing.
5. Right-click **System** and select **Clear All Events**. Click **No** when you are asked if you want to save the log before clearing.
6. Close the computer management window.

Troubleshooting Microsoft Windows boot problems

Use this section to help you resolve Microsoft Windows boot problems on the master console system.

Perform the following actions to resolve Windows boot problems:

- If you cannot start the Windows system from the boot drive, try to start the master console system from the second disk drive (the mirrored disk).

- If you continue to have problems starting the system from either the boot disk drive or the second disk drive, you must replace the corrupted disk drive, and then mirror the boot drive again.

Note: After you set up mirroring, the hard disk drive on the system that runs the master console is actually a mirrored pair of hard disks. This strategy protects against loss of access to the master console due to a disk failure. This mirroring can help you start the master console system if the boot disk does not work. Whenever you replace one of the disks on your master console, you must make sure that you mirror the disks again.

Starting the master console hardware from the mirrored disk

During the Microsoft Windows boot process on the master console hardware, if Windows tries to start but fails with an Inaccessible Boot Device message on a blue screen, and another restart attempt does not solve the problem, the Windows boot code on the startup device might be corrupted.

The following instructions require that you use the administrator password for the power-on password when you restart the system. If the system is set up with an administrator password and you use a regular power-on password, you can see only a limited version of the **Configuration/Setup** menu.

Perform the following steps to resolve the problem:

1. Restart the master console system and watch the screen. When the Press F1 for Configuration/Setup message appears, press F1.
The main menu for Configuration/Setup Utility is displayed.
2. Select **Start Options** from the main menu.
3. Select **Start Sequence**.
4. Step down the sequence to the one that contains the hard disk.
5. Use the left and right cursor keys to select the other hard disk. For example, if the hard disk is set to 1, select 0. If the hard disk is set to 0, select 1.
6. Press Esc to exit each menu until the option to save and exit is displayed. Select **Yes** to save the changes and exit the Configuration/Setup Utility.
7. If the master console system starts, proceed with the steps for recovering from a master console disk failure. If the master console system does not start, contact your IBM service representative.

Replace a disk on the master console server

If one of the disk drives on the master console server fails, you might need to replace it with a new disk drive. The new drive must be the same capacity or larger than the drive being replaced.

Perform the following steps if one of the mirrored disk drives fails and must be replaced:

1. If you cannot determine which of the two disk drives has failed, restart the server with each disk drive to determine which drive is not functioning.
2. Right-click the **My Computer** icon on your desktop and select **Manage**.
3. Select **Disk Management** from the left navigation panel. The hard drives are displayed in the right panel.
4. If the failing disk drive is displayed, right-click the main volume of the drive and select **Break Mirror**.

5. Shut down the master console hardware and replace the failing disk drive using the procedures that are detailed in the documentation for your replacement hard drive. Ensure that the jumper settings for the new drive are the same as the jumper settings for the drive that is being replaced.

Notes: If the replacement drive has a master boot record (MBR), erase the MBR prior to using the replacement drive. However, if the master console computer fails to start because it cannot find the MBR, change the start sequence in the BIOS to the other hard drive.

6. Restart the computer.
7. Right-click **My Computer** on your desktop and select **Manage**.
8. Select **Disk Management**. The hard drives are displayed in the right panel.
9. If a disk drive is marked **Missing**, right-click the drive and select **Remove Disk**.
10. If a no entry sign is displayed on the new disk drive, right-click that disk drive and select **Write Signature**. This removes the no entry sign.
11. Right-click the new disk drive and select **Upgrade to Dynamic Disk**.
12. Right-click the volume that you want to mirror and select **Add Mirror**. The Add Mirror wizard is started.
13. Use the Add Mirror wizard to configure the second volume.
14. Ignore the window for making changes to the boot.ini file.

The status of both volumes, the existing drive, and the new drive changes to **Regenerating**. After a short period of time, the status shows the percentage of regeneration that has completed. When the regeneration completes, the status is displayed as **Healthy**.

Master console recovery procedures

If the master console server disk drive fails and the master console software is also lost, the hardware master console software can be restored to the factory default settings.

The master console server uses a mirrored pair of disk drives to protect the master console software in case a disk drive fails. However, if both copies of the software are also destroyed, you can restore the software to the factory default settings by using the CDs that are supplied with the hardware master console.

Complete the following steps to restore the master console software to the factory default settings:

Hardware master console V4.1 and later

1. Inspect your recovery CDs. Beginning with version 4.1, IBM provides a separate Microsoft Windows CD in addition to the software Master console CDs.
2. Reinstall the Windows operating system using the supplied Windows CDs.
3. Install the master console software from the supplied CDs.
4. Configure the master console software.

Hardware master console versions prior to V4.1

1. Inspect your recovery CDs. Prior to version 4.1, the set of recovery CDs contains both Microsoft Windows and the master console software in one bundle.
2. Insert recovery CD 1.

3. Power off the master console server.
4. Power on the master console server and follow the on-screen instructions.
5. Configure the master console software.

Accessibility

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully.

Features

These are the major accessibility features in the SAN Volume Controller Console :

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. The following screen readers have been tested: WebKing v5.5 and Window-Eyes v5.5.
- You can operate all features using the keyboard instead of the mouse.

Navigating by keyboard

You can use keys or key combinations to perform operations and initiate many menu actions that can also be done through mouse actions. You can navigate the SAN Volume Controller Console and help system from the keyboard by using the following key combinations:

- To traverse to the next link, button, or topic, press Tab inside a frame (page).
- To expand or collapse a tree node, press → or ←, respectively.
- To move to the next topic node, press V or Tab.
- To move to the previous topic node, press ^ or Shift+Tab.
- To scroll all the way up or down, press Home or End, respectively.
- To go back, press Alt+←.
- To go forward, press Alt+→.
- To go to the next frame, press Ctrl+Tab.
- To move to the previous frame, press Shift+Ctrl+Tab.
- To print the current page or active frame, press Ctrl+P.
- To select, press Enter.

