IBM Storwize V7000 Unified

Adding Storwize V7000 File Modules to an existing Storwize V7000 system

IBM

> **Note**
>
> Before using this information and the product it supports, read the following information:
>
> - The general information in "Notices" on page 123
> - The information in the "Safety and environmental notices" on page iii
> - The information in the *IBM Environmental Notices and User Guide* (provided on a DVD)

This edition applies to IBM Storwize V7000 Unified and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces SC27-4223-04.

Safety and environmental notices

Review the safety notices, environmental notices, and electronic emission notices for IBM® Storwize® V7000 Unified before you install and use the product.

Suitability for telecommunication environment: This product is not intended to connect directly or indirectly by any means whatsoever to interfaces of public telecommunications networks.

Here are examples of a caution and a danger notice:

CAUTION:
A caution notice indicates the presence of a hazard that has the potential of causing moderate or minor personal injury. (C001)

DANGER

A danger notice indicates the presence of a hazard that has the potential of causing death or serious personal injury. (D002)

To find the translated text for a caution or danger notice:

1. Look for the identification number at the end of each caution notice or each danger notice. In the preceding examples, the numbers (C001) and (D002) are the identification numbers.
2. Locate the *IBM Systems Safety Notices* with the user publications that were provided with the Storwize V7000 Unified hardware.
3. Find the matching identification number in the *IBM Systems Safety Notices*. Then, review the topics concerning the safety notices to ensure that you are in compliance.
4. Optionally, read the multilingual safety instructions on the Storwize V7000 Unified website. Go to www.ibm.com/storage/support/storwize/v7000/unified, search for Storwize V7000 Unified, and click the documentation link.

Safety notices and labels

Review the safety notices and safety information labels before using this product.

To view a PDF file, you need Adobe Acrobat Reader. You can download it at no charge from the Adobe website:

www.adobe.com/support/downloads/main.html

IBM Systems Safety Notices

This publication contains the safety notices for the IBM Systems products in English and other languages. Anyone who plans, installs, operates, or services the system must be familiar with and understand the safety notices. Read the related safety notices before you begin work.

Note: The *IBM System Safety Notices* document is organized into two sections. The danger and caution notices without labels are organized alphabetically by language

in the "Danger and caution notices by language" section. The danger and caution notices that are accompanied with a label are organized by label reference number in the "Labels" section.

Note: You can find and download the current *IBM System Safety Notices* by searching for Publication number **G229-9054** in the IBM Publications Center.

The following notices and statements are used in IBM documents. They are listed in order of decreasing severity of potential hazards.

Danger notice definition
>   A special note that emphasizes a situation that is potentially lethal or extremely hazardous to people.

Caution notice definition
>   A special note that emphasizes a situation that is potentially hazardous to people because of some existing condition, or to a potentially dangerous situation that might develop because of some unsafe practice.

Note: In addition to these notices, labels might be attached to the product to warn of potential hazards.

Finding translated notices

Each safety notice contains an identification number. You can use this identification number to check the safety notice in each language.

To find the translated text for a caution or danger notice:

1. In the product documentation, look for the identification number at the end of each caution notice or each danger notice. In the following examples, the numbers (D002) and (C001) are the identification numbers.

   DANGER

   > **A danger notice indicates the presence of a hazard that has the potential of causing death or serious personal injury. (D002)**

   CAUTION:
   A caution notice indicates the presence of a hazard that has the potential of causing moderate or minor personal injury. (C001)

2. After you download the *IBM System Safety Notices* document, open it.
3. Under the language, find the matching identification number. Review the topics about the safety notices to ensure that you are in compliance.

Note: This product was designed, tested, and manufactured to comply with IEC 60950-1, and where required, to relevant national standards that are based on IEC 60950-1.

Caution notices for the Storwize V7000 Unified

Ensure that you understand the caution notices for Storwize V7000 Unified.

Use the reference numbers in parentheses at the end of each notice, such as (C003) for example, to find the matching translated notice in *IBM Systems Safety Notices*.

CAUTION:
The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do not: Throw or immerse into water, heat to more than 100°C (212°F), repair or disassemble. (C003)

CAUTION:
Electrical current from power, telephone, and communication cables can be hazardous. To avoid personal injury or equipment damage, disconnect the attached power cords, telecommunication systems, networks, and modems before you open the machine covers, unless instructed otherwise in the installation and configuration procedures. (26)

CAUTION:
- **Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.**
- **Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.**
- **Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.**
- **(For sliding drawers) Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.**
- **(For fixed drawers) This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.**

(R001 part 2 of 2)

CAUTION:
Removing components from the upper positions in the rack cabinet improves rack stability during a relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building.

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must observe the following precautions.
  - Remove all devices in the 32U position and above.
  - Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
  - Ensure that there are no empty U-levels between devices installed in the rack cabinet below the 32U level.
- If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
- If the rack cabinet you are relocating was supplied with removable outriggers they must be reinstalled before the cabinet is relocated.
- Inspect the route that you plan to take to eliminate potential hazards.
- Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that comes with your rack cabinet for the weight of a loaded rack cabinet.
- Verify that all door openings are at least 760 x 230 mm (30 x 80 in.).
- Ensure that all devices, shelves, drawers, doors, and cables are secure.
- Ensure that the four leveling pads are raised to their highest position.
- Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
- Do not use a ramp inclined at more than 10 degrees.
- When the rack cabinet is in the new location, complete the following steps:
  - Lower the four leveling pads.
  - Install stabilizer brackets on the rack cabinet.
  - If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
- If a long-distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also lower the leveling pads to raise the casters off the pallet and bolt the rack cabinet to the pallet.

(R002)

CAUTION:
- Rack is not intended to serve as an enclosure and does not provide any degrees of protection required of enclosures.
- It is intended that equipment installed within this rack will have its own enclosure. (R005).

CAUTION:
Tighten the stabilizer brackets until they are flush against the rack. (R006)

CAUTION:
Use safe practices when lifting. (R007)

CAUTION:

Do not place any object on top of a rack-mounted device unless that rack-mounted device is intended for use as a shelf. (R008)

CAUTION:

If the rack is designed to be coupled to another rack only the same model rack should be coupled together with another same model rack. (R009)

Danger notices for Storwize V7000 Unified

Ensure that you are familiar with the danger notices for Storwize V7000 Unified.

Use the reference numbers in parentheses at the end of each notice, such as (C003) for example, to find the matching translated notice in *IBM Systems Safety Notices*.

DANGER

When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

* If IBM supplied a power cord(s), connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.
* Do not open or service any power supply assembly.
* Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
* The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.
* Connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
* Connect any equipment that will be attached to this product to properly wired outlets.
* When possible, use one hand only to connect or disconnect signal cables.
* Never turn on any equipment when there is evidence of fire, water, or structural damage.
* Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
* Connect and disconnect cables as described in the following procedures when installing, moving, or opening covers on this product or attached devices.

  To disconnect:
  1. Turn off everything (unless instructed otherwise).
  2. Remove the power cords from the outlets.
  3. Remove the signal cables from the connectors.
  4. Remove all cables from the devices.

  To connect:
  1. Turn off everything (unless instructed otherwise).
  2. Attach all cables to the devices.
  3. Attach the signal cables to the connectors.
  4. Attach the power cords to the outlets.
  5. Turn on the devices.
* Sharp edges, corners and joints might be present in and around the system. Use care when handling equipment to avoid cuts, scrapes and pinching. (D005)

DANGER

Heavy equipment–personal injury or equipment damage might result if mishandled. (D006)

DANGER

Observe the following precautions when working on or around your IT rack system:

- Heavy equipment–personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.

- Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

(R001 part 1 of 2)

DANGER

Racks with a total weight of > 227 kg (500 lb.), Use Only Professional Movers! (R003)

DANGER

Do not transport the rack via fork truck unless it is properly packaged, secured on top of the supplied pallet. (R004)

DANGER

Main Protective Earth (Ground):

This symbol is marked on the frame of the rack.

The PROTECTIVE EARTHING CONDUCTORS should be terminated at that point. A recognized or certified closed loop connector (ring terminal) should be used and secured to the frame with a lock washer using a bolt or stud. The connector should be properly sized to be suitable for the bolt or stud, the locking washer, the rating for the conducting wire used, and the considered rating of the breaker. The intent is to ensure the frame is electrically bonded to the PROTECTIVE EARTHING CONDUCTORS. The hole that the bolt or stud goes into where the terminal conductor and the lock washer contact should be free of any non-conductive material to allow for metal to metal contact. All PROTECTIVE EARTHING CONDUCTORS should terminate at this main protective earthing terminal or at points marked with ⏚ . (R010)

Special caution and safety notices

This information describes special safety notices that apply to the Storwize V7000 Unified. These notices are in addition to the standard safety notices supplied and address specific issues relevant to the equipment provided.

General safety

When you service the Storwize V7000 Unified, follow general safety guidelines.

Use the following general rules to ensure safety to yourself and others.

- Observe good housekeeping in the area where the devices are kept during and after maintenance.
- Follow the guidelines when lifting any heavy object:
  1. Ensure that you can stand safely without slipping.
  2. Distribute the weight of the object equally between your feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that weigh more than 18 kg (40 lb) or objects that you think are too heavy for you.*
- Do not perform any action that causes a hazard or makes the equipment unsafe.
- Before you start the device, ensure that other personnel are not in a hazardous position.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the unit.
- Keep your tool case away from walk areas so that other people cannot trip over it.
- Do not wear loose clothing that can be trapped in the moving parts of a device. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.

- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconducting clip, approximately 8 cm (3 in.) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

  Remember: Metal objects are good electrical conductors.
- Wear safety glasses when you are hammering, drilling, soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly after you have finished servicing the unit.

Handling static-sensitive devices

Ensure that you understand how to handle devices that are sensitive to static electricity.

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective bags until you are ready to install them.

To reduce the possibility of electrostatic discharge, observe the following precautions:
- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its antistatic bag, touch it to an unpainted metal part of the system unit for at least two seconds. (This action removes static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your Storwize V7000 Unified, without putting it down. If it is necessary to put the device down, place it onto its static-protective bag. (If your device is an adapter, place it component-side up.) Do not place the device onto the cover of the Storwize V7000 Unified or onto a metal table.
- Take additional care when you handle devices during cold weather. Indoor humidity tends to decrease in cold weather, causing an increase in static electricity.

Sound pressure

Attention: Depending on local conditions, the sound pressure can exceed 85 dB(A) during service operations. In such cases, wear appropriate hearing protection.

Environmental notices

This information contains all of the required environmental notices for IBM Systems products in English and other languages.

The *IBM Systems Environmental Notices* (`http://ibm.co/1fBgWFI`) information includes statements on limitations, product information, product recycling and disposal, battery information, flat panel display, refrigeration and water-cooling systems, external power supplies, and safety data sheets.

About this guide

This publication provides information that helps you install and initialize IBM Storwize V7000 Unified systems.

Who should use this guide

This guide is intended for installers of Storwize V7000 Unified systems.

Before configuring your system, ensure that you follow the procedures as listed. Be sure to gather IP addresses that you will need before you begin the installation.

Storwize V7000 Unified library and related publications

Product manuals, other publications, and websites contain information that relates to Storwize V7000 Unified.

IBM Knowledge Center for Storwize V7000 Unified

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The information collection in the IBM Knowledge Center contains all of the information that is required to install, configure, and manage the system. The information collection in the IBM Knowledge Center is updated between product releases to provide the most current documentation. The information collection is available at the following website:

publib.boulder.ibm.com/infocenter/storwize/unified_ic/index.jsp

Storwize V7000 Unified library

Unless otherwise noted, the publications in the library are available in Adobe portable document format (PDF) from a website.

www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss

Click **Search for publications** to find the online publications you are interested in, and then view or download the publication by clicking the appropriate item.

Table 1 lists websites where you can find help, services, and more information.

Table 1. IBM websites for help, services, and information

Website	Address
IBM home page	http://www.ibm.com
Directory of worldwide contacts	http://www.ibm.com/planetwide
Support for Storwize V7000 (2076)	www.ibm.com/storage/support/storwize/v7000
Support for Storwize V7000 Unified (2073)	www.ibm.com/storage/support/storwize/v7000/unified
Support for IBM System Storage® and IBM TotalStorage products	www.ibm.com/storage/support/

Each of the PDF publications in the Table 2 library is also available in the IBM Knowledge Center by clicking the number in the "Order number" column:

Table 2. Storwize V7000 Unified library

Title	Description	Order number
IBM Storwize V7000 Model 2073-720 Quick Start Guide	The guide provides general instructions for installing your system, and is intended for experienced developers.	
Storwize V7000 Unified Quick Installation Guide	The guide provides instructions for unpacking your order and installing your system. The first chapter describes verifying your order, becoming familiar with the hardware components, and meeting environmental requirements. The second chapter describes installing the hardware and attaching data cables and power cords. The last chapter describes accessing the management GUI to initially configure your system.	
IBM Storwize V7000 Expansion Enclosure Installation Guide, Machine type 2076	The guide provides instructions for unpacking your order and installing the 2076 expansion enclosure for the Storwize V7000 Unified system.	
Adding Storwize V7000 Unified File modules to an Existing Storwize V7000 System	The guide is for adding Storwize V7000 file modules to an existing Storwize V7000 system to create a Storwize V7000 Unified system.	
Storwize V7000 Unified Problem Determination Guide	The guide describes how to service, maintain, and troubleshoot the Storwize V7000 Unified system.	
IBM Storwize V7000 Unified Safety Notices	The guide contains translated caution and danger statements for the node canister documentation. Each caution and danger statement in the Storwize V7000 Unified documentation has a number that you can use to locate the corresponding statement in your language in the *IBM Storwize V7000 Unified Safety Notices* document.	

Table 2. Storwize V7000 Unified library (continued)

Title	Description	Order number
Safety Information	The guide contains translated caution and danger statements for the file module documentation. Each caution and danger statement in the Storwize V7000 Unified documentation has a number. Use the number to locate the corresponding statement in your language in the *Safety Information* document.	
Storwize V7000 Unified Read First Flyer	This document introduces the major components of the Storwize V7000 Unified system and describes how to get started with the *Storwize V7000 Unified Quick Installation Guide*.	
Read First before adding file modules to an existing Storwize V7000 Unified	This document introduces the major components of the Storwize V7000 Unified system and describes how to get started with *Adding Storwize V7000 Unified File modules to an Existing Storwize V7000 System*.	
IBM Statement of Limited Warranty (2145 and 2076)	This multilingual document provides information about the IBM warranty for machine types 2145 and 2076.	
IBM Statement of Limited Warranty (2073)	This multilingual document provides information about the IBM warranty for machine type 2073.	
IBM License Agreement for Machine Code	This multilingual guide contains the License Agreement for Machine Code for the Storwize V7000 Unified product.	
Getting Started with Real-time Compression on IBM Storwize(r) V7000 Unified 1.4.0.1	This document provides technical information and guidelines on what to consider to deploy compression in the Storwize V7000 Unified storage environment.	
IBM Storwize(r) V7000 Unified Data Migration Guide: NetApp to IBM Storwize(r) V7000 Unified	This document is a guide for migrating data from a NetApp system to an IBM Storwize(r) V7000 Unified NAS platform.	