Accessing the publications

You can view the publications for the SAN Volume Controller in Adobe Portable Document Format (PDF) using the Adobe Acrobat Reader. The PDFs are provided at the following Web site:

www.ibm.com/storage/support/2145

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European community contact:

IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569

Telephone: 0049 (0)711 785 1176
Fax: 0049 (0)711 785 1283
E-mail: tjahn@de.ibm.com

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Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung des EMVG ist die IBM Deutschland GmbH, 70548 Stuttgart.

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

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This product has been designed and built to comply with (IEC) Standard 950.

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This apparatus is manufactured to the International Safety Standard EN60950 and as such is approved in the U.K. under approval number NS/G/1234/J/100003 for indirect connection to public telecommunications systems in the United Kingdom.

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European Contact Information

This topic contains the product service contact information for Europe.

European Community contact:
IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569
Tele: 0049 (0)711 785 1176
Fax: 0049 (0)711 785 1283
e-mail: <mailto:tjahn@de.ibm.com>

Taiwan Contact Information

This topic contains the product service contact information for Taiwan.

IBM Taiwan Product Service Contact Information:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd., Taipei Taiwan
Tel: 0800-016-888

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

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Glossary

This glossary includes terms for the IBM System Storage SAN Volume Controller.

This glossary includes selected terms and definitions from A Dictionary of Storage Networking Terminology (www.snia.org/education/dictionary), copyrighted 2001 by the Storage Networking Industry Association, 2570 West El Camino Real, Suite 304, Mountain View, California 94040-1313. Definitions derived from this book have the symbol (S) after the definition.

The following cross-references are used in this glossary:

- See** Refers the reader to one of two kinds of related information:
- A term that is the expanded form of an abbreviation or acronym. This expanded form of the term contains the full definition.
 - A synonym or more preferred term.

See also
Refers the reader to one or more related terms.

Contrast with
Refers the reader to a term that has an opposite or substantively different meaning.

Numerics

2145 A hardware machine type for the IBM System Storage SAN Volume Controller. Models of the SAN Volume Controller are expressed as the number 2145 followed by "-xxx", such as 2145-8G4. Hardware models for the 2145 include 2145-4F2, 2145-8F2, 2145-8F4, 2145-8G4, and 2145-8A4.

A

access mode
One of three different modes in which a logical unit (LU) in a disk controller system can operate. See also *image mode*, *managed space mode*, and *unconfigured mode*.

Address Resolution Protocol (ARP)
A protocol that dynamically maps an IP address to a network adapter address in a local area network.

agent code
An open-systems standard that interprets Common Information Model (CIM) requests and responses as they transfer between the client application and the device.

application server
A host that is attached to the storage area network (SAN) and that runs applications.

ARP See *Address Resolution Protocol*.

array An ordered collection, or group, of physical storage devices that are used to define logical volumes or devices.

association
A class that contains two references that define a relationship between two referenced objects.

asymmetric virtualization

A virtualization technique in which the virtualization engine is outside the data path and performs a metadata-style service. The metadata server contains all the mapping and locking tables while the storage devices contain only data. See also *symmetric virtualization*.

auxiliary virtual disk

The virtual disk that contains a backup copy of the data and that is used in disaster recovery scenarios. See also *master virtual disk*.

availability

The ability of a system to continue working, with perhaps a decrease in performance, after individual components fail.

B**bandwidth**

The range of frequencies an electronic system can transmit or receive. The greater the bandwidth of a system, the more information the system can transfer in a given period of time.

bitmap

A coded representation in which each bit, or group of bits, represents or corresponds to an item; for example, a configuration of bits in main storage in which each bit indicates whether a peripheral device or a storage block is available or in which each group of bits corresponds to one pixel of a display image.

blade One component in a system that is designed to accept some number of components (blades). Blades could be individual servers that plug into a multiprocessing system or individual port cards that add connectivity to a switch. A blade is typically a hot-swappable hardware device.

block A unit of data storage on a disk drive.

block virtualization

The act of applying virtualization to one or more block-based (storage) services for the purpose of providing a new aggregated, higher-level, richer, simpler, or secure block service to clients. Block virtualization functions can be nested. A disk drive, RAID system, or volume manager all perform some form of block-address to (different) block-address mapping or aggregation. See also *virtualization*.

Boolean

Pertaining to the processes used in the algebra formulated by George Boole.

C

cache A high-speed memory or storage device used to reduce the effective time required to read data from or write data to lower-speed memory or a device. Read cache holds data in anticipation that it will be requested by a client. Write cache holds data written by a client until it can be safely stored on more permanent storage media such as disk or tape.

Call Home

In SAN Volume Controller, a communication service that sends data and event notifications to a service provider. The machine can use this link to place a call to IBM or to another service provider when service is required.

capacity licensing

A type of licensing that grants you the use of a number of terabytes (TB) for virtualization, a number of terabytes for Metro Mirror and Global Mirror relationships, and a number of terabytes for FlashCopy® mappings.

cascading

The process of connecting two or more fibre-channel hubs or switches together to increase the number of ports or extend distances.

CIM See *Common Information Model*.

CIM object manager (CIMOM)

The common conceptual framework for data management that receives, validates, and authenticates the CIM requests from the client application. It then directs the requests to the appropriate component or service provider.

CIMOM

See *CIM object manager*.

class The definition of an object within a specific hierarchy. A class can have properties and methods and can serve as the target of an association.

CLI See *command line interface*.

client A computer system or process that requests a service of another computer system or process that is typically referred to as a server. Multiple clients can share access to a common server.

client application

A storage management program that initiates Common Information Model (CIM) requests to the CIM agent for the device.

cluster

In SAN Volume Controller, up to four pairs of nodes that provide a single configuration and service interface.

command line-interface (CLI)

A type of computer interface in which the input command is a string of text characters.