IBM documentation and related websites

Table 3 lists websites that provide publications and other information about the Storwize V7000 Unified or related products or technologies. The IBM Redbooks® publications provide positioning and value guidance, installation and implementation experiences, solution scenarios, and step-by-step procedures for various products.

Table 3. IBM documentation and related websites

Website	Address
IBM Publications Center	www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss
IBM Redbooks publications	www.redbooks.ibm.com/

Related accessibility information

To view a PDF file, you need Adobe Reader, which can be downloaded from the Adobe website:

www.adobe.com/support/downloads/main.html

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 website:

www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss

Related websites

The following websites provide information about Storwize V7000 Unified or related products or technologies:

Type of information	Website
Storwize V7000 Unified support	www.ibm.com/storage/support/storwize/v7000/unified
Technical support for IBM storage products	www.ibm.com/storage/support/
IBM Electronic Support registration	www.ibm.com/electronicsupport

Sending your comments

Your feedback is important in helping to provide the most accurate and highest quality information.

To submit any comments about this book or any other Storwize V7000 Unified documentation, send your comments by email to starpubs@us.ibm.com. Include the following information in your email:

- Publication title
- Publication form number
- Page, table, or illustration numbers that you are commenting on
- A detailed description of any information that should be changed

How to get information, help, and technical assistance

If you need help, service, technical assistance, or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

Information

IBM maintains pages on the web where you can get information about IBM products and fee services, product implementation and usage assistance, break and fix service support, and the latest technical information. For more information, refer to Table 4.

Table 4. IBM websites for help, services, and information

Website	Address
IBM home page	http://www.ibm.com
Directory of worldwide contacts	http://www.ibm.com/planetwide
Support for Storwize V7000 (2076)	www.ibm.com/storage/support/storwize/v7000
Support for Storwize V7000 Unified (2073)	www.ibm.com/storage/support/storwize/v7000/ unified
Support for IBM System Storage and IBM TotalStorage products	www.ibm.com/storage/support/

Note: Available services, telephone numbers, and web links are subject to change without notice.

Help and service

Before calling for support, be sure to have your IBM Customer Number available. If you are in the US or Canada, you can call 1 (800) IBM SERV for help and service. From other parts of the world, see http://www.ibm.com/planetwide for the number that you can call.

When calling from the US or Canada, choose the **storage** option. The agent decides where to route your call, to either storage software or storage hardware, depending on the nature of your problem.

If you call from somewhere other than the US or Canada, you must choose the **software** or **hardware** option when calling for assistance. Choose the **software** option if you are uncertain if the problem involves the Storwize V7000 Unified software or hardware. Choose the **hardware** option only if you are certain the problem solely involves the Storwize V7000 Unified hardware. When calling IBM for service regarding the product, follow these guidelines for the **software** and **hardware** options:

Software option

> Identify the Storwize V7000 Unified product as your product and supply your customer number as proof of purchase. The customer number is a 7-digit number (0000000 to 9999999) assigned by IBM when the product is purchased. Your customer number should be located on the customer information worksheet or on the invoice from your storage purchase. If asked for an operating system, use **Storage**.

Hardware option

> Provide the serial number and appropriate 4-digit machine type. For Storwize V7000 Unified, the machine type is 2073.

In the US and Canada, hardware service and support can be extended to 24x7 on the same day. The base warranty is 9x5 on the next business day.

Getting help online

You can find information about products, solutions, partners, and support on the IBM website.

To find up-to-date information about products, services, and partners, visit the IBM website at www.ibm.com/storage/support/storwize/v7000/unified.

Before you call

Make sure that you have taken steps to try to solve the problem yourself before you call.

Some suggestions for resolving the problem before calling IBM Support include:

- Check all cables to make sure that they are connected.
- Check all power switches to make sure that the system and optional devices are turned on.
- Use the troubleshooting information in your system documentation. The troubleshooting section of the information center contains procedures to help you diagnose problems.
- Go to the IBM Support website at www.ibm.com/storage/support/storwize/v7000/unified to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Using the documentation

Information about your IBM storage system is available in the documentation that comes with the product.

That documentation includes printed documents, online documents, readme files, and help files in addition to the information center. See the troubleshooting information for diagnostic instructions. The troubleshooting procedure might require you to download updated device drivers or software. IBM maintains pages on the web where you can get the latest technical information and download device drivers and updates. To access these pages, go to www.ibm.com/storage/support/storwize/v7000/unified and follow the instructions. Also, some documents are available through the IBM Publications Center.

Sign up for the Support Line Offering

If you have questions about how to use and configure the machine, sign up for the IBM Support Line offering to get a professional answer.

The maintenance supplied with the system provides support when there is a problem with a hardware component or a fault in the system machine code. At times, you might need expert advice about using a function provided by the system or about how to configure the system. Purchasing the IBM Support Line offering gives you access to this professional advice while deploying your system, and in the future.

Contact your local IBM sales representative or your support group for availability and purchase information.

What's new

This book describes installing and initializing an IBM Storwize V7000 Unified. For information about the new features and updates added in this release, see the *What's New* topic in the Storwize V7000 Unified Information Center.

Chapter 1. Adding file modules to an existing Storwize V7000 system

You can safely add IBM Storwize V7000 file modules to a working Storwize V7000 system to create a Storwize V7000 Unified system.

A Storwize V7000 Unified system provides Network Attached Storage (NAS), like a file server, and it provides volumes as it did before by using Fibre Channel (SCSI) and iSCSI block storage protocols.

A single management interface is provided by the file module which is currently the active management node, for administration of both file systems and block volumes. This simplifies storage administration with a single administrative user interface and common CLI.

File systems are provided by IBM General Parallel File System (GPFS), running on the file modules, and shared with Ethernet network users using industry standard protocols such as:

- Common Internet File System (CIFS)
- Network File System (NFS)
- File Transfer Protocol (FTP)
- Hypertext Transfer Protocol Secure (HTTPS)
- Secure Copy Protocol (SCP)

Network users can be validated and have their IDs mapped by using an external authentication directory server such as:

- Microsoft Active Directory
- Lightweight Directory Access Protocol (LDAP) with optional use of Kerberos domain controller
- SAMBA primary domain controller (PDC) on Microsoft Windows NT version 4 (NT4)
- Network Information Service (NIS) as an extension to Active Directory/Samba PDC.

Alternatively, a local authentication server running on the file module can be used, but asynchronous replication of file systems requires that the local IDs on both systems match exactly.

If one file module becomes unavailable then the other file module takes over its IP addresses and maintains network access to file systems and the management GUI. If both file modules become unavailable then network access to file systems is lost, unless there are replicas of the file systems provided by other NAS systems on the network. Access to block volumes is not affected by file modules becoming unavailable.

File modules must be directly connected to Fibre Channel ports 1 and 2 of each node canister in the Storwize V7000 control enclosure that is providing IO group 0. If you currently have any of these Fibre Channel ports connected to Fibre Channel switches then you need to plan how these connections can be made to be redundant. Plan how to add more Fiber Channel paths, if needed, so that the switch can be disconnected from port 1 and port 2. Do this to ensure that Fibre

Channel port 1 and port 2 on each node canister can be safely disconnected from the switch with minimum effect to any volume IO with Fibre Channel hosts, external Fibre Channel storage systems, or other Storwize V7000 or SAN Volume Controller nodes.

Chapter 2. Planning for adding file modules

Plan for bandwidth, Fibre Channel ports, and system requirements when you add file modules to an existing Storwize V7000 system to make a Storwize V7000 Unified system.

System requirements for adding file modules

You must define your requirements prior to, and during, the adding of file modules.

Purpose

To define and understand the requirements associated with adding file modules, including best practices.

Access

- You must have access to the:
  - Storwize V7000 Management GUI and command-line interface (CLI), to help with planning, preparing, and adding the file modules
  - Physical access to the Storwize V7000 system, and the associated network switches
  - Fibre channel hosts that may need their multi-pathing driver restarted or rescanned (to find added or removed paths)
  - Fibre channel storage systems providing MDisk
  - Fibre channel switches that require zoning changes to provide any new paths, and for removing the paths to ports 1 and 2 of the control enclosure.

Storwize V7000 and file module software levels

- File modules are loaded with IBM Storwize V7000 Unified software at IBM Manufacturing.
- File modules with any level of IBM Storwize V7000 Unified software can be added to an IBM Storwize V7000 at any level of software after 6.3.0.0. However, file modules have only been tested with the IBM Storwize V7000 software levels that are included in the Storwize V7000 Unified software update package.

Tip: From the support page (www.ibm.com/storage/support/storwize/v7000/unified), search for the document: `Concurrent Compatibility and Code Cross Reference for Storwize V7000 Unified`. Then, refer to the Software Cross-Reference table to see the version of Storwize V7000 software included in each of the Storwize V7000 Unified software update packages.

After the file modules have been added to the system, you must update the Storwize V7000 Unified software as soon as you have completed the initial configuration of the system, and can access the update software panel in the management GUI. When you update the Storwize V7000 Unified software, it will automatically update the Storwize V7000 software to the level which has been tested with that level of the Storwize V7000 Unified software.

If the Storwize V7000 software is updated as part of the initial setup of the file modules, there will be some rebooting of the node canisters, and failing over of the

paths from hosts to volumes. You may wish to wait until a time of low system work load before proceeding with the initial setup of the file modules. Consider updating the Storwize V7000 to the latest software level that has been tested with the latest Storwize V7000 Unified software before you begin to add the file modules.

Important: Because the Storwize V7000 software can not be downgraded, do not update the Storwize V7000 to the latest level before you add the file modules, unless that level has been tested with file modules.

Important: Install and run the `IBM2076_INSTALL_upgradechecker_<version>` utility before attempting to apply an update to the Storwize V7000 software. Access this utility from the update wizard, in the management GUI.

The **up2nas** update to network attached storage (NAS) checker utility, verifies that the current Storwize V7000 software level is older than, or the same as, the level included in the latest Storwize V7000 Unified software update package. This utility is also known as the Storwize V7000 to Storwize V7000 Unified Conversion Utility.

1. Download the latest **up2nas** installable package from www.ibm.com/storage/ support/storwize/v7000/unified; then upload it to the `/home/admin/upgrade` folder on Storwize V7000.
2. Install the **up2nas** software package. For example:
   `applysoftware -file IBM2076_INSTALL_up2nas_<version>`.
3. Run **up2nas** on the Storwize V7000 CLI.

Storwize V7000 Unified Fibre Channel ports

If Fibre Channel port 1 or port 2 on each node canister in the control enclosure is connected to a fibre channel switch, then plan how to add more fiber channel paths if needed. This is so that the switch can be disconnected from port 1 and port 2 to allow connection of the file modules; it should be possible to do this without requiring an outage.

1 Gbps Ethernet ports and IP address

- If you only have one of the 1 Gbps Ethernet ports on each node canister in each Storwize V7000 control enclosure connected to a 1 Gbps Ethernet switch then you can choose to connect the second port to the switch to allow for a redundant path from the active management node on a file module to ssh CLI commands to the Storwize V7000.
- One or two ports on the same 1 Gbps Ethernet switch to which the control enclosure is connected to are needed for each file module.
- One or two IP address for each file module are needed in the same IPv4 subnet as the system IP address of the Storwize V7000 system.
- A management IP address to access the Storwize V7000 Unified management GUI and command-line interface (CLI) is needed in the same IPv4 subnet as the Storwize V7000 system IP address. The Storwize V7000 Unified management GUI will be provided by whichever file module takes the active management node role. If the active management node becomes unavailable, then the other file module will take over the active management node role and the management IP addresses, so that administrative users can access the management GUI and CLI again.
- The Storwize V7000 Unified system utilizes the other services it needs via the management IP address. For example, the authentication server, Network Time Protocol (NTP) server and email server.

- Optional public IP addresses for network attached storage (NAS) can be assigned to allow external computer systems to access files and allow connection with other NAS systems for services like asynchronous replication.
- The 1 Gbps Ethernet port 1 on each file module will be directly connected together to allow the file modules cluster state to be kept in sync.
- The 1 Gbps Ethernet port 2 on each file module will be directly connected together to allow the file modules cluster state to be kept in sync.

Optional 10 Gbps Ethernet ports and IP addresses
- Each file module has 2, 10 Gbps ports that can be connected to a 10 Gbps Ethernet switch.
- Optional public IP addresses for network attached storage (NAS) can be assigned to allow external computer systems to access files, and for connection to other NAS systems for services like asynchronous replication over the 10 Gbps Ethernet.

Event notifications

Event notifications and call homes from the Storwize V7000 storage enclosures are done by email. The IP address of an email server that can access the internet is required.

Call home from a file module is done by electronic customer care (ecc) using secure shell (SSH), and requires a proxy server to access the internet; or your firewall must be made to allow each file module service IP address to ssh to the IBM call home IP addresses (*.ibm.com) on the internet.

Time services

Access to a Network Time Protocol (NTP) server is required.

Authentication

An authentication directory service must be accessible through the 1 Gbps Ethernet, providing network users access to file systems that have been shared with network users. Alternatively, local authentication can be used, but this method does not provide asynchronous file replication to another NAS system.

Important: The links to more information from installation error messages or from the Storwize V7000 Unified critical events shown in the management GUI work only if the web browser has internet access.

Best practice for performance
- The maximum work load should be less than 20 000 file operations per second. Otherwise, ask your IBM Relationship Representative if the Storwize V7000 Unified system is the best product to meet your needs.
- File operations per second performance can be improved by configuring the meta data for a file system into a storage pool that is provided by solid state drives (SSD).
- The recommended minimum capacity allocation to a new file system is 100 gigabytes (GB).
- The total capacity of file systems should not exceed the capacity provided by four Storwize V7000 storage enclosures.

Planning to free Fibre Channel ports from use for volumes

Plan how to free Fibre Channel ports 1 and 2 on each node canister in the control enclosure from being used for accessing block storage. Freeing ports 1 and 2 is required because file modules connect directly to ports 1 and 2 of the node canisters in the control enclosure that is providing IO group 0. After connecting file modules, only ports 3 and 4 connect to the Storage Area Network (SAN) for Fibre Channel access to volumes.

About this task

Table 5 provides a list that you can use to record your use of FC ports.