Common Information Model (CIM)

A set of standards developed by the Distributed Management Task Force (DMTF). CIM provides a conceptual framework for storage management and an open approach to the design and implementation of storage systems, applications, databases, networks, and devices.

concurrent maintenance

Service that is performed on a unit while it is operational.

In SAN Volume Controller, the ability for one node in the cluster to be turned off for maintenance without interrupting access to the VDisk data provided by the cluster.

configuration node

A node that acts as the focal point for configuration commands and manages the data that describes the cluster configuration.

connected

In a Global Mirror relationship, pertaining to the status condition that occurs when two clusters can communicate.

consistency group

A group of copy relationships between virtual disks that are managed as a single entity.

consistent copy

In a Metro or Global Mirror relationship, a copy of a secondary virtual disk (VDisk) that is identical to the primary VDisk from the viewpoint of a host system, even if a power failure occurred while I/O activity was in progress.

consistent-stopped

In a Global Mirror relationship, the state that occurs when the secondary virtual disk (VDisk) contains a consistent image, but the image might be out-of-date with respect to the primary VDisk. This state can happen when a relationship was in the consistent-synchronized state when an error occurred that forced a freeze of the consistency group. This state can also happen when a relationship is created with the create-consistent flag set to TRUE.

consistent-synchronized

In a Global Mirror relationship, the status condition that occurs when the primary virtual disk (VDisk) is accessible for read and write I/O operations. The secondary VDisk is accessible for read-only I/O operations. See also *primary virtual disk* and *secondary virtual disk*.

container

A data storage location; for example, a file, directory, or device.

A software object that holds or organizes other software objects or entities.

contingency capacity

Initially, a fixed amount of unused real capacity that is maintained on a space-efficient virtual disk that is configured to automatically expand its real capacity. It is also the difference between the used capacity and the new real capacity when the real capacity is changed manually.

copied

In a FlashCopy mapping, a state that indicates that a copy has been started after the copy relationship was created. The copy process is complete and the target disk has no further dependence on the source disk.

copying

A status condition that describes the state of a pair of virtual disks (VDisks) that have a copy relationship. The copy process has been started but the two virtual disks are not yet synchronized.

Copy Services

The services that enable you to copy virtual disks (VDisks): FlashCopy, Metro, and Global Mirror.

counterpart SAN

A nonredundant portion of a redundant storage area network (SAN). A counterpart SAN provides all the connectivity of the redundant SAN but without the redundancy. Each counterpart SANs provides an alternate path for each SAN-attached device. See also *redundant SAN*.

cross-volume consistency

In SAN Volume Controller, a consistency group property that guarantees consistency between virtual disks when an application issues dependent write operations that span multiple virtual disks.

D**data migration**

The movement of data from one physical location to another without disrupting I/O operations.

degraded

Pertaining to a valid configuration that has suffered a failure but continues to be supported and legal. Typically, a repair action can be performed on a degraded configuration to restore it to a valid configuration.

dense wavelength division multiplexing (DWDM)

A technology that places many optical signals onto one single-mode fiber using slightly different optical frequencies. DWDM enables many data streams to be transferred in parallel.

dependent write operations

A set of write operations that must be applied in the correct order to maintain cross-volume consistency.

destage

A write command initiated by the cache to flush data to disk storage.

device

In the CIM Agent, the storage server that processes and hosts client application requests.

IBM definition: A piece of equipment that is used with the computer and does not generally interact directly with the system, but is controlled by a controller.

HP definition: In its physical form, a magnetic disk that can be attached to a SCSI bus. The term is also used to indicate a physical device that has been made part of a controller configuration; that is, a physical device that is known to the controller. Units (virtual disks) can be created from devices after the devices have been made known to the controller.

device provider

A device-specific handler that serves as a plug-in for the Common Information Model (CIM); that is, the CIM object manager (CIMOM) uses the handler to interface with the device.

directed maintenance procedures

The set of maintenance procedures that can be run for a cluster. These procedures are run from within the SAN Volume Controller application and are documented in the *IBM System Storage SAN Volume Controller Troubleshooting Guide*.

disconnected

In a Metro or Global Mirror relationship, pertains to two clusters when they cannot communicate.

discovery

The automatic detection of a network topology change, for example, new and deleted nodes or links.

disk controller

A device that coordinates and controls the operation of one or more disk drives and synchronizes the operation of the drives with the operation of the system as a whole. Disk controllers provide the storage that the cluster detects as managed disks (MDisks).

disk drive

A disk-based, nonvolatile, storage medium.

disk zone

A zone defined in the storage area network (SAN) fabric in which the SAN Volume Controller can detect and address the logical units that the disk controllers present.

Distributed Management Task Force (DMTF)

An organization that defines standards for the management of distributed systems. See also *Common Information Model*.

DMP See *directed maintenance procedures*.

DMTF See *Distributed Management Task Force*.

domain name server

In the Internet suite of protocols, a server program that supplies name-to-address conversion by mapping domain names to IP addresses.

DRAM See *dynamic random access memory*.

DWDM

See *dense wavelength division multiplexing*.

dynamic random access memory (DRAM)

A storage in which the cells require repetitive application of control signals to retain stored data.

E

EC See *engineering change*.

EIA See *Electronic Industries Alliance*.

Electronic Industries Alliance (EIA)

An alliance of four trade associations: The Electronic Components, Assemblies & Materials Association (ECA); the Government Electronics and Information Technology Association (GEIA); the JEDEC Solid State Technology Association (JEDEC); and the Telecommunications Industry Association (TIA). Prior to 1998, EIA was the Electronic Industries Association and the group dates back to 1924.

empty In a Global Mirror relationship, a status condition that exists when the consistency group contains no relationships.

engineering change (EC)

A correction for a defect of hardware or software that is applied to a product.

error code

A value that identifies an error condition.