Table 5. Fibre Channel ports and their use

	FC port	WWPN	Status	Speed (Gbps)	Connected to
Node canister 1	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
Node canister 2	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				

The WWPN and speed for each Fibre Channel port on the control enclosure is listed in the Storwize V7000 management GUI.

Procedure

To check the current use of the Fibre Channel ports, perform the following procedure.

1. In the management GUI select **Monitoring** > **System**.
2. Use the dynamic image of the system to display the rear of the system.
3. Hover over each canister to display the node name and other details about the canister.
4. In the **Ports** table, the port order can be found from the WWPN order.

   Note: Consult your records and follow the physical cables to find out if the Fibre Channel port is not connected, connected to a switch, or connected to a file module.

Planning Fibre Channel network changes

You must understand the reconfiguration process that is necessary when planning Fibre Channel network changes.

About this task

Prior to implementation, it is important to understand and plan for the Fibre Channel network changes.

For each host:
- If Fibre Channel ports 1 and 2 on the node canisters of the control enclosure are not currently connected to the Fibre Channel fabric, there is no need for Fibre Channel fabric changes. Otherwise make a list of the Fibre Channel host systems, storage systems, SAN Volume Controller nodes, and Storwize V7000 nodes that access block volumes on the Storwize V7000.
- For each Fibre Channel host, controller, SAN Volume Controller node, and Storwize V7000 node, record which Fibre Channel ports on the control enclosure they communicate through and through which fabric.
- To use a redundant Fibre Channel fabric, determine if node canister port 3 is already connected to a different fabric than node canister port 4? If not, you can choose to change the fabric so that port 3 and port 4 do not connect to the same fabric.
- If a host uses all four Fibre Channel ports on each canister, determine the fabric zoning changes to make so that it can no longer reach port 1 and port 2 on each canister.
- If a connection to port 1 or port 2 must be moved to port 3 or port 4, attach fiber channel port 3 and port 4 of both node canisters to the Fibre Channel fabric, if needed and plan to use the following procedure to move the connections with minimum effect on any volume IO.

Procedure

This procedure reconfigures the Fibre Channel hosts to use different Fibre Channel ports on the Storwize V7000 without disruption to IO. Perform this procedure for each Fibre Channel zone containing a control enclosure port 1 or a port 2.
1. Add port 3 to the zone.
2. Add port 4 to the zone.
3. Reconfigure the multi-pathing driver to detect the new path, or paths, on each affected host.
4. Remove port 1 or port 2 from the zone.
5. Reconfigure the multi-pathing drivers to remove the paths to port 1 or port 2, on each affected host.

What to do next

When all zones and hosts have been reconfigured, and no hosts are connected to port 1 or port 2 from either node canister, remove the Fibre Channel cable from port 1 and port 2 on the control enclosure to the Fibre Channel switch ports.

Fibre Channel bandwidth

Consider the Fibre Channel bandwidth. The bandwidth to the Fibre Channel fabric might be halved if all four Fibre Channel ports per node canister are in use before adding the file modules.

The bandwidth of a single 8 Gbps Fibre Channel port or of two 4 Gbps Fibre Channel ports per node canister is more than enough to saturate the volume input/output throughput (IOps) that the Storwize V7000 can deliver.

If the bandwidth to the Fibre Channel fabric is less than a total of 8 Gbps from each node canister, consider upgrading the switches from 2 Gbps to either 4 Gbps or 8 Gbps.

To determine whether bandwidth is a problem, monitor the Fibre Channel throughput using the Storwize V7000 management GUI, while all four Fibre Channel ports are connected:

1. Navigate to **Monitoring** > **Performance** in the management interface.
2. Select **FC** to show only the Fibre Channel performance in the **Interfaces** graph.
3. Watch for the maximum Fibre Channel throughput (**FC MBps**) during a high usage period.
4. If 90% of the calculated bandwidth for the Fibre Channel ports to be connected to the SAN is less than the peak Fibre Channel throughput with all Fibre Channel ports connected to the SAN, volume **IOps** might be limited by the Fiber Channel bandwidth (**BW**) after the file modules are connected.

Planning for hardware

Before you install the Storwize V7000 Unified system, plan the physical configuration and the initial data configuration for the system. Although your Storwize V7000 Unified enclosures are already installed and working, the full planning detail is given in case it is needed for relocation. Locate your Storwize V7000 Unified system physical configuration records to use as a reference as needed.

Physical configuration planning of the Storwize V7000 Unified system

Before you install the Storwize V7000 Unified system, plan the physical configuration and the initial data configuration for the system. Certain physical site specifications must be met before you can set up your system. This activity includes verifying that adequate space is available, and that requirements for power and environmental conditions are met.

Procedure

1. Use the hardware location chart to record the physical configuration of your system.
2. Use the cable connection tables to plan and record the storage enclosures and file modules connections.
3. Use the configuration planning tables to record the data required before the initial setup and initial configuration.

Results

Once the physical configuration is complete, plan for the physical installation.

Completing the hardware location chart

Planning for the physical location includes documenting the rack locations of the enclosures and other devices, based on the requirements of each device.

The hardware location represents the rack in which the enclosures are installed, and into which the file modules will be installed. Each row of the chart represents one Electronic Industries Alliance (EIA) 19-inch wide by 1.75-inch tall rack space or unit, each of which is commonly referred to as *1U* of the rack.

Refer to the Installing topic for the recommended layout of a Storwize V7000 Unified System.

As you design your Storwize V7000 Unified rack, use Table 6 to record the physical configuration of the 2U Storwize V7000 Unified enclosures, the 2U file modules, and other devices in your system such as Ethernet switches.

If the rack contains sufficient space, plan to install the control enclosure in the middle of the rack to minimize the length of the SAS cables (required to connect expansion enclosures to the control enclosure).

Table 6. Hardware locations of Storwize V7000 Unified enclosures and other devices

Rack unit	Component
EIA 36	
EIA 35	
EIA 34	
EIA 33	
EIA 32	
EIA 31	
EIA 30	
EIA 29	
EIA 28	
EIA 27	
EIA 26	
EIA 25	
EIA 24	
EIA 23	
EIA 22	
EIA 21	
EIA 20	
EIA 19	
EIA 18	
EIA 17	
EIA 16	
EIA 15	

EIA 14	
EIA 13	
EIA 12	
EIA 11	
EIA 10	
EIA 9	
EIA 8	
EIA 7	
EIA 6	
EIA 5	
EIA 4	
EIA 3	
EIA 2	
EIA 1	

A volume storage system is a collection of control enclosures that are managed as a single system. Each control enclosure contains two node canisters. The two node canisters within the control enclosure form the node pair that attaches to the SAN fabric.

The components of your system might include the storage enclosures listed in Table 7.

Table 7. Storwize V7000 Unified hardware location requirements

Device	Machine type and model	Number of EIA units required	Notes
Control enclosure (Gen 2)	2076-524	2	24 disk drive slots; dual power supplies; optional 4 port 10 Gbps Ethernet adapter in expansion slot 3 or additional 4 port 8 Gbps fibre channel adapter.
Expansion enclosure (Gen 2)	2076-12F	2	12 disk drive slots; dual power supplies
Expansion enclosure (Gen 2)	2076-24F	2	24 disk drive slots; dual power supplies
Control enclosure	2076-112	2	12 disk drive slots; dual power supplies
Control enclosure	2076-124	2	24 disk drive slots; dual power supplies
Expansion enclosure	2076-212	2	12 disk drive slots; dual power supplies
Expansion enclosure	2076-224	2	24 disk drive slots; dual power supplies
Control enclosure	2076-312	2	12 disk drive slots; dual power supplies; 10 Gbps Ethernet adapter in expansion slot
Control enclosure	2076-324	2	24 disk drive slots; dual power supplies; 10 Gbps Ethernet adapter in expansion slot
File module	2073-700	2	Each of the two file modules is 2 EIA units; each file module has either eight 1 Gbps Ethernet ports or four 10 Gbps Ethernet ports

Table 7. Storwize V7000 Unified hardware location requirements (continued)

Device	Machine type and model	Number of EIA units required	Notes
File module	2073-720	2	Each of the two file modules is 2 EIA units; each file module has eight 1 Gbps Ethernet ports, two 10 Gbps Ethernet ports, and two 8 Gbps fibre channel ports

Planning network cable connections

The cable-connection tables provide a method of recording the locations of current and planned cable connections for each control enclosure and file module in the system.

Use these tables to record the locations of cable connections in your Storwize V7000 Unified system.

Tip: Figures contained in the Installation topics: "Before you begin adding file models" and "Performing the hardware installation", illustrate the proper connections between the file module and the storage enclosure.

Ethernet port 1 on each node canister is used by the active management node on a file module to access the Storwize V7000 command-line interface (CLI), to monitor and configure the storage. It is also for accessing the service assistant GUI for the node canister, and iSCSI host communications. Port 2 can be used for the Storwize V7000 CLI, and iSCSI host attachment.

Each node canister in a control enclosure connects over an Ethernet cable from Ethernet port 1 of the canister to an enabled port on your Ethernet switch or router. Optionally, you can attach an Ethernet cable from Ethernet port 2 on the canister to your Ethernet network. After the initial configuration of the Storwize V7000 Unified system, this can be configured as a redundant connection for the file module to access the Storwize V7000 CLI; refer to the Installation topic: "Next steps", for more information.

Control enclosure models 2076-312 and 2076-324 have two 10 Gbps Ethernet ports per node canister, numbered ports 3 and 4. The 10 Gbps ports can only be used for iSCSI or Fibre Channel over Ethernet host attachment, and cannot be used for management or configuration.

File module model 2073-720 has two 10 Gbps Ethernet ports, labelled ports 5 and 6. The 10 Gbps ports of a file module can be used for public file access. It is also possible to move management communications over to these ports after the initial configuration of the system.

Note: Ethernet cables are not supplied as part of your order. Ensure that your cables meet the minimum standards for the Ethernet port type that you are using.

Table 8 provides a list of Ethernet cable standards.

Table 8. Ethernet cable standards

Ethernet port type	Cable type	Minimum standard	Connector
1 Gbps Ethernet port	Unshielded twisted pair (UTP)	CAT 5 (up to 100 meters)	RJ45
10 Gbps Ethernet port	Optical fiber	OM2 (up to 60 meters) OM3 (60 to 150 meters)	LC

Record Storwize V7000 Gen1 node canister Ethernet port connections with Table 9.

Table 9. Storwize V7000 Gen1 node canister Ethernet port connections

Node canister		Ethernet port 1	Ethernet port 2	Ethernet port 3	Ethernet port 4
Node canister 1 (upper)	switch:				
	port:				
	speed:			10 Gbps	10 Gbps
Node canister 2 (lower)	switch:				
	port:				
	speed:			10 Gbps	10 Gbps

Record Storwize V7000 Gen2 node canister Ethernet port connections with Table 10.

Table 10. Storwize V7000 Gen2 node canister Ethernet port connections

Node canister		Ethernet port 1	Ethernet port 2	Ethernet port 3	Ethernet port 4	Ethernet port 5	Ethernet port 6	Ethernet port 7
Node canister 1 (left)	switch:							
	port:							
	speed:				10 Gbps	10 Gbps	10 Gbps	10 Gbps
Node canister 2 (right)	switch:							
	port:							
	speed:				10 Gbps	10 Gbps	10 Gbps	10 Gbps

Note: Fibre Channel is standard.

Record node canister Fibre Channel port connections with Table 11, Table 12 on page 13, and file module Ethernet connections with Table 13 on page 13.

Table 11. Storwize V7000 Gen1 node canister Fibre Channel port connections

Node canister		Fibre Channel port 1	Fibre Channel port 2	Fibre Channel port 3	Fibre Channel port 4
Node canister 1 (upper)	switch or host:	File module 1	File module 2		
	port:	1	1		
	speed:	8 Gbps	8 Gbps		
Node canister 2 (lower)	switch or host:	File module 1	File module 2		
	port:	2	2		
	speed:	8 Gbps	8 Gbps		

Table 12. Storwize V7000 Gen2 node canister Fibre Channel port connections

Node canister		Fibre Channel port 1	Fibre Channel port 2	Fibre Channel port 3	Fibre Channel port 4	Fibre Channel port 5	Fibre Channel port 6	Fibre Channel port 7	Fibre Channel port 8
Node canister 1 (left)	switch or host:	File module 1	File module 2						
	port:	1	1						
	speed:	8 Gbps	8 Gbps						
Node canister 2 (right)	switch or host:	File module 1	File module 2						
	port:	2	2						
	speed:	8 Gbps	8 Gbps						

Table 13. File Module Ethernet connections

Port	File module 1 (upper)			File module 2 (lower)		
	Switch	Port	Speed	Switch	Port	Speed
Ethernet port 1		Ethernet port 1 on File module 2			Ethernet port 1 on File module 1	
Ethernet port 2		Ethernet port 2 on File module 2			Ethernet port 2 on File module 1	
Ethernet port 3						
Ethernet port 4						
Ethernet port 5 (10 Gbps optical)						
Ethernet port 6 (10 Gbps optical)						
Ethernet port 7						
Ethernet port 8						
Ethernet port 9						
Ethernet port 10						

If you have additional control enclosures, use Table 14 on page 14, Table 15 on page 14, Table 16 on page 14, and Table 17 on page 15 to record the locations of cable connections to each additional control enclosure.

Table 14. Storwize V7000 Gen1 node canister Ethernet port connections to an additional control enclosure

Node canister		Ethernet port 1	Ethernet port 2	Ethernet port 3	Ethernet port 4
Upper	switch:				
	port:				
	speed:				
Lower	switch:				
	port:				
	speed:				

Table 15. Storwize V7000 Gen2 node canister Ethernet port connections to an additional control enclosure

Node canister		Ethernet port 1	Ethernet port 2	Ethernet port 3	Ethernet port 4	Ethernet port 5	Ethernet port 6	Ethernet port 7
Node canister 1 (left)	switch:							
	port:							
	speed:				10 Gbps	10 Gbps	10 Gbps	10 Gbps
Node canister 1 (right)	switch:							
	port:							
	speed:				10 Gbps	10 Gbps	10 Gbps	10 Gbps

Important: File modules should not be connected to additional control enclosures; they are only connected to the first control enclosure.

Table 16. Storwize V7000 Gen1 node canister Fibre Channel port connections to an additional control enclosure

Node canister		Fibre Channel port 1	Fibre Channel port 2	Fibre Channel port 3	Fibre Channel port 4
Node canister 1 (upper)	switch or host:				
	port:				
	speed:				
Node canister 2 (lower)	switch or host:				
	port:				
	speed:				

Table 17. Storwize V7000 Gen2 node canister Fibre Channel port connections to an additional control enclosure

Node canister		Fibre Channel port 1	Fibre Channel port 2	Fibre Channel port 3	Fibre Channel port 4	Fibre Channel port 5	Fibre Channel port 6	Fibre Channel port 7	Fibre Channel port 8
Node canister 1 (left)	switch or host:								
	port:								
	speed:								
Node canister 1 (right)	switch or host:								
	port:								
	speed:								

Planning for configuration

You can plan for the configuration data that you must provide as you install a control enclosure and accompanying expansion enclosures and file modules.