ESS See *IBM TotalStorage Enterprise Storage Server[®]*.

exclude

To remove a managed disk (MDisk) from a cluster because of certain error conditions.

excluded

In SAN Volume Controller, the status of a managed disk that the cluster has removed from use after repeated access errors.

extent A unit of data that manages the mapping of data between managed disks and virtual disks.

F

fabric In fibre-channel technology, a routing structure, such as a switch, that receives addressed information and routes it to the appropriate destination. A fabric can consist of more than one switch. When multiple fibre-channel switches are interconnected, they are described as cascading. See also *cascading*.

fabric port (F_port)

A port that is part of a fibre-channel fabric. An F_port on a fibre-channel fabric connects to the node port (N_port) on a node.

failover

In SAN Volume Controller, the function that occurs when one redundant part of the system takes over the workload of another part of the system that has failed.

FCIP See *Fibre Channel over IP*.

fibre channel

A technology for transmitting data between computer devices at a data rate of up to 4 Gbps. It is especially suited for attaching computer servers to shared storage devices and for interconnecting storage controllers and drives.

fibre-channel extender

A device that extends a fibre-channel link over a greater distance than is supported by the standard, usually a number of miles or kilometers. Devices must be deployed in pairs at each end of a link.

Fibre Channel over IP (FCIP)

A network storage technology that combines the features of the Fibre Channel Protocol and the Internet Protocol (IP) to connect distributed SANs over large distances.

Fibre Channel Protocol (FCP)

A protocol that is used in fibre-channel communications with five layers that define how fibre-channel ports interact through their physical links to communicate with other ports.

field replaceable unit (FRU)

An assembly that is replaced in its entirety when any one of its components fails. An IBM service representative performs the replacement. In some cases, a field replaceable unit might contain other field replaceable units.

FlashCopy mapping

A relationship between two virtual disks.

FlashCopy relationship

See *FlashCopy mapping*.

FlashCopy service

In SAN Volume Controller, a copy service that duplicates the contents of a source virtual disk (VDisk) to a target VDisk. In the process, the original contents of the target VDisk are lost. See also *point-in-time copy*.

F_port

See *fabric port*.

FRU See *field replaceable unit*.

G

gateway

An entity that operates above the link layer and translates, when required, the interface and protocol used by one network into those used by another distinct network.

GB See *gigabyte*.

GBIC See *gigabit interface converter*.

gigabit interface converter (GBIC)

An interface module that converts the light stream from a fibre-channel cable into electronic signals for use by the network interface card.

gigabyte (GB)

In decimal notation, 1 073 741 824 bytes.

Global Mirror

An asynchronous copy service that enables host data on a particular source virtual disk (VDisk) to be copied to the target VDisk that is designated in the relationship.

grain In a FlashCopy bitmap, the unit of data represented by a single bit.

graphical user interface (GUI)

A type of computer interface that presents a visual metaphor of a real-world scene, often of a desktop, by combining high-resolution graphics, pointing devices, menu bars and other menus, overlapping windows, icons and the object-action relationship.

GUI See *graphical user interface*.

H

hardcoded

Pertaining to software instructions that are statically encoded and not intended to be altered.

HBA See *host bus adapter*.

HLUN See *virtual disk*.

hop One segment of a transmission path between adjacent nodes in a routed network.

host An open-systems computer that is connected to the SAN Volume Controller through a fibre-channel interface.

host bus adapter (HBA)

In SAN Volume Controller, an interface card that connects a host bus, such as a peripheral component interconnect (PCI) bus, to the storage area network.

host ID

In SAN Volume Controller, a numeric identifier assigned to a group of host fibre-channel ports for the purpose of logical unit number (LUN) mapping. For each host ID, there is a separate mapping of Small Computer System Interface (SCSI) IDs to virtual disks (VDisks).

host zone

A zone defined in the storage area network (SAN) fabric in which the hosts can address the SAN Volume Controllers.

hub A fibre-channel device that connects nodes into a logical loop by using a

physical star topology. Hubs will automatically recognize an active node and insert the node into the loop. A node that fails or is powered off is automatically removed from the loop.

A communications infrastructure device to which nodes on a multi-point bus or loop are physically connected. Commonly used in Ethernet and fibre-channel networks to improve the manageability of physical cables. Hubs maintain the logical loop topology of the network of which they are a part, while creating a “hub and spoke” physical star layout. Unlike switches, hubs do not aggregate bandwidth. Hubs typically support the addition or removal of nodes from the bus while it is operating. (S) Contrast with *switch*.

I

IBM System Storage Productivity Center (SSPC)

An integrated hardware and software solution that provides a single point of entry for managing SAN Volume Controller clusters, IBM System Storage DS8000™ systems, and other components of a data storage infrastructure.

IBM TotalStorage Enterprise Storage Server (ESS)

An IBM product that provides an intelligent disk-storage system across an enterprise.

ID See *identifier*.

identifier (ID)

A sequence of bits or characters that identifies a user, program device, or system to another user, program device, or system.

idle In a FlashCopy mapping, the state that occurs when the source and target virtual disks (VDisks) act as independent VDisks even if a mapping exists between the two. Read and write caching is enabled for both the source and the target.

idling The status of a pair of virtual disks (VDisks) that have a defined copy relationship for which no copy activity has yet been started.

In a Metro or Global Mirror relationship, the state that indicates that the master virtual disks (VDisks) and auxiliary VDisks are operating in the primary role. Consequently, both VDisks are accessible for write I/O operations.

idling-disconnected

In a Global Mirror relationship, the state that occurs when the virtual disks (VDisks) in this half of the consistency group are all operating in the primary role and can accept read or write I/O operations.

illegal configuration

A configuration that will not operate and will generate an error code to indicate the cause of the problem.

image mode

An access mode that establishes a one-to-one mapping of extents in the managed disk (MDisk) with the extents in the virtual disk (VDisk). See also *managed space mode* and *unconfigured mode*.

image VDisk

A virtual disk (VDisk) in which there is a direct block-for-block translation from the managed disk (MDisk) to the VDisk.

IML See *initial microcode load*.

inconsistent

In a Metro or Global Mirror relationship, pertaining to a secondary virtual disk (VDisk) that is being synchronized with the primary VDisk.

inconsistent-copying

In a Global Mirror relationship, the state that occurs when the primary virtual disk (VDisk) is accessible for read and write input/output (I/O) operations, but the secondary VDisk is not accessible for either. This state occurs after a **start** command is issued to a consistency group that is in the inconsistent-stopped state. This state also occurs when a **start** command is issued, with the force option, to a consistency group that is in the idling or consistent-stopped state.

inconsistent-disconnected

In a Global Mirror relationship, a state that occurs when the virtual disks (VDisks) in the half of the consistency group that is operating in the secondary role are not accessible for either read or write I/O operations.

inconsistent-stopped

In a Global Mirror relationship, the state that occurs when the primary virtual disk (VDisk) is accessible for read and write input/output (I/O) operations, but the secondary VDisk is not accessible for either read or write I/O operations.

indication

An object representation of an event.

initial microcode load (IML)

In SAN Volume Controller, the process by which the run-time code and data for a node are loaded into memory and initialized.

initiator

The system component that originates an I/O command over an I/O bus or network. I/O adapters, network interface cards, and intelligent controller device I/O bus control ASICs are typical initiators. (S) See also *logical unit number*.

input/output (I/O)

Pertaining to a functional unit or communication path involved in an input process, an output process, or both, concurrently or not, and to the data involved in such a process.

instance

An individual object that is a member of some class. In object-oriented programming, an object is created by instantiating a class.

integrity

The ability of a system to either return only correct data or respond that it cannot return correct data.

Internet Protocol (IP)

In the Internet suite of protocols, a connectionless protocol that routes data through a network or interconnected networks and acts as an intermediary between the higher protocol layers and the physical network. IPv4 is the dominant network layer protocol on the Internet, and IPv6 is designated as its successor. IPv6 provides a much larger address space, which enables greater flexibility in assigning addresses and simplifies routing and renumbering.

interswitch link (ISL)

The physical connection that carries a protocol for interconnecting multiple routers and switches in a storage area network.

I/O See *input/output*.

I/O group

A collection of virtual disks (VDisks) and node relationships that present a common interface to host systems.

I/O throttling rate

The maximum rate at which an I/O transaction is accepted for this virtual disk (VDisk).

IP See *Internet Protocol*.

IP address

The unique 32-bit address that specifies the location of each device or workstation in the Internet. For example, 9.67.97.103 is an IP address.

ISL See *interswitch link*.

ISL hop

A hop on an interswitch link (ISL). Considering all pairs of node ports (N-ports) in a fabric and measuring distance only in terms of interswitch links (ISLs) in the fabric, the number of ISLs traversed is the number of ISL hops on the shortest route between the pair of nodes that are farthest apart in the fabric.

J**JBOD (just a bunch of disks)**

IBM definition: See *non-RAID*.

HP definition: A group of single-device logical units not configured into any other container type.

L

LBA See *logical block address*.

least recently used (LRU)

An algorithm used to identify and make available the cache space that contains the least-recently used data.

line card

See *blade*.

local fabric

In SAN Volume Controller, those storage area network (SAN) components (such as switches and cables) that connect the components (nodes, hosts, switches) of the local cluster together.

local/remote fabric interconnect

The storage area network (SAN) components that are used to connect the local and remote fabrics together.

logical block address (LBA)

The block number on a disk.

logical unit (LU)

An entity to which Small Computer System Interface (SCSI) commands are addressed, such as a virtual disk (VDisk) or managed disk (MDisk).

logical unit number (LUN)

The SCSI identifier of a logical unit within a target. (S)

longitudinal redundancy check (LRC)

A method of error checking during data transfer that involves checking parity.

LRC See *longitudinal redundancy check*.

LRU See *least recently used*.

LU See *logical unit*.

LUN See *logical unit number*.

LUN masking

A process that allows or prevents I/O to the disk drives through the host-bus-adaptor (HBA) device or operating-system device driver.

M**managed disk (MDisk)**

A Small Computer System Interface (SCSI) logical unit that a redundant array of independent disks (RAID) controller provides and a cluster manages. The MDisk is not visible to host systems on the storage area network (SAN).

managed disk group

A collection of managed disks (MDisks) that, as a unit, contain all the data for a specified set of virtual disks (VDisks).

Managed Object Format (MOF)

A language for defining Common Information Model (CIM) schemas.

managed space mode

An access mode that enables virtualization functions to be performed. See also *image mode* and *unconfigured mode*.

Management Information Base (MIB)

Simple Network Management Protocol (SNMP) units of managed information that specifically describe an aspect of a system, such as the system name, hardware number, or communications configuration. A collection of related MIB objects is defined as a MIB.

mapping

See *FlashCopy mapping*.

master console

A single point from which to manage the IBM System Storage SAN Volume Controller. For SAN Volume Controller version 4.2.1 and earlier, the master console was purchased either as software that was installed and configured on a server or as a hardware platform with preinstalled operating system and master console software. See *IBM System Storage Productivity Center*.

master virtual disk

The virtual disk (VDisk) that contains a production copy of the data and that an application accesses. See also *auxiliary virtual disk*.

MB See *megabyte*.

MDisk See *managed disk*.

megabyte (MB)

In decimal notation, 1 048 576 bytes.

mesh configuration

A network that contains a number of small SAN switches configured to create a larger switched network. With this configuration, four or more switches are connected together in a loop with some of the paths short circuiting the loop. An example of this configuration is to have four switches connected together in a loop with ISLs for one of the diagonals.

method

A way to implement a function on a class.

Metro Mirror

A synchronous copy service that enables host data on a particular source virtual disk (VDisk) to be copied to the target VDisk that is designated in the relationship.

MIB See *Management Information Base*.

migration

See *data migration*.

mirrored virtual disk

A virtual disk (VDisk) with two VDisk copies.

mirrorset

IBM definition: See *RAID-1*.