Note: Additional details about configuring the system are included in the installing information.

Plan to attach two CAT 5 Ethernet cables, which is the minimum cable quality, to port 1 of both node canisters in the control enclosure for management connections, as described in the following table. You can also configure these ports for iSCSI host attachment.

When a 10 Gbps Ethernet adapter is installed in Storwize V7000 Gen1 canisters, there are four Ethernet ports. The 1 Gbps Ethernet ports are numbered 1 and 2, and the 10 Gbps Ethernet ports are numbered 3 and 4. Only the 1 Gbps Ethernet ports can be used for configuration or management. Either the 1 Gbps or 10 Gbps Ethernet ports can be used for iSCSI or Fibre Channel over Ethernet (FCoE) connections.

When a 10 Gbps Ethernet adapter is installed in Storwize V7000 Gen2 node canisters, there are seven Ethernet ports. The 1 Gbps Ethernet ports are numbered 1, 2 and 3, and the 10 Gbps Ethernet ports are numbered 4, 5, 6, and 7. Only the 1 Gbps Ethernet ports can be used for configuration or management. Either the 1 Gbps or 10 Gbps Ethernet ports can be used for iSCSI or FCoE connections.

Make a note of the management IP address that is assigned to the file modules.

Use Table 18 to record the management IP addresses that are allocated for use by the volume storage system.

Table 18. Management IP address configuration

Configuration item	Value	Description
Port 1		
Management IPv4 address		IPv4 address used for configuration and access to the system

Table 18. Management IP address configuration (continued)

Configuration item	Value	Description
Gateway IPv4 address		IPv4 address for the default local gateway for the system
IPv4 subnet mask		IPv4 subnet mask, which identifies the IPv4 network on which the system is operating
File module 1 IPv4 address		IPv4 address used for service access to file module 1
File module 2 IPv4 address		IPv4 address used for service access to file module 2

Make a note of the IP address assigned to the volume system ports.

Use Table 19 to record the volume storage system IP addresses that are allocated for use by the volume storage system.

Table 19. Management IP address configuration

Configuration item	Value	Description
Port 1		
System IPv4 address		IPv4 address used for configuration and access to the volume storage system by the file modules
Gateway IPv4 address		IPv4 address for the default local gateway for the volume storage system
IPv4 subnet mask		IPv4 subnet mask, which identifies the IPv4 network on which the volume storage system is operating
System IPv6 address		IPv6 address used for configuration and access to the volume storage system
Gateway IPv6 address		IPv6 address for the default local gateway for the volume storage system
IPv6 prefix		The system prefix, which identifies the IPv6 network on which the volume storage system is operating
Port 2 (optional)		
System IPv4 address		IPv4 address used for configuration and access to the volume storage system by the file modules
Gateway IPv4 address		IPv4 address for the default local gateway for the system
IPv4 subnet mask		IPv4 subnet mask, which identifies the IPv4 network on which the volume storage system is operating
System IPv6 address		IPv6 address used for configuration and access to the volume storage system
Gateway IPv6 address		IPv6 address for the default local gateway for the volume storage system
IPv6 prefix		The system prefix, which identifies the IPv6 network on which the volume storage system is operating

You can configure up to two Ethernet ports for each file module if you have a 1 Gpbs Ethernet connection, and up to two Ethernet ports for each file module if you have a 10 Gpbs Ethernet connection.

Table 20. File Module Ethernet connections

Port	File module 1 (upper)			File module 2 (lower)		
	Switch	**Port**	**Speed**	**Switch**	**Port**	**Speed**
Ethernet port 1		Ethernet port 1 on File module 2			Ethernet port 1 on File module 1	
Ethernet port 2		Ethernet port 2 on File module 2			Ethernet port 2 on File module 1	
Ethernet port 3						
Ethernet port 4						
Ethernet port 5 (10 Gbps optical)						
Ethernet port 6 (10 Gbps optical)						
Ethernet port 7						
Ethernet port 8						
Ethernet port 9						
Ethernet port 10						

Note: The 1Gbps Ethernet port 1 of each file module are directly connected together. The Ethernet port 2 of each file module are directly connected together.

Use Table 21 to plan the service addresses that are required to perform service actions on individual node canisters in the control enclosure.

Table 21. Ethernet service address configuration for the control enclosure

Configuration item	Value
Language	
Node canister 1 service port 1	
Service IPv4 address	192.168.70.121
Gateway IPv4 address	
IPv4 subnet mask	255.255.255.0
Service IPv6 address	
Gateway IPv6 address	

Table 21. Ethernet service address configuration for the control enclosure (continued)

Configuration item	Value
IPv6 prefix	
Node canister 2 service port 1	
Service IPv4 address	192.168.70.122
Gateway IPv4 address	
IPv4 subnet mask	255.255.255.0
Service IPv6 address	
Gateway IPv6 address	
IPv6 prefix	

Attention: Do not attach Ethernet cables to the network if a conflict exists with the default IP addresses. A utility is provided on the USB flash drive, Figure 1, to reset the default service IP addresses (if necessary), and to resolve any IP address conflicts.

Figure 1. USB flash drive.

Keep the USB flash drive in a safe location to use for other periodic tasks, such as resetting a password.

Use Table 22 to configure the system for event notification.

Table 22. Event notification settings

Configuration item	Value
E-mail server addresses	
SNMP server addresses	
SNMP community strings	
Syslog servers	

Controlling access to the root user password:

Your Storwize V7000 Unified runs on a Linux operating system, which has a super user ID named *root*. The use of this ID and its password must be tightly controlled.

About this task

IBM requires the password for the root user during service procedures.

While performing a directed service procedure, you must not log onto the Storwize V7000 Unified system as the root user unless directed to by IBM service or the service procedure instructions.

Although the data that you must provide in the installation planning worksheet and in the configuration planning worksheet requires you to provide the password for the root user, you can provide the password at the time of the service call to install and configure your machine, or when IBM service personnel arrive to service your machine.

You have the responsibility to change the root password at whatever interval your company requires. You also have the following responsibilities:
- Record the password accurately.
- Keep the password information secure.
- Prevent users from logging on as root.
- Make the root password available to IBM service personnel during a service call.

To change the root password, use the `chrootpwd` command while logged on as root or a Security Administrator user.

Planning for user authentication:

One of the configuration choices you must plan for is the method of authenticating and authorizing a client user.

Authentication is the process of verifying the identify of a client user. Authentication is typically accomplished by verifying a user ID and password. Authorization is the process of determining the resources that a user is allowed to access. As an example, a user might have full (read/write/create/delete/execute) access to files in one directory and no access to another directory.

To use all Storwize V7000 Unified features, an external authentication infrastructure that supplies the directory of users is required. To allow interoperability with the Common Internet File System (CIFS) protocol, a user ID mapping mechanism must be established so that Storwize V7000 Unified can translate the CIFS user ID into a Network File System (NFS) user identifier (UID), which Storwize V7000 Unified uses internally.

During Storwize V7000 Unified configuration, a choice among the following authentication methods is required:
- Microsoft Active Directory (AD)
- Lightweight Directory Access Protocol (LDAP)
- Samba Primary Domain Controller (PDC) - NT4
- Network Information Service (NIS) - NFS NetGroup support
- Microsoft Service For UNIX (SFU)

The following sections briefly describe each user-authentication method.

Microsoft Active Directory (AD)

With this method, the Microsoft Active Directory (AD) infrastructure authenticates users. To join the Active Directory domain, these users must have Domain Admin privileges. For information on configuring Storwize V7000 Unified systems with active Directory, see Authentication using Microsoft Active Directory. The Active Directory verifies the user credentials and supplies Storwize V7000 Unified with the CIFS user security identifier (SID) and group information. By default, Storwize V7000 Unified maps these SIDs to arbitrary internal UNIX IDs. This method requires no maintenance. Use this method only if accessing the same data with the same user names, through both CIFS and NFS, is not required.

Microsoft Active Directory can be combined with Microsoft Services for UNIX (SFU) or NIS ID lookup to allow synchronizing the used UNIX IDs through both CIFS and NFS. If you are considering or plan to consider implementing a disaster recovery site using asynchronous replication, this method must be combined with Microsoft SFU or NIS ID lookup.

Lightweight Directory Access Protocol (LDAP)

With this method, a Lightweight Directory Access Protocol (LDAP) user directory authenticates users. The LDAP directory verifies the user credentials and supplies Storwize V7000 Unified with the CIFS user ID and group information as SIDs. It also supplies Storwize V7000 Unified with NFS UIDs so that additional Storwize V7000 Unified mapping is not required. This method allows using the same user names on both NFS and CIFS. Implementing this method might require additions to the LDAP schema.

Netgroups, managed by an LDAP server, are enabled when the cfgldap command is executed. You must define netgroups on the LDAP server, and create the NFS export. When creating the NFS export for use by LDAP netgroups, the NFS option must be specified in the format @netgroup_name(rw,root_squash).

Samba Primary Domain Controller (PDC) - NT4

With this method, a Samba Primary Domain Controller (PDC) infrastructure authenticates users. The Samba PDC verifies the user credentials and supplies Storwize V7000 Unified with the CIFS user SID and group information. By default, Storwize V7000 Unified maps these IDs to arbitrary internal UNIX IDs. The administrator maintains the NFS UIDs. Use this method only if accessing the same data with the same user names, through both CIFS and NFS, is not required.

This method can be combined with NIS ID lookup to allow using the same user names on both NFS and CIFS.

Network Information Service (NIS) - NFS NetGroup support

This method can be combined with the Microsoft Active Directory method to allow using the same user names on both NFS and CIFS. To translate CIFS user IDs into NFS UIDs, Storwize V7000 Unified matches the user name and queries the NIS to retrieve the NFS UID. A set of restriction and mapping rules is available to customize the lookup process. Examples of these rules include which NIS domain to use for looking up an Active Directory user and what happens to users that are unknown to one of the directories. The administrator maintains the NFS UIDs.

Microsoft Service For UNIX (SFU)

This method can be combined with the Microsoft Active Directory method to allow using the same user names on both NFS and CIFS. To translate CIFS user IDs into NFS UIDs, Storwize V7000 Unified queries the Active Directory Server to retrieve the NFS UID that is stored inside the Service for UNIX (SFU) extensions on the server. The administrator maintains the NFS UIDs

Planning for power

Each enclosure is provided power through two power supplies. Either power supply unit can power the enclosure independently if there is a loss of input power to the other power supply in the enclosure.

Therefore, plan to connect the power cords of the power supplies on the left side of the enclosures (when viewed from the rear) to one power source, and the power cords of the power supplies on the right side of the enclosures to another power source.

Attention: The power cord is the main power disconnect. Ensure that the socket outlets are located near the equipment and are easily accessible.

The locations of power supply units in Storwize V7000 Gen2 enclosures are shown in Figure 2 and Figure 3 on page 22. The locations of power supply units in Storwize V7000 Gen1 enclosures are shown in Figure 4 on page 22 and Figure 5 on page 23.

The power supply units in a control enclosure are not interchangeable with the power supply units in an expansion enclosure.

Figure 2 shows the rear view of a Storwize V7000 Gen2 control enclosure with the power supplies **2** at either end of the enclosure.
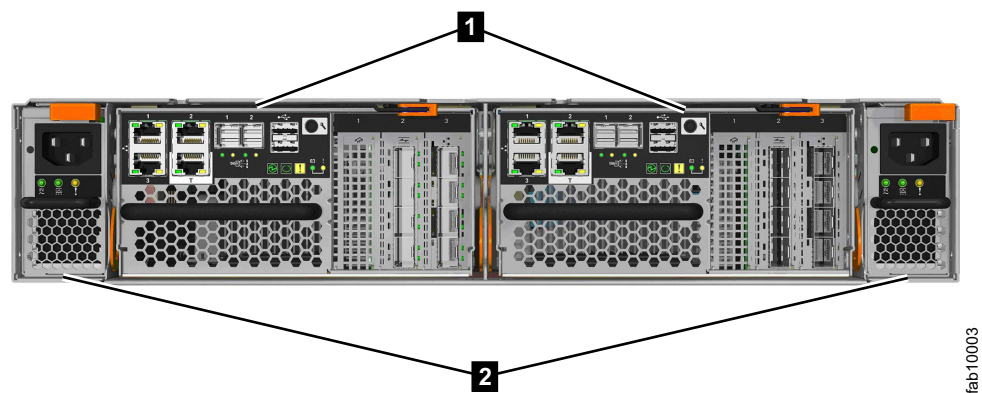
Figure 2. Rear view of a Storwize V7000 Gen2 control enclosure with the power supplies

- **1** Node canisters
- **2** Power supply units: power supply 1 (left), power supply 2 (right)
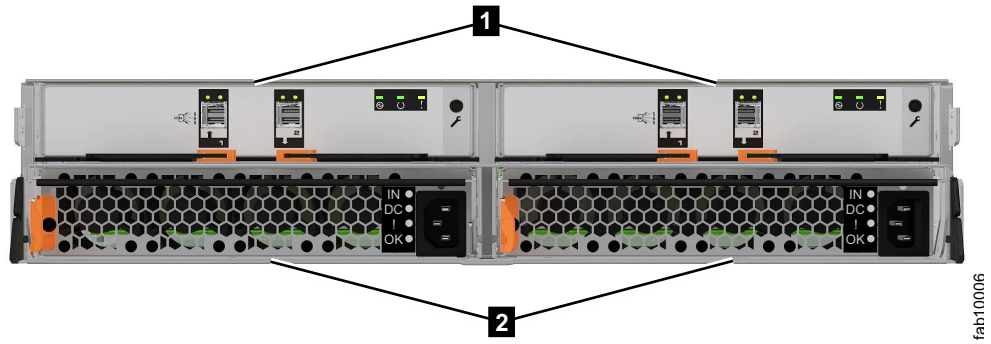
Figure 3. Rear view of a Storwize V7000 Gen2 expansion enclosure

- **1** Expansion canisters
- **2** Power supply units
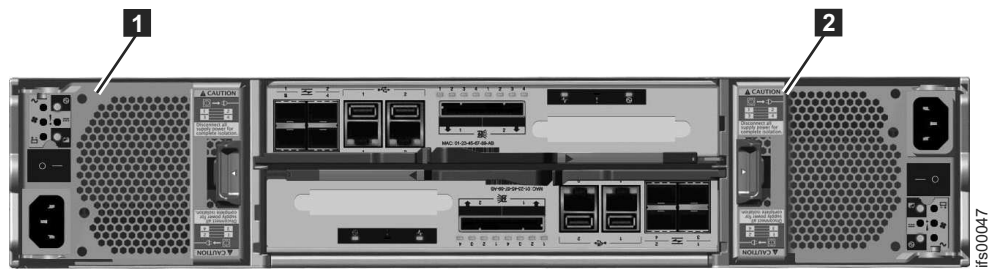
Figure 4. Rear view of a Storwize V7000 Gen1 control enclosure