HP definition: A RAID storage set of two or more physical disks that maintain a complete and independent copy of the data from the virtual disk. This type of storage set has the advantage of being highly reliable and extremely tolerant of device failure. Raid level 1 storage sets are referred to as mirrorsets.

MOF See *Managed Object Format (MOF)*.

N**namespace**

The scope within which a Common Information Model (CIM) schema applies.

node One SAN Volume Controller. Each node provides virtualization, cache, and Copy Services to the storage area network (SAN).

node name

A name identifier associated with a node. (SNIA)

node port (N_port)

A port that connects a node to a fabric or to another node. N_ports connect to fabric ports (F_ports) or to other N_ports of other nodes. N_ports handle creation, detection, and flow of message units to and from the connected systems. N_ports are end points in point-to-point links.

node rescue

In SAN Volume Controller, the process by which a node that has no valid software installed on its hard disk drive can copy the software from another node connected to the same fibre-channel fabric.

non-RAID

Disks that are not in a redundant array of independent disks (RAID). HP definition: See *JBOD*.

N_port

See *node port*.

O

object In object-oriented design or programming, a concrete realization of a class that consists of data and the operations associated with that data.

object model

A representation, such as a diagram, of objects in a given system. Using symbols similar to standard flowchart symbols, an object model depicts the classes the objects belong to, their associations with each other, the attributes that make them unique, and the operations that the objects can perform and that can be performed on them.

object name

An object that consists of a namespace path and a model path. The namespace path provides access to the Common Information Model (CIM) implementation managed by the CIM Agent, and the model path provides navigation within the implementation.

object path

An object that consists of a namespace path and a model path. The namespace path provides access to the Common Information Model (CIM) implementation managed by the CIM Agent, and the model path provides navigation within the implementation.

offline Pertaining to the operation of a functional unit or device that is not under the continual control of the system or of a host.

online Pertaining to the operation of a functional unit or device that is under the continual control of the system or of a host.

operating set

In SAN Volume Controller, the set of nodes that are operating together to deliver storage services.

overallocated volume

See *space-efficient virtual disk*.

oversubscription

The ratio of the sum of the traffic that is on the initiator N-node connections to the traffic that is on the most heavily loaded interswitch links (ISLs), where more than one ISL is connected in parallel between these switches. This definition assumes a symmetrical network and a specific workload that is applied equally from all initiators and sent equally to all targets. See also *symmetrical network*.

P

partition

IBM definition: A logical division of storage on a fixed disk.

HP definition: A logical division of a container represented to the host as a logical unit.

partner node

The other node that is in the I/O group to which this node belongs.

partnership

In Metro or Global Mirror operations, the relationship between two clusters. In a cluster partnership, one cluster is defined as the local cluster and the other cluster as the remote cluster.

paused

In SAN Volume Controller, the process by which the cache component quiesces all ongoing I/O activity below the cache layer.

pend To cause to wait for an event.

petabyte (PB)

In decimal notation, 1 125 899 906 842 624 bytes.

PDU See *power distribution unit*.

physical disk licensing

A type of licensing that grants you the use of a number of physical disks for virtualization. You can also license the use of the Metro Mirror and Global Mirror feature, the use of the FlashCopy feature, or both of these features.

PLUN See *managed disk*.

point-in-time copy

The instantaneous copy that the FlashCopy service makes of the source virtual disk (VDisk). In some contexts, this copy is known as a T_0 copy.

port The physical entity within a host, SAN Volume Controller, or disk controller system that performs the data communication (transmitting and receiving) over the fibre channel.

port ID

An identifier associated with a port.

power distribution unit (PDU)

A device that distributes electrical power to multiple devices in the rack. It typically is rack-mounted and provides circuit breakers and transient voltage suppression.

power-on self-test

A diagnostic test that servers or computers run when they are turned on.

prepared

In a Global Mirror relationship, the state that occurs when the mapping is ready to start. While in this state, the target virtual disk (VDisk) is offline.

preparing

In a Global Mirror relationship, the state that occurs when any changed write data for the source virtual disk (VDisk) is flushed from the cache. Any read or write data for the target VDisk is discarded from the cache.

primary virtual disk

In a Metro or Global Mirror relationship, the target of write operations issued by the host application.

property

In the Common Information Model (CIM), an attribute that is used to characterize instances of a class.

PuTTY

A client program that allows you to run remote sessions on your computer through specific network protocols, such as SSH, Telnet, and Rlogin.

Q**qualifier**

A value that provides additional information about a class, association, indication, method, method parameter, instance, property, or reference.

quorum

A set of nodes that operates as a cluster. Each node has a connection to every other node in the cluster. If a connection failure causes the cluster to split into two or more groups of nodes that have full connection within the group, the quorum is the group that is selected to operate as the cluster. Typically, this is the larger group of nodes, but the quorum disk serves as a tiebreaker if the groups are the same size.

queue depth

The number of I/O operations that can be run in parallel on a device.

quorum disk

A managed disk (MDisk) that contains a reserved area that is used exclusively for cluster management. The quorum disk is accessed in the event that it is necessary to determine which half of the cluster continues to read and write data.

quorum index

A number that can be either: 0, 1 or 2

R

rack A free-standing framework that holds the devices and card enclosure.

RAID See *redundant array of independent disks*.

RAID 0

IBM definition: RAID 0 allows a number of disk drives to be combined and presented as one large disk. RAID 0 does not provide any data redundancy. If one drive fails, all data is lost.

HP definition: A RAID storage set that stripes data across an array of disk drives. A single logical disk spans multiple physical disks, allowing parallel data processing for increased I/O performance. While the performance characteristics of RAID level 0 is excellent, this RAID level is the only one that does not provide redundancy. RAID level 0 storage sets are referred to as stripesets.

RAID 1

SNIA dictionary definition: A form of storage array in which two or more identical copies of data are maintained on separate media. (S)

IBM definition: A form of storage array in which two or more identical copies of data are maintained on separate media. Also known as mirrorset.

HP definition: See *mirrorset*.

RAID 5

SNIA definition: A form of parity RAID in which the disks operate independently, the data strip size is no smaller than the exported block size, and parity check data is distributed across the array's disks. (S)

IBM definition: See the SNIA definition.

HP definition: A specially developed RAID storage set that stripes data and parity across three or more members in a disk array. A RAIDset combines the best characteristics of RAID level 3 and RAID level 5. A RAIDset is the best choice for most applications with small to medium I/O requests, unless the application is write intensive. A RAIDset is sometimes called parity RAID. RAID level 3/5 storage sets are referred to as RAIDsets.

RAID 10

A type of RAID that optimizes high performance while maintaining fault

tolerance for up to two failed disk drives by striping volume data across several disk drives and mirroring the first set of disk drives on an identical set.

real capacity

The amount of storage that is allocated to a virtual disk copy from a managed disk group.

redundant ac-power switch

A device that provides input power redundancy by attaching a SAN Volume Controller to two independent power sources. If the main source becomes unavailable, the redundant ac-power switch automatically provides power from a secondary (backup) source. When power is restored, the redundant ac-power switch automatically changes back to the main power source.

redundant array of independent disks (RAID)

A collection of two or more disk drives that present the image of a single disk drive to the system. In the event of a single device failure, the data can be read or regenerated from the other disk drives in the array.

redundant SAN

A storage area network (SAN) configuration in which any one single component might fail, but connectivity between the devices within the SAN is maintained, possibly with degraded performance. This configuration is normally achieved by splitting the SAN into two, independent, counterpart SANs. See also *counterpart SAN*.

reference

A pointer to another instance that defines the role and scope of an object in an association.

rejected

A status condition that describes a node that the cluster software has removed from the working set of nodes in the cluster.

relationship

In Metro or Global Mirror, the association between a master virtual disk (VDisk) and an auxiliary VDisk. These VDIsks also have the attributes of a primary or secondary VDisk. See also *auxiliary virtual disk*, *master virtual disk*, *primary virtual disk*, and *secondary virtual disk*.

reliability

The ability of a system to continue to return data even if a component fails.

remote fabric

In Global Mirror, the storage area network (SAN) components (switches and cables) that connect the components (nodes, hosts, and switches) of the remote cluster.

roles

Authorization is based on roles that map to the administrator and service roles in an installation. The switch translates these roles into SAN Volume Controller administrator and service user IDs when a connection is made to the node for the SAN Volume Controller.

S

SAN See *storage area network*.

SAN Volume Controller fibre-channel port fan in

The number of hosts that can see any one SAN Volume Controller port.

SATA See *Serial Advanced Technology Attachment*.

schema

A group of object classes defined for and applicable to a single namespace. Within the CIM Agent, the supported schemas are the ones that are loaded through the managed object format (MOF).

SCSI See *Small Computer Systems Interface*.

SCSI back-end layer

The layer in a Small Computer Systems Interface (SCSI) network that performs the following functions: controls access to individual disk controller systems that are managed by the cluster; receives requests from the virtualization layer, processes them, and sends them to managed disks; addresses SCSI-3 commands to the disk controller systems on the storage area network (SAN).

SCSI front-end layer

The layer in a Small Computer Systems Interface (SCSI) network that receives I/O commands sent from hosts and provides the SCSI-3 interface to hosts. SCSI logical unit numbers (LUNs) are mapped to virtual disks (VDisks) in this layer as well. Thus, the layer converts SCSI read and write commands that are addressed to LUNs into commands that are addressed to specific VDIs.

SDD See *subsystem device driver (SDD)*.

secondary virtual disk

In Metro or Global Mirror, the virtual disk (VDis) in a relationship that contains a copy of data written by the host application to the primary VDis.

Secure Shell (SSH)

A program to log in to another computer over a network, to run commands in a remote machine, and to move files from one machine to another.

Secure Sockets Layer (SSL)

A security protocol that provides communication privacy. With SSL, client/server applications can communicate in a way that is designed to prevent eavesdropping, tampering, and message forgery.

sequential VDis

A virtual disk that uses extents from a single managed disk.

Serial Advanced Technology Attachment (SATA)

The evolution of the ATA interface from a parallel bus to serial connection architecture. (S)

Serial ATA

See *Serial Advanced Technology Attachment*.

server In a network, the hardware or software that provides facilities to other stations; for example, a file server, a printer server, a mail server. The station making the request of the server is usually called the client.

Service Location Protocol (SLP)

In the Internet suite of protocols, a protocol that identifies and uses network hosts without having to designate a specific network host name.

fibres-channel SFP connector

See *small form-factor pluggable connector*.

Simple Mail Transfer Protocol (SMTP)

An Internet application protocol for transferring mail among users of the

Internet. SMTP specifies the mail exchange sequences and message format. It assumes that the Transmission Control Protocol (TCP) is the underlying protocol.

Simple Network Management Protocol (SNMP)

In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application-layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

SLP See *Service Location Protocol*.

Small Computer System Interface (SCSI)

A standard hardware interface that enables a variety of peripheral devices to communicate with one another.

small form-factor pluggable (SFP) connector

A compact optical transceiver that provides the optical interface to a fibre-channel cable.

SMI-S See *Storage Management Initiative Specification*.

SMTP See *Simple Mail Transfer Protocol*.

SNIA See *Storage Networking Industry Association*.

SNMP See *Simple Network Management Protocol*.

space-efficient VDisk

See *space-efficient virtual disk*.

space-efficient virtual disk

A virtual disk that has different virtual capacities and real capacities.

SSH See *Secure Shell*.

SSPC See *IBM System Storage Productivity Center (SSPC)*.