1 Power supply unit 1 (left)
2 Power supply unit 2 (right)
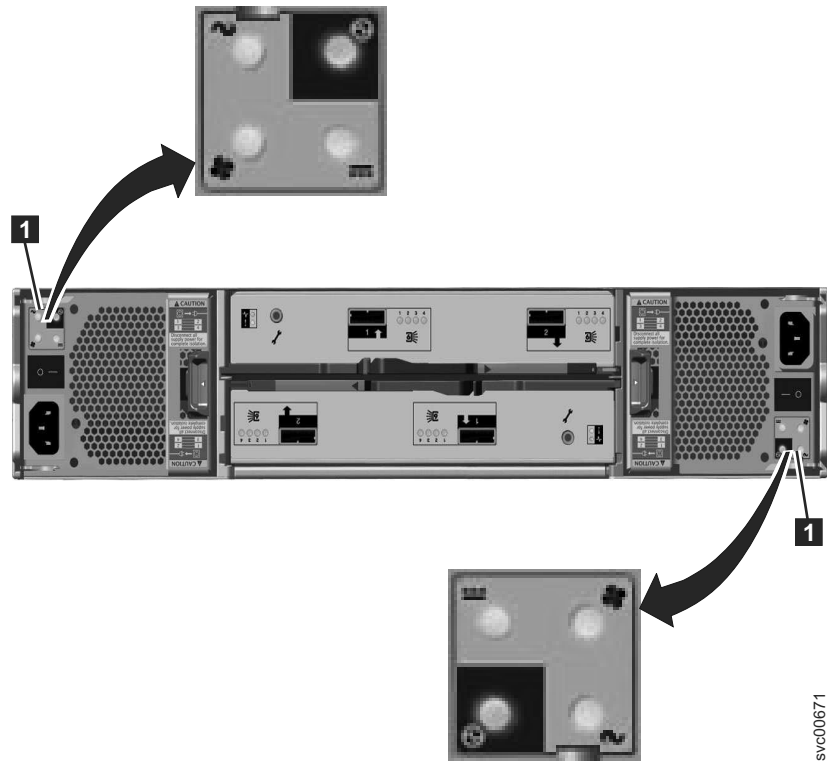
Figure 5. Rear view of a Storwize V7000 Gen1 expansion enclosure

Power supply unit **1** (left) and power supply unit **2** (right), and LED detail as shown.

Figure 6 shows the rear view of a file module with the power supplies (**1** and **2**) on the right.
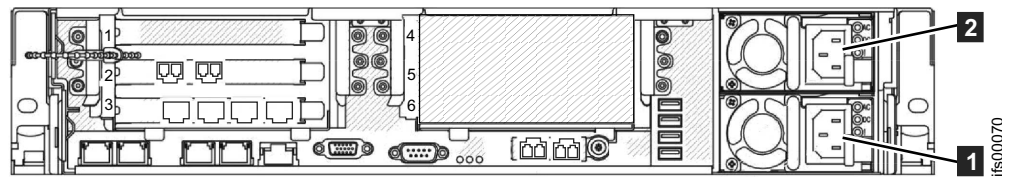
Figure 6. Rear view of file module (2073-720) with the power supplies (1 and 2).

Plan to connect the power cords of the auto-sensing power supplies on the left side of the rack (when viewed from the rear) to one power source that provides power in the range 100V - 240V ac. Plan to connect the power cords of the power supplies on the right side of the rack to another 100V - 240V ac power source. Using two power sources provides power redundancy.

Uninterruptible power supply

An uninterruptible power supply (UPS) can keep the system powered for some limited time after power to the rack has been interrupted. The choice of an UPS depends mainly on the length of time required to maintain access to your storage, after the rack power has been interrupted. There is no provision for the file

modules or the control enclosure to receive a signal that the UPS input power has been interrupted, or that it is about to stop suppling power from its batteries.

File system corruption is still possible when the power is removed from the file modules without being properly shutdown first. The control enclosure has its own batteries to allow critical system state and cached writes to volumes to be saved after its power supply is interrupted.

If an UPS is used then it is best if the file modules, storage enclosures, and Ethernet switches in the rack are all connected to the same UPS. The bottom of the rack is the best location for the UPS.

Storwize V7000 Unified physical installation planning

Before you set up your Storwize V7000 Unified environment, verify that the prerequisite conditions are met.

About this task

This information applies to the supported hardware components.

Answer the following questions before starting the installation process.

1. Does your physical site meet the environment requirements for Storwize V7000 Unified?
2. Do you have adequate rack space for your hardware?

   The Storwize V7000 Unified requires two Electronic Industries Alliance (EIA) units for each control enclosure or expansion enclosure.
3. Do the power circuits that you are planning to use have sufficient capacity and the correct sockets for your Storwize V7000 Unified installation?
   - A clearly visible and accessible emergency power off switch is required.
   - For redundancy, two independent power circuits are required. One circuit connects to each power supply in each enclosure.
   - If you are using the redundant AC-power switch, the redundant AC-power switch main input and the other circuit connect to the redundant AC-power switch backup input.
4. Have you provided appropriate connectivity by preparing your environment?

Storwize V7000 Unified operating environment

To use the system, you must meet the minimum hardware and software requirements and ensure that other operating environment criteria are met.

Minimum requirements

You must set up your Storwize V7000 Unified operating environment with a minimum of one control enclosure and one pair of Storwize V7000 Unified file modules. The file modules are connected only to the control enclosure that provides I/O group 0. Even in a system with four control enclosures, there is only one pair of Storwize V7000 Unified file modules.

Enclosures

RAID MDisk features

You can use the Storwize V7000 Unified management GUI or the command-line interface (CLI) to create a RAID MDisk from the local drives. RAID (other than RAID 0) offers redundancy and the ability to recover from the physical failure of a drive.

A RAID MDisk can be composed of flash drives or hard disk drives (HDDs).

Creating a storage pool that contains both flash drive MDisks and HDD MDisks enables the automatic data-placement mode of the IBM Easy Tier® function. By using this mode, block volumes can take advantage of the better performance of the higher speed flash drives. This is not important if the storage pool will be used only for file volumes.

A Storwize V7000 Gen1 control enclosure supports up to 240 drives with RAID levels 0, 1, 5, 6, and 10. A system can contain up to four control enclosures.

A Storwize V7000 Gen2 control enclosure supports up to 504 drives, but there can be only 1056 drives per system.

When a file system is created, it will create and use volumes only in I/O group 0.

Distributed array features

These arrays, which can contain 4 - 128 drives, also contain rebuild areas that are used to maintain redundancy after a drive fails.

Supported RAID levels are Distributed RAID 5 and Distributed RAID 6

To enhance performance of a distributed array, all of the drives must come from the same, or superior, drive class. Each drive class is identified by its *drive_class_id*.

Drive features

Both flash drives and HDDs include these features:
- Each drive is a 2.5-inch or a 3.5-inch serial-attached SCSI (SAS) drive.
- Drives are hot-pluggable and hot-swappable.

Supported hosts

In a storage area network (SAN) environment, host systems are application servers that access data from the storage controllers that are connected to the SAN. Hosts that are running in a number of operating environments can connect to the storage by using the Storwize V7000 Unified.

For a list of the supported host operating systems, see http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss

Multipathing software

For more information, see http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss

User interfaces

The Storwize V7000 Unified system provides these user interfaces:

- The management GUI, a web-accessible graphical user interface (GUI) that supports flexible and rapid access to storage management information
- A command-line interface (CLI) that uses Secure Shell (SSH)
- Service assistant, a web application that helps troubleshoot and resolve problems on a node canister

Application programming interfaces

The Storwize V7000 Unified system provides an application programming interface that is called the Common Information Model (CIM) agent. The CIM agent supports the Storage Management Initiative Specification (SMI-S) of the Storage Network Industry Association.

Power and cooling requirements for the IBM Storwize V7000 file module (2073-700)

The following document outlines power and cooling requirements for the IBM Storwize V7000 file module (2073-700).

To aid in power and cooling requirements planning for the Storwize V7000 file module, the following table lists the rating of the power supply unit used (PSU). Two PSUs are used per Storwize V7000 file module.

Table 23. Power supply unit (PSU) rating.

PSU	Input	Maximum Power Output	Caloric value BTU/hr
675 W	100 - 240V 7.8A - 3.8A At a frequency of 50 Hz or 60Hz	675 W	2304 BTU/hour

The power and thermal measurements shown below were obtained in the specific operating environment and under the conditions described below and are presented as an illustration. Measurements obtained in other operating environments may vary and customers should conduct their own testing.

Table 24. The following measurements were taken whilst using the Storwize V7000 file module at between 20 and 23 degrees Celsius ambient with a typical workload, and when idle.

Model	Workload	Total Power Consumption	Calorific Value BTU/hr
2073-700	Powered on - typical	138 W	472 BTU/hour
2073-700	Powered on - idle	128 W	438 BTU/hour

Each Storwize V7000 file module contains 2 PSUs for redundancy. The **Total Power Consumption** heading represents the total of the power drawn across both PSUs.

Storwize V7000 Unified environmental requirements

Before you install a Storwize V7000 Unified system, your physical environment must meet certain requirements. This includes verifying that adequate space is available and that requirements for power and environmental conditions are met.

This information pertains to Storwize V7000 Gen1 environmental requirements. For Storwize V7000 Gen2 requirements, search for the words *power cooling* at the following website:

www.ibm.com/storage/support/storwize/v7000/unified

Safety notices

Use the following general safety information for all rack-mounted devices:

DANGER

> **Observe the following precautions when working on or around your IT rack system:**
> - **Heavy equipment–personal injury or equipment damage might result if mishandled.**
> - **Always lower the leveling pads on the rack cabinet.**
> - **Always install stabilizer brackets on the rack cabinet.**
> - **To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.**
> - **Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.**
>
>
>
> - **Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.**
> - **Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.**
> - **An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.**
>
> **(R001 part 1 of 2)**

CAUTION:

- **Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.**
- **Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.**
- **Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.**
- **(For sliding drawers) Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.**
- **(For fixed drawers) This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.**

(R001 part 2 of 2)

Important: In addition, remember:

- The rack design must support the total weight of the installed enclosures and incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over during installation or normal use.
- The rack design must take into consideration the maximum enclosure operating ambient temperature of 35 degrees C (95 degrees Fahrenheit).
- The system must be operated with low pressure rear exhaust installation with back pressure created by rack doors and obstacles not to exceed 5 pascals (0.5 mm water gauge).
- The rack must have a safe electrical distribution system. It must provide overcurrent protection for the enclosure and must not be overloaded by the total number of enclosures installed. The electrical power consumption rating shown on the nameplate should be observed.
- The electrical distribution system must provide a reliable ground for each enclosure in the rack.

Power requirements for each power supply (two per enclosure)

Ensure that your environment meets the following power requirements.

To aid in power and cooling requirements planning, Table 25 on page 29 lists the rating of each power supply unit (PSU) by enclosure.

The power used by the system depends on a variety of factors, including the number of enclosures and drives in the system and the ambient temperature.

Table 25. Power specifications per power supply

Model and type	PSU	Input power requirements	Maximum input current	Maximum power output	Caloric value (BTU/hr)
2076-112 Control Enclosure with 12 3.5-inch drive slots	764 W (2)	100V to 240V single phase ac At a frequency of 50 Hz or 60 Hz	10A for 100V 6A for 240V	764 W	2607
2076-124 Control Enclosure with 24 2.5-inch drive slots					
2076-212 Expansion Enclosure with 12 3.5-inch drive slots	580 W (2)	100V to 240V single phase ac At a frequency of 50 Hz or 60 Hz	8A for 100V 6A for 240V	580 W	1980
2076-224 Expansion Enclosure with 24 2.5-inch drive slots					
2076-312 Control Enclosure with 12 3.5-inch drive slots and 10 Gbps Ethernet adapter	764 W (2)	100V to 240V single phase ac At a frequency of 50 Hz or 60 Hz	10A for 100V 6A for 240V	764 W	2607
2076-324 Control Enclosure with 24 2.5-inch drive slots and 10 Gbps Ethernet adapter					
2076-524 Control Enclosure with 24 2.5-inch solid state drives, 2 host adapters, 2 compression accelerators	1200 W (2)	100V to 240V single phase ac At a frequency of 50 Hz or 60Hz	12A for 100V 7A for 240V	452 W	1542
2076-524 Control Enclosure with 24, 10k SAS Drives, 2 host adapters, 2 compression accelerators	1200 W (2)	100V to 240V single phase ac At a frequency of 50 Hz or 60Hz	12A for 100V 7A for 240V	430 W	1467
2076-524 Control Enclosure with 24, 15k SAS Drives, 2 host adapters, 2 compression accelerators	1200 W (2)	100V to 240V single phase ac At a frequency of 50 Hz or 60Hz	12A for 100V 7A for 240V	471 W	1607
2073-700 File Module	675 W (2)	100 - 240V (7.8A - 3.8A) At a frequency of 50 Hz or 60Hz	n/a	675 W	2304
2073-720 File Module	725 W (2)	100V to 240V single phase ac At a frequency of 50 Hz or 60 Hz	n/a	725 W	2560

These power and thermal measurements shown in Table 26 were obtained in the specific operating environment and under the conditions described. These measurements are presented as an illustration; measurements obtained in other operating environments might vary. Conduct your own testing to determine specific measurements for your environment.

Table 26. Power consumption examples per enclosure

Model and type	Configuration	Total power consumption	Caloric value (BTU/hr)
2076-124	1 enclosure with 24 10K RPM SAS Drives	410 W	1400
2076-224	1 enclosure with 24 10K RPM SAS Drives	205 W	700
2076-212	1 enclosure with 12 7.2K RPM nearline SAS Drives	175 W	600
2076-312	1 enclosure with 12 7.2K RPM nearline SAS Drives and 10 Gbps Ethernet adapter	380 W	1300
2076-324	1 enclosure with 24 flash drives and 10 Gbps Ethernet adapter	530 W	1800
2076-324	1 enclosure with 24 10K RPM SAS Drives and 10 Gbps Ethernet adapter	410 W	1400
2076-524	1 enclosure with 24 2.5-inch solid state drives, 2 host adapters, 2 compression accelerators	452 W	1542
2076-524	1 enclosure with 24 10K SAS drives, 2 host adapters, 2 compression accelerators	430 W	1467
2076-524	1 enclosure with 24 15K SAS drives, 2 host adapters, 2 compression accelerators	471 W	1607
2073-700 File Module	Powered on	138 W	472
2073-700 File Module	Powered on (idle)	128 W	438
2073-720 File Module	Powered on	192 W	652

Each Storwize V7000 Unified enclosure contains two PSUs for redundancy. The total power consumption values represent the total power drawn by both PSUs.