SSL See *Secure Sockets Layer*.

stand-alone relationship

In FlashCopy, Metro Mirror, and Global Mirror, relationships that do not belong to a consistency group and that have a null consistency group attribute.

stop A configuration command that is used to stop the activity for all copy relationships in a consistency group.

stopped

The status of a pair of virtual disks (VDisks) that have a copy relationship that the user has temporarily broken because of a problem.

storage area network (SAN)

A network whose primary purpose is the transfer of data between computer systems and storage elements and among storage elements. A SAN consists of a communication infrastructure, which provides physical connections, and a management layer, which organizes the connections, storage elements, and computer systems so that data transfer is secure and robust. (S)

Storage Management Initiative Specification (SMI-S)

A design specification developed by the Storage Networking Industry Association (SNIA) that specifies a secure and reliable interface that allows storage management systems to identify, classify, monitor, and control physical and logical resources in a storage area network. The interface is

intended as a solution that integrates the various devices to be managed in a storage area network (SAN) and the tools used to manage them.

Storage Networking Industry Association (SNIA)

An association of producers and consumers of storage networking products whose goal is to further storage networking technology and applications. See www.snia.org.

striped

Pertains to a virtual disk (VDisk) that is created from multiple managed disks (MDisks) that are in the MDisk group. Extents are allocated on the MDisks in the order specified.

stripeset

See *RAID 0*.

subsystem device driver (SDD)

An IBM pseudo device driver designed to support the multipath configuration environments in IBM products.

superuser authority

Can issue any command-line interface (CLI) command. A superuser can view and work with the following panels: View users, Add cluster, Remove cluster, Add users, and Modify users. Only one Superuser role is available.

suspended

The status of a pair of virtual disks (VDisks) that have a copy relationship that has been temporarily broken because of a problem.

switch

A network infrastructure component to which multiple nodes attach. Unlike hubs, switches typically have internal bandwidth that is a multiple of link bandwidth, and the ability to rapidly switch node connections from one to another. A typical switch can accommodate several simultaneous full link bandwidth transmissions between different pairs of nodes. (S) Contrast with *hub*.

symmetrical network

A network in which all the initiators are connected at the same level and all the controllers are connected at the same level.

symmetric virtualization

A virtualization technique in which the physical storage in the form of Redundant Array of Independent Disks (RAID) is split into smaller chunks of storage known as *extents*. These extents are then concatenated, using various policies, to make virtual disks (VDisks). See also *asymmetric virtualization*.

synchronized

In Metro or Global Mirror, the status condition that exists when both virtual disks (VDisks) of a pair that has a copy relationship contain the same data.

system

A functional unit, consisting of one or more computers and associated software, that uses common storage for all or part of a program and also for all or part of the data necessary for the execution of the program. A computer system can be a stand-alone unit, or it can consist of multiple connected units.

T

terabyte

In decimal notation, 1 099 511 628 000 bytes.

thinly provisioned volume

See *space-efficient virtual disk*.

topology

The logical layout of the components of a computer system or network and their interconnections. Topology deals with questions of what components are directly connected to other components from the standpoint of being able to communicate. It does not deal with questions of physical location of components or interconnecting cables. (S)

trigger

To initiate or reinstate copying between a pair of virtual disks (VDisks) that have a copy relationship.

U

UID See *unique identifier*.

unconfigured mode

A mode in which I/O operations cannot be performed. See also *image mode* and *managed space mode*.

uninterruptible power supply

A device that is connected between a computer and its power source that protects the computer against blackouts, brownouts, and power surges. The uninterruptible power supply contains a power sensor to monitor the supply and a battery to provide power until an orderly shutdown of the system can be performed.

unique identifier (UID)

An identifier that is assigned to storage system logical units when they are created. It is used to identify the logical unit regardless of the logical unit number (LUN), status of the logical unit, or whether alternate paths exist to the same device. Typically, a UID is only used once.

unmanaged

An access mode that pertains to a managed disk (MDisk) that is not used by the cluster.

V

valid configuration

A configuration that is supported.

VDisk See *virtual disk (VDisk)*.

VDisk copy

See *virtual disk copy*.

virtual capacity

The amount of storage that is available to a server on a virtual disk (VDisk) copy. In a space-efficient virtual disk, the virtual capacity can be different from the real capacity. In a standard virtual disk, the virtual capacity and real capacity are the same.

virtual disk copy

A physical copy of the data that is stored on a virtual disk (VDisk). Mirrored VDIsks have two such copies. Nonmirrored VDIsks have one copy.

virtual disk (VDisk)

A device that host systems in a storage area network (SAN) recognize as a Small Computer System Interface (SCSI) disk.

virtualization

In the storage industry, a concept in which a pool of storage is created that contains several disk subsystems. The subsystems can be from various vendors. The pool can be split into virtual disks that are visible to the host systems that use them.

virtualized storage

Physical storage that has virtualization techniques applied to it by a virtualization engine.

virtual storage area network (VSAN)

A fabric within the SAN.

vital product data (VPD)

Information that uniquely defines system, hardware, software, and microcode elements of a processing system.

VLUN See *managed disk*.

VPD See *vital product data*.

VSAN See *virtual storage area network*.

W**WBEM**

See *Web-Based Enterprise Management*.

Web-Based Enterprise Management (WBEM)

A tiered, enterprise-management architecture that was developed by the Distributed Management Task Force (DMTF). This architecture provides the management design framework that consists of devices, device providers, the object manager, and the messaging protocol for the communication between client applications and the object manager.

worldwide node name (WWNN)

An identifier for an object that is globally unique. WWNNs are used by Fibre Channel and other standards.

worldwide port name (WWPN)

A unique 64-bit identifier that is associated with a fibre-channel adapter port. The WWPN is assigned in an implementation- and protocol-independent manner.

WWNN

See *worldwide node name*.

WWPN

See *worldwide port name*.

Z**zoning**

In fibre-channel environments, the grouping of multiple ports to form a virtual, private, storage network. Ports that are members of a zone can communicate with each other, but are isolated from ports in other zones.

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