Environmental requirements

System airflow is from the front to the rear of each enclosure:
- Airflow passes between drive carriers and through each enclosure.
- The combined power and cooling module exhausts air from the rear of the each canister.
- Back pressure from rack doors and other obstacles cannot exceed 5 pascals (0.5mm Water gauge).

Ensure that your environment falls within the ranges shown in Table 27.

Table 27. Temperature requirements

Environment	Ambient temperature	Altitude	Relative humidity	Maximum wet bulb temperature
200W operating	5°C to 40°C (41°F to 104°F)	0 to 2133 m (0 to 7000 ft)	8% to 80% noncondensing	23°C (73°F)
	5°C to 35°C (41°F to 95°F)	2134 to 3048 m (7001 to 10000 ft)		
400W operating	5°C to 35°C (41°F to 95°F)	0 to 2133 m (0 to 7000 ft)	8% to 80% noncondensing	23°C (73°F)
	5°C to 30°C (41°F to 86°F)	2134 to 3048 m (7001 to 10000 ft)		
Non-operating	1°C to 50°C (34°F to 122°F)	-305 to 12192m (-1000 to 40000 ft)	8% to 80% noncondensing	27°C (80°F)
Storage	1°C to 60°C (34°F to 140°F)		5% to 80% noncondensing	29°C (84°F)
Shipping	-40°C to 60°C (-40°F to 140°F)		5% to 100% condensing, but not precipitating	

Dimensions and weight

Ensure space is available in a rack, capable of supporting the enclosure based on the data shown in Table 28.

Table 28. Physical characteristics

Enclosure	Height	Width	Depth	Maximum weight	
				Drive ready (without drive modules)	Fully configured (with drive modules)
2076-112, 2076-212, and 2076-312 Control Enclosures with 12 drive slots	87.9 mm (3.46 in.)	483 mm (19.0 in.)	630 mm (24.8 in.)	17.1 kg (37.6 lb)	27.2 kg (59.8 lb)
2076-124, 2076-224, and 2076-324 Control Enclosures with 24 drive slots	87.9 mm (3.46 in.)	483 mm (19.0 in.)	630 mm (24.8 in.)	17.1 kg (37.6 lb)	25.2 kg (55.4 lb)
2073-700 File Module	85 mm (3.36 in.)	443 mm (17.5 in.)	698 mm (27.5 in.)	n/a	29.6 kg (65 lb)
2073-720 File Module	86 mm (3.4 in.)	445 mm (17.5 in)	764 mm (29.4 in)	n/a	30 kg (65 lb)

Additional space requirements

Ensure that these additional space requirements, as shown in Table 29, are available around the enclosures.

Table 29. Clearances

Location	Additional space requirements	Reason
Left and right sides	50 mm (2 in.)	Cooling air flow

Table 29. Clearances (continued)

Location	Additional space requirements	Reason
Back	Minimum: 100 mm (4 in.)	Cable exit

Supported drives for Storwize V7000 Unified enclosures

Table 30 provides drive specifications for your Storwize V7000 Unified system.

Table 30. Drive specifications

Model and type	3.5-inch drives	2.5-inch drives
2076-112 Control Enclosure with 12 3.5-inch drive slots	2 TB 3.5" 7.2K RPM Nearline SAS drive	-
2076-124 Control Enclosure with 24 2.5-inch drive slots	-	• 300 GB 2.5" 10K RPM SAS drive • 450 GB 2.5" 10K RPM SAS drive • 600 GB 2.5" 10K RPM SAS drive • 300 GB 2.5" E-MLC (enterprise-grade multilevel cell) flash drive
2076-212 Expansion Enclosure with 12 3.5-inch drive slots	2 TB 3.5" 7.2K RPM Nearline SAS drive	-
2076-224 Expansion Enclosure with 24 2.5-inch drive slots	-	• 300 GB 2.5" 10K RPM SAS drive • 450 GB 2.5" 10K RPM SAS drive • 600 GB 2.5" 10K RPM SAS drive • 300 GB 2.5" E-MLC (enterprise-grade multilevel cell) flash drive
2076-312 Control Enclosure with 12 3.5-inch drive slots and 10 Gbps Ethernet adapter	2 TB 3.5" 7.2K RPM Nearline SAS drive	-
2076-324 Control Enclosure with 24 2.5-inch drive slots and 10 Gbps Ethernet adapter	-	• 300 GB 2.5" 10K RPM SAS drive • 450 GB 2.5" 10K RPM SAS drive • 600 GB 2.5" 10K RPM SAS drive • 300 GB 2.5" E-MLC (enterprise-grade multilevel cell) flash drive

The Storwize V7000 Gen1 models support up to 240 drives in the system with RAID levels 0, 1, 5, 6, and 10. The Storwize V7000 Gen2 model supports up to 504 drives in the system with RAID levels 0, 1, 5, 6, and 10.

Acoustical specifications for SAS drives for each Storwize V7000 Unified enclosure

Table 31. Acoustical specifications

Model and type	Acoustical output per enclosure
2076-112 Control Enclosure with 12 3.5-inch drive slots	Less than 7.4 B LwA -- Operating (40% Average seek rate) @ 23°C ambient
2076-124 Control Enclosure with 24 2.5-inch drive slots	Less than 7.4 B LwA -- Operating (40% Average seek rate) @ 23°C ambient

Table 31. Acoustical specifications (continued)

Model and type	Acoustical output per enclosure
2076-212 Expansion Enclosure with 12 3.5-inch drive slots	Less than 6.3 B LwA -- Operating (40% Average seek rate) @ 23°C ambient
2076-224 Expansion Enclosure with 24 2.5-inch drive slots	Less than 6.3 B LwA -- Operating (40% Average seek rate) @ 23°C ambient
2076-312 Control Enclosure with 12 3.5-inch drive slots	Less than 7.7 B LwA -- Operating (40% Average seek rate) @ 23°C ambient
2076-324 Control Enclosure with 24 2.5-inch drive slots	Less than 7.7 B LwA -- Operating (40% Average seek rate) @ 23°C ambient
2076-524 Expansion Enclosure with 24 2.5-inch drive slots	Less than 6.5 B LwA -- Operating (40% Average seek rate) @ 23°C ambient
2076-524 Control Enclosure with 24 2.5-inch drive slots	Less than 6.3 B LwA – Operating (40% Average seek rate) @ 23°C ambient

The noise emission level stated is the declared (upper limit) sound power level, in decibels, for a random sample of machines. All measurements are made in accordance with ISO 7779 and reported in conformance with ISO 9296.

Shock and vibration specifications for Storwize V7000 Unified enclosures

Table 32 and Table 33 provide the shock and vibration testing results for your Storwize V7000 Unified system.

Table 32. Shock testing results

Shock categories	Test level	Performance
Operational	5g 10ms 1/2 Sine	<=25g 10ms
Non-operational	30g 10ms 1/2 Sine	<=75g 11ms

Table 33. Vibration testing results

Vibration categories	Test level	Performance
Operational	0.21 grms 5-500Hz Random	Throughput loss <=10% FCAL <= 0.68 grms
Non-operational	1.04 grms 2-200Hz Random	<=3.12 grms
Shipping	0.3g 2-200Hz Sine	<=5g
Rotational vibration	Normal operation performance measurements in enclosure with no external vibration.	Throughput loss for all drives of the same type within performance profile.

Connections

Ensure that you are familiar with the specific connection types for the Storwize V7000 Unified system.

Each Storwize V7000 Unified system requires the following connections:

- Each Storwize V7000 Unified control enclosure requires two Ethernet cables to connect it to an Ethernet switch or hub. One cable connects to port 1 of the left node canister, and the other cable connects to port 1 of the right node canister. A 10/100/1000 Mb Ethernet connection is required for each cable. Both Internet Protocol Version 4 (IPv4) and Internet Protocol Version 6 (IPv6) are supported.

Note: For increased redundancy, an optional second Ethernet connection is supported for each Storwize V7000 Unified node canister.

- To ensure system failover operations, Ethernet port 1 on each node canister must be connected to the same set of subnets. If used, Ethernet port 2 on each node canister must also be connected to the same set of subnets. However, the subnets for Ethernet port 1 do not have to be the same as Ethernet port 2.

Short-wave SFP transceivers are preinstalled in the control enclosure Fibre Channel ports and any 10 Gbps Ethernet ports. You can order long-wave SFP transceivers to replace the short-wave transceivers in the Fibre Channel ports only. 10 Gbps Ethernet ports for FCoE and iSCSI do not use long-wave transceivers.

TCP/IP requirements for Storwize V7000 Unified

Plan your installation, considering TCP/IP address requirements and service access.

To plan your installation, use Table 34 and consider the TCP/IP address requirements of the Storwize V7000 Unified volume storage system and the requirements for the Storwize V7000 Unified to access other services. You must also plan for the Ethernet address allocation, and for the configuration of the Ethernet router, gateway and firewall.

Figure 7 shows how a Storwize V7000 Unified system can be configured.
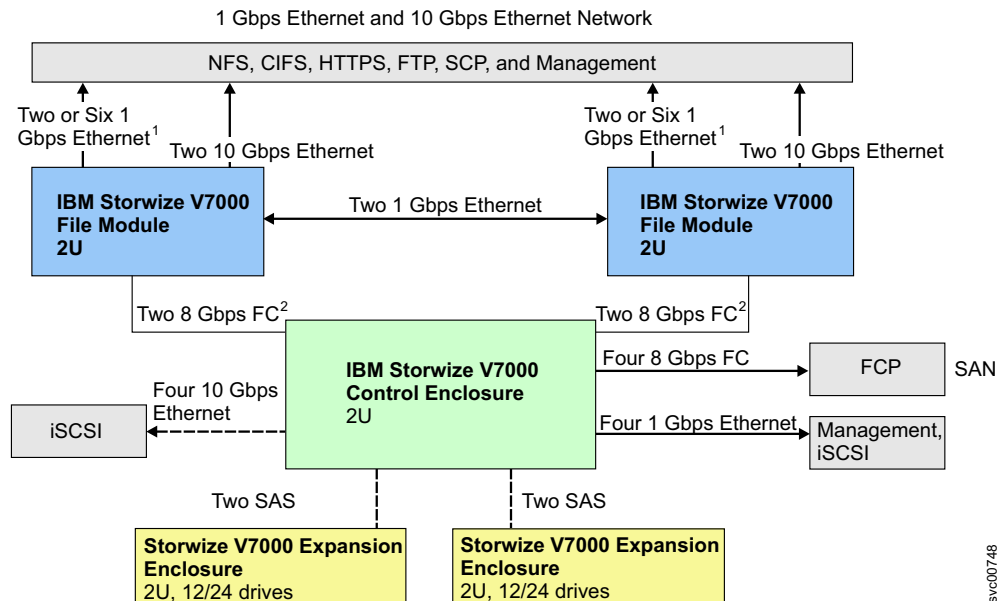
Figure 7. Storwize V7000 Unified configuration

Table 34. TCP/IP ports and services listing

Service	Traffic direction	Protocol	Port	Service type
Email (SMTP) notification and inventory reporting	Outbound	TCP	25	optional
SNMP event notification	Outbound	UDP	162	optional
Syslog event notification	Outbound	UDP	514	optional

Table 34. TCP/IP ports and services listing (continued)

Service	Traffic direction	Protocol	Port	Service type
IPv4 DHCP (Node service address)	Outbound	UDP	68	optional
IPv6 DHCP (Node service address)	Outbound	UDP	547	optional
Network time server (NTP)	Outbound	UDP	123	optional
SSH for command line interface (CLI) access	Inbound	TCP	22	mandatory
HTTPS for GUI access	Inbound	TCP	443	mandatory
CIMOM (HTTPS)	Inbound	TCP	5989	optional
CIMOM SLPD	Inbound	UDP	427	optional
Remote user authentication service - HTTP	Outbound	TCP	16310	optional
Remote user authentication service - HTTPS	Outbound	TCP	16311	optional
Remote user authentication service - Lightweight Directory Access Protocol (LDAP)	Outbound	TCP	389	optional
iSCSI	Inbound	TCP	3260	optional
iSCSI iSNS	Outbound	TCP	3260	optional
IP Partnership management IP communication	Inbound	TCP	3260	optional
IP Partnership management IP communication	Outbound	TCP	3260	optional
IP Partnership data path connections	Inbound	TCP	3265	optional
IP Partnership data path connections	Outbound	TCP	3265	optional

Both IPv4 and IPv6 addresses are supported. These addresses are supported by the control enclosure unless they are for file modules, which only support IPv4.Storwize V7000 Unified can operate with either internet protocol or with both internet protocols concurrently.

For configuration and management, you must allocate an IP address to the system, which is referred to as the management IP address. For additional fault tolerance, you can also configure a second IP address for the second Ethernet port on the file module. The storage system also has a management IP address known as the system IP address.

Note: Storwize V7000 Gen1 models 2076-312 and 2076-324 have two 10 Gbps Ethernet ports per node canister, numbered ports 3 and 4. The 10 Gbps ports can only be used for iSCSI or Fibre Channel over Ethernet host attachment. They cannot be used for configuration or management. A Storwize V7000 Gen2 model 2076-524 can have up to eight 10 Gbps Ethernet ports per control enclosure when two 4-port 10 GbE host interface adapters are installed.

In addition to the management IP addresses, the system is configured with one or more service IP addresses. Service IP addresses are used to gain access to the service assistant when a node is not operating correctly as part of the system. As with the management IP addresses, service IP addresses can be IPv4 addresses, IPv6 addresses, or both. You should choose a fixed IP address per Ethernet port, or you can configure Storwize V7000 Unified to use a DHCP-allocated address.

Attention: The address for a management IP cannot be the same address that is used for the service IP. Using the same IP address causes an error.

Any system that accesses the service IP address must be able to access a management IP address, or a dynamically-allocated service address if DHCP is used.

You can configure Storwize V7000 Unified for event notification by SNMP, syslog or email. To configure notification, you must ensure that the SNMP agent, syslog IP addresses or SMTP email server IP addresses can be accessed from all Storwize V7000 Unified management addresses.

Storwize V7000 Unified does not use name servers to locate other devices. You must supply the numeric IP address of the device. To locate a device, the device must have a fixed IP address.

The nodes in a Storwize V7000 Unified system can receive native IPv4 or IPv6 packets. The nodes cannot operate as an endpoint of a tunnel where an IPv4 packet contains an IPv6 payload or where an IPv6 packet contains an IPv4 payload.

To summarize then, with regards to IPv6 protocols supported:
- IPv6 for CIFS/NFS data traffic (to File Modules) is not supported
- IPv6 for iSCSI data traffic (to Control Enclosure) is supported
- IPv6 for Management is not supported.

Call home IP addresses and ports

To provide for call home, Storwize V7000 Unified nodes require access from the service IP addresses to the IPs/ports shown in Table 35.

Table 35. Call home IP addresses and ports

Hostname	IP Address	Port(s)
eccgw01.boulder.ibm.com	207.25.252.197	443
eccgw02.rochester.ibm.com	129.42.160.51	443
www.ecurep.ibm.com	192.109.81.20	443
www6.software.ibm.com	170.225.15.41	443
www-945.ibm.com	129.42.26.224	443
www-945.ibm.com	129.42.34.224	443
www-945.ibm.com	129.42.42.224	443
www.ibm.com	129.42.56.216	80, 443
www.ibm.com	129.42.58.216	80, 443
www.ibm.com	129.42.60.216	80, 443
www-03.ibm.com	204.146.30.17	80, 443

Licensed functions

The base license that is provided with your system includes the use of its basic functions. However, the following extra licenses can be purchased to expand the capabilities of your system. Administrators are responsible for purchasing extra licenses and configuring the systems within the license agreement, which includes configuring the settings of each licensed function on the system.

The system supports enclosure-based licensing, which allows the use of certain licensed functions that are based on the number of enclosures that are indicated in the license. The system supports the following licensed functions:

External Virtualization
> The system does not require a license for its own control and expansion enclosures; however, a license is required for each enclosure of any external systems that are being virtualized. Data can be migrated from existing storage systems to your system that uses the external virtualization function within 45 days of purchase of the system without purchase of a license. After 45 days, any ongoing use of the external virtualization function requires a license for each enclosure in each external system. The system does not require an external virtualization license for external enclosures that are only being used to provide managed disks for a quorum disk and are not providing any capacity for volumes.

Remote Mirroring
> The remote-mirroring function configures a relationship between two volumes. This function mirrors updates that are made to one volume to another volume. The volumes can be in the same system or on two different systems. The remote-mirroring function is licensed per enclosure. It allows the use of remote-mirroring functions on the total number of enclosures that are licensed. The total number of enclosures must include the enclosures on external storage systems that are licensed for virtualization and the number of control and expansion enclosures that are part of your local system. The license settings apply only to the system on which you are configuring license settings. For remote-copy partnerships, a license is also required on any remote systems that are in the partnership.

Real-time Compression
> The Real-time Compression™ function is a separately orderable license that is set on a per enclosure basis. One license is required for each control or expansion enclosure and each enclosure in any external storage systems that use virtualization. With the compression function, data is compressed as it is written to disk, saving extra capacity for the system.

In addition to these licenses, enclosure licenses are also required for the Easy Tier and FlashCopy® functions on certain models of systems. These two functions are not tracked by the system and do not require any additional input to operate. For auditing purposes, retain the license agreement for proof of compliance.

In addition to these enclosure-based licensed functions, the system also supports encryption through a key-based license. Key-based licensing requires an authorization code to activate encryption on the system. Only certain models of the control enclosures support encryption. During system setup, you can select to activate the license with the authorization code. The authorization code is sent with the licensed function authorization documents that you receive after purchasing the license. These documents contain the authorization codes that are required to obtain keys for the encryption function that you purchased for your system. Encryption is activated on a per system basis and an active license is required for each control enclosure that uses encryption. During system setup, the system detects any SAS attached enclosures and applies the license to these enclosures. If additional control enclosures are added and require encryption, additional encryption licenses need to be purchased and activated.

Performance of Fibre Channel extenders

When you are planning to use Fibre Channel extenders, be aware that the performance of the link to the remote location decreases as the distance to the remote location increases.

For Fibre Channel IP extenders, throughput is limited by latency and bit error rates. Typical I/O latency can be expected to be 10 microseconds per kilometer. Bit error rates vary depending on the quality of the circuit that is provided.

You must review the total throughput rates that might be expected for your planned configuration with the vendor of your Fibre Channel extender and your network provider.

Planning for software

Your plan for the installation and operation of your system must include the necessary software prerequisites.

Installation knowledge and skills

It is important that anyone who has the responsibility for installing the system have some key information and skills.

Ensure that the people authorized to install the system have the necessary knowledge and skills. Before beginning the installation, they should have an understanding of:

- File storage and NAS systems.
- Networking topology and configuration.
- The types of authentication that will be used in the installed system.

Refer to related topics in the sections of the Information Center on configuring, using the file system, and administering the file system for more information on file storage, networking, configuration, and authentication.

Web browser requirements to access the management GUI

You must have a supported web browser to access the management GUI.

To ensure that your web browser is supported and has the appropriate settings enabled, see the topic in related tasks about checking your web browser settings for the management GUI.

Planning your network and storage network

Plan to provide the network infrastructure and the storage network infrastructure that your system requires.

Before you begin

The installation information describes connecting the file module to the control enclosure, and connecting to both the internal Ethernet network and the external Ethernet network.

Event notifications and call homes from the Storwize V7000 Unified storage enclosures are done by email. This requires the IP address of an email server that can access the Internet.

Call homes from a file module are done by electronic customer care (ECC) using secure shell (SSH), and require either:

- A proxy server to access the internet
- Firewall access that must allow each file module service IP address to SSH to the IP addresses for the ECC transaction gateways given in Information required before starting initial configuration of your system.

Suitability for telecommunication environment: This product is not intended to connect directly or indirectly by any means whatsoever to interfaces of public telecommunications networks.

The SAN must contain only supported switches, Fibre Channel extenders, and SAN routers. See the following website for specific firmware levels and the latest supported hardware: www.ibm.com/storage/support/storwize/v7000/unified

Support for long links between the local and remote fabric

Ensure that you are familiar with the support for the interswitch link (ISL) between the local and remote fabric.

See the following Web site for the supported ISLs:

www.ibm.com/storage/support/storwize/v7000/unified

Planning to access Storwize V7000 Unified MIB files for SNMP tools

Many IT organizations use Simple Network Management Protocol (SNMP) tools, such as those provided by IBM Systems Director or the Net-SNMP open source project, to monitor and extend data that identifies products and potential problems that those hardware and software products recognize. One component of the SNMP tools is the ability to read Management Information Bases (MIBs).

An MIB text file is information that the software and hardware products provide to SNMP. Storwize V7000 Unified provides three MIB files. Two files are for information gathered from the file system. The third file is for information gathered from the block storage system.

The file system information files are originally for the Scale Out Network Attached Storage (SONAS) product, but the MIB files also support the Storwize V7000 Unified file system equally as well.

See the Management Information Base (MIB) file for SNMP web page for information about downloading the MIB file for the Storwize V7000 Unified block storage system.

See the Information Center for links to the files that you can download.

Documents

A list of document links that you would need to have access to before adding file modules:

http://publib.boulder.ibm.com/infocenter/storwize/unified_ic/index.jsp

Chapter 3. Before you begin adding file modules

These installation instructions cover adding file modules to an existing Storwize V7000 system to make a Storwize V7000 Unified system.

Do not use these instructions if you have purchased a complete Storwize V7000 Unified system unless directed to do so by IBM Remote Technical Support.

If you have a problem with the initial setup or the initial configuration then refer to the Troubleshooting section of the Information Center. If you still have an issue, then contact IBM Remote Technical Support.

File modules can be added to a Storwize V7000 system having more than one control enclosure. However, only two file modules are allowed on the system. The control enclosure that presents IO group 0 (that is zero) is the only one directly connected by Fibre Channel to the file modules. File volumes for file systems can only be created in IO group 0.

The Storwize V7000 control enclosure that presents IO group 0 could have every available Fibre Channel (FC) port connected to the Storage Area Network (SAN). Any host, storage system or node logins that go trough FC port 1 or FC port 2 of the node canisters in IO group 0 need to be disabled or moved over to FC ports 3 and FC port 4 of each node canister. Having all block volume IOs going through 1 or 2 FC ports on each node canister will probably not cause any change in performance, compared to using all 4 FC ports on each node canister.

A single 8 Gbps Fibre Channel (FC) port or a pair of 4 Gbps FC ports per node canister, has more than enough band width (BW) to saturate the storage IOps of the Storwize V7000. If you will end up with less FC BW connected to the SAN, then you should check that the current peak time FC MBps per node fit in 90% of the final FC BW per node.

The best practice guidance for capacity and performance is:
- The total capacity of file systems should not be more than the capacity of 4 Storwize V7000 enclosures. The maximum file work load should be less than 20,000 file operations per second. Otherwise ask IBM if the Storwize V7000 Unified is the best product to meet your needs.

Note the following:
- The loss of storage capacity caused by adding file modules to your system is insignificant.
- The loss of storage capacity caused by adding a file system is insignificant compared to the space that you allocate for files in that storage system.

Important information:
1. You must first work through the planning information regarding your physical environment and logical network in the Storwize V7000 Unified Information Center. Refer to Chapter 2, "Planning for adding file modules," on page 3.
2. Ensure that you have available any cables that you are supplying.
3. Pay attention to any flyers that were shipped with your shipping order.

4. Check the IBM support home page http://www.ibm.com/storage/support/storwize/v7000/unified for any information revenant to planning, installing and configuring a Storwize V7000 Unified system.

5. An update to NAS checker utility is available on the IBM support home page http://www.ibm.com/storage/support/storwize/v7000/unified. You can use this to check that the system is ready for file modules to be added. You will also use this to start the initial setup of the file modules.

6. The Initial setup e-Learning module is available on the IBM Storwize V7000 Unified Information Center. Look under **Learning and tutorials**.

7. You should use the management GUI to update to the latest Storwize V7000 Unified software immediately after completing the initial configuration.

Tools needed

A screwdriver is the only tool needed for the system installation. The screwdriver can be either a flat-blade screwdriver or a cross head screwdriver.

Installation knowledge and skills

It is important that anyone who has the responsibility for installing the system have some key information and skills. Refer to http://publib.boulder.ibm.com/infocenter/storwize/unified_ic/topic/com.ibm.storwize.v7000.unified.doc/ifs_installskills.html.

Limits and restrictions

For current supported functions and limitations, such as network protocols, authentications, and so forth, refer to IBM Storwize V7000 Unified Support. Go to http://www.ibm.com/storage/support/storwize/v7000/unified and search for Limits and restrictions.

Release notes

For the latest release notes go to http://www.ibm.com/storage/support/storwize/v7000/unified.

Reviewing your packing slip

Open all the boxes and review the packing slip. Make sure you have everything you ordered so you can properly install the file modules.

After you open your box or boxes, locate your packing slip. Ensure that the items that are listed in your packing slip match what is in the box. Ensure that any optional items that you ordered are included in the list. Your shipment might contain additional items depending on the order.

Two file modules. Each file module box contains:

__ • File module
__ • Rack-mounting hardware kit, including:
  __ – Two sets of two rails (right and left assembly)
  __ – Large cable tie
  __ – Cable ties
  __ – Two sets of four M6 screws per rail (two rails)

   __ – Two sets of two 10-32 screws per chassis

   __ – Cable management support arm

   __ – Cable management arm stop bracket

   __ – Cable management arm assembly

Note: The rail kit for the file module differs from the rail kit for the control enclosure.

__ • Two power cords

__ • Small form-factor pluggable (SFP) transceivers that are preinstalled in the file module.

__ • Any additional fibre optic cables that you ordered.

One documentation pack:

__ • Read first flyer

__ • Read first information flyer

__ • Quality hotline flyer

__ • Environmental notices CD

__ • Environmental flyers

__ • Safety notices

__ • Limited warranty information

__ • License information

__ • License Function authorization document

__ • International Program License Agreement

__ • IBM Storwize V7000 Unified Problem Determination Guide

__ • IBM Storwize V7000 Unified Publications DVD

__ • IBM Storwize V7000 Unified Software Recovery DVD. One DVD is shipped per file module

__ • USB flash drive for initialization of Storwize V7000 Unified

Identifying the hardware components

The following graphics and descriptions identify the various hardware components and port locations for the control enclosure in the existing system, and file modules to be added.

Control enclosure

Each enclosure has drives that are located on the front. Figure 8 on page 44 and Figure 9 on page 44 show the front of an enclosure that has space for up to 12 or 24 drives **2** , depending on the model, and a left end cap **1** and a right end cap **3** .
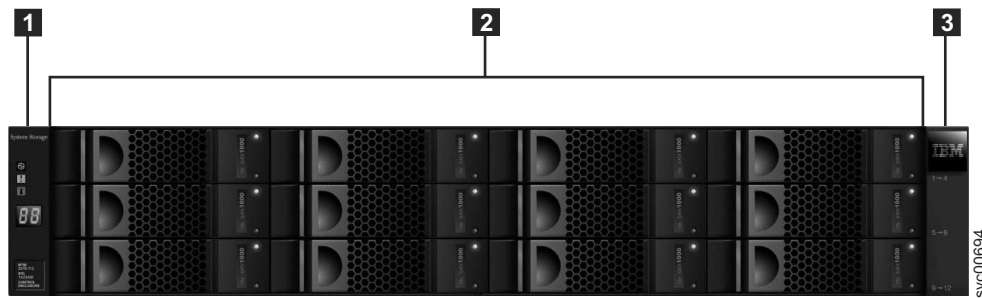
Figure 8. This figure shows 12 drives and two end caps (model 2076-112).

Figure 9. This figure shows 24 drives and two end caps (model 2076-124).

Control enclosure components

Figure 10 shows the rear view of a control enclosure and identifies the location of the power supply units and the canisters.
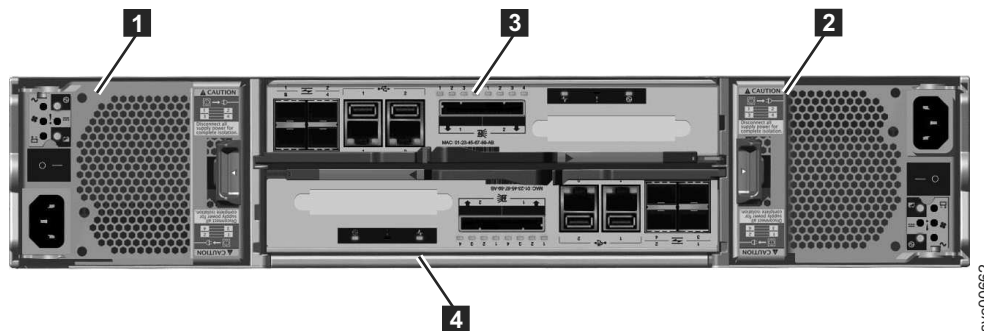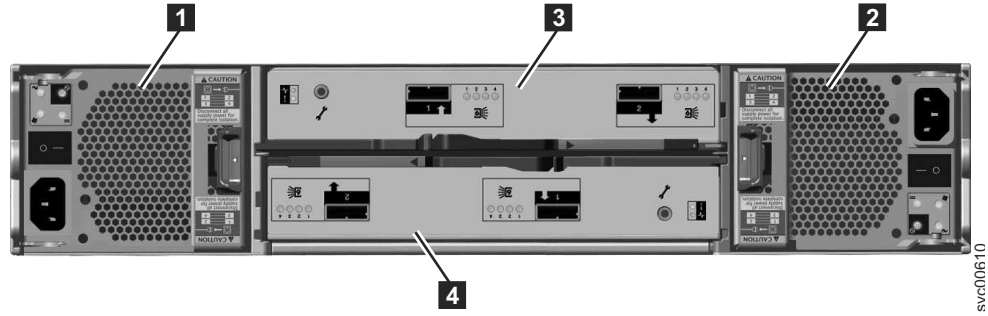

Figure 10. Rear view of a model 2076-112 or a model 2076-124 control enclosure

- Power supply units are located on the left and right of the canisters. Each unit contains a battery. Power supply **1** is located on the left. Power supply **2** is located on the right. Power supply **1** is inserted top side up, and power supply **2** is inverted, or top side down.

  Important: The power supply units for the control enclosure and expansion enclosure are not interchangeable.

- Two canisters are housed in the middle of the enclosure. Each canister is known as a node canister. The upper canister, as shown in Figure 10, is labelled **3**, and the lower canister is labelled **4**. Canister **3** is top side up, and canister **4** is inverted, or top side down.

Figure 11 shows the rear view of a model 2076-112 or a model 2076-124 control enclosure and identifies the location of the ports.
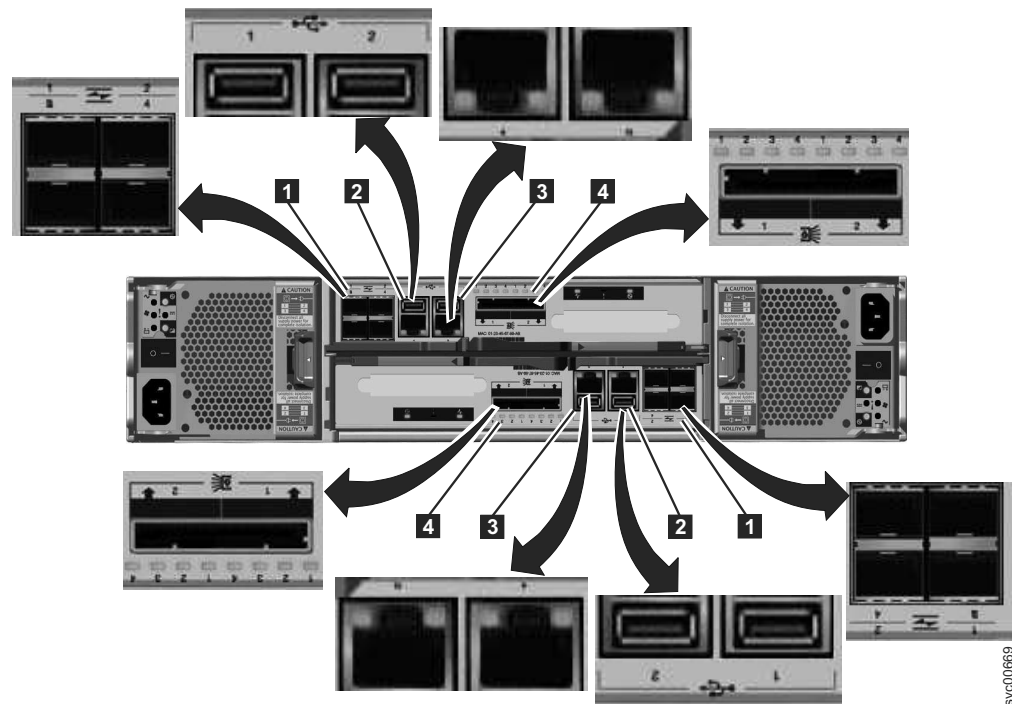
Figure 11. This figure shows the data ports in the rear of the control enclosure.

- **1** Fibre Channel ports. Each canister has four Fibre Channel ports. They are in a block of four in two rows of two connectors. The ports are numbered 1 - 4 from left to right, top to bottom. Two ports connect to the file modules and two are optional.
- **2** USB ports. Each canister has two USB ports. The ports are side by side on the canister and are numbered 1 on the left and 2 on the right. One port is used during installation.
- **3** Ethernet ports. Each canister has two Ethernet ports. The ports are side by side on the canister. They are numbered 1 on the left and 2 on the right on the upper canister. The port locations are inverted for the lower canister. Port 1 must be connected first; the use of port 2 is optional.
- **4** Serial-attached SCSI (SAS) ports. Each canister has two SAS ports. The ports are side by side on the canister. They are numbered 1 on the left and 2 on the right. Port 1 must be connected first if you are adding one expansion enclosure. Port 2 must be connected if you are adding a second expansion enclosure.

Note: The reference to the left and right locations applies to canister 1, which is the upper canister. The port locations are inverted for canister 2, which is the lower canister.

Figure 12 on page 46 shows the rear view of a model 2076-312 or a model 2076-324 control enclosure with the optional 10 Gbps Ethernet ports installed. All other ports remain the same.
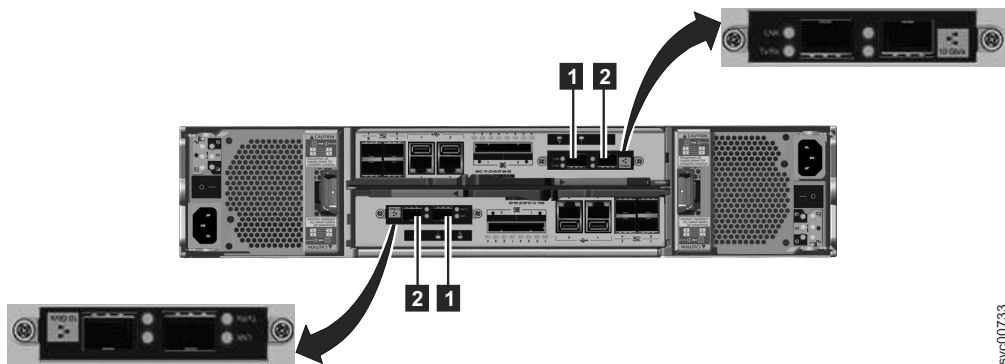
Figure 12. 10 Gbps Ethernet ports on the rear of the Storwize V7000 enclosure

- **1** 10 Gbps Ethernet port 3 which is the left port.
- **2** 10 Gbps Ethernet port 4 which is the right port.

Figure 13 shows the rear view of a Storwize V7000 Gen2 control enclosure and identifies the location of the node canisters and power supply units.
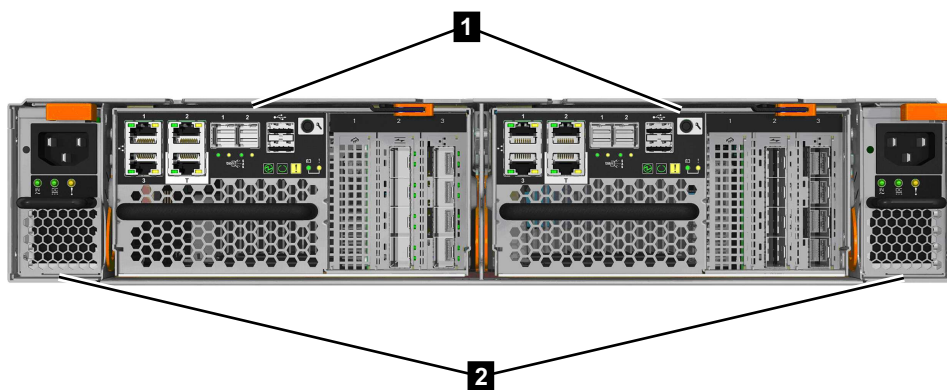
Figure 13. Rear view of a Storwize V7000 Gen2 control enclosure (2076-524)

1 Node canisters.

2 Power supply units.

Figure 14 shows the rear view of a Storwize V7000 Gen2 control enclosure and identifies the location of the ports.

Figure 14. Data ports in the rear of the Storwize V7000 Gen2 control enclosure (2076-524)

- **1** USB ports. Each canister has two USB ports.
- **2** Ethernet ports. Each canister has four 10 Gbps Ethernet ports.

- **3** Serial-attached SCSI (SAS) ports. Each canister has two SAS ports for connecting to optional expansion enclosures.

Expansion enclosure components

Figure 15 shows the rear view of an expansion enclosure and identifies the location of the power supply units and the canisters. The ports and their use are described later in this section.

Figure 15. Rear view of a model 2076-212 or a model 2076-224 expansion enclosure

- Power supply units are on the left and right of the canisters. Power supply **1** is located on the left. Power supply **2** is located on the right. Power supply 1 is inserted top side up, and power supply 2 is inverted, or top side down.

  Important: The power supply units for the control enclosure and expansion enclosure are not interchangeable.
- Two canisters are housed in the middle of the enclosure. Each canister is known as an expansion canister. The upper canister, as shown in Figure 15, is canister **3**, and the lower canister is canister **4**. Canister 3 is top side up, and canister 4 is inverted, or top side down.

Figure 16 on page 48 shows the rear view of an expansion enclosure and identifies the SAS port locations.
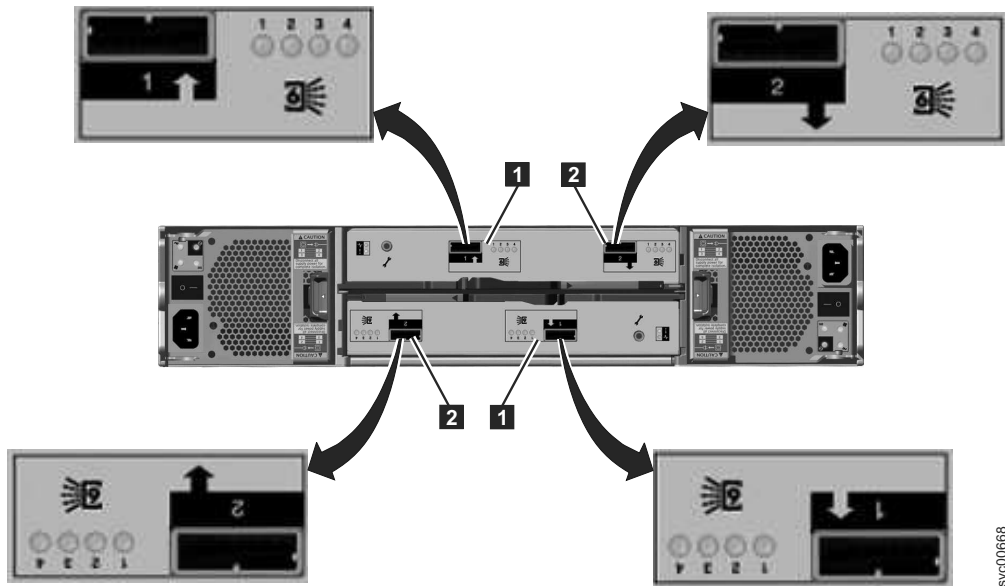
Figure 16. SAS ports and LEDs in rear of expansion enclosure

Each canister has two SAS ports that are numbered 1 on the left **1** and 2 on the right **2** . Port 1 must be connected if you are adding one expansion enclosure. Port 2 must be connected if you are adding a second expansion enclosure.

Note: The reference to the left and right locations applies to canister 1, which is the upper canister. The port locations are inverted for canister 2, which is the lower canister.

Figure 17 shows the rear view of a Storwize V7000 Gen2 expansion enclosure and identifies the location of power supply units and expansion canisters.
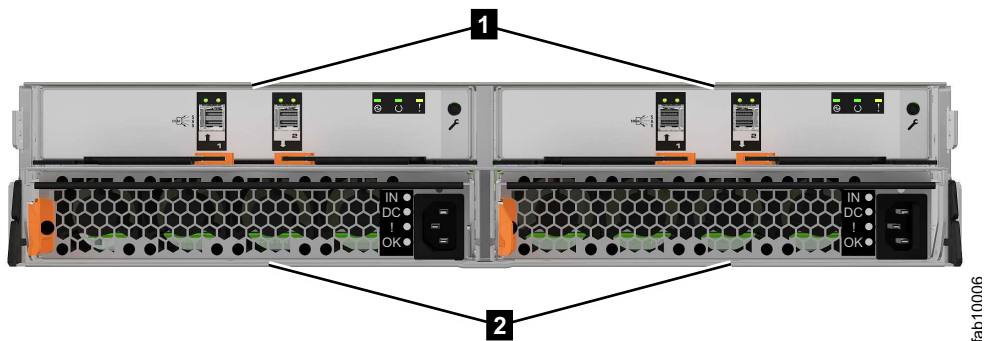
Figure 17. Rear view of a Storwize V7000 Gen2 expansion enclosure

1 Expansion canisters
2 Power supply units

Figure 18 on page 49 shows the rear view of a Storwize V7000 Gen2 expansion canister and identifies the SAS port locations.

1 LEDs
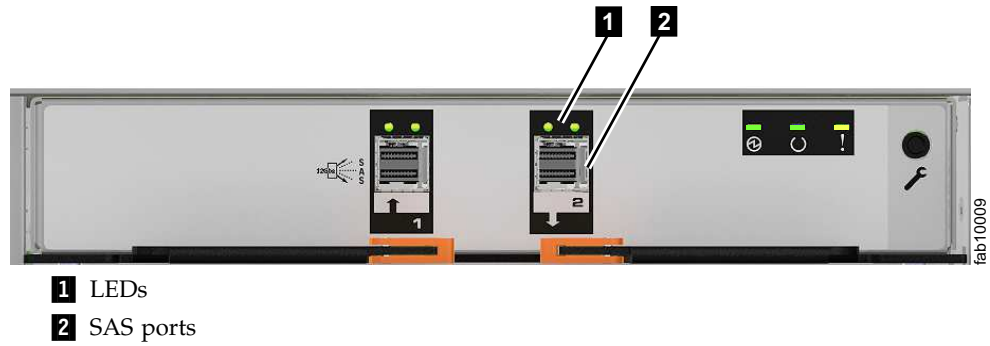
2 SAS ports

Figure 18. SAS ports and LEDs in rear of a Storwize V7000 Gen2 expansion canister

File module

Figure 19 identifies the various ports and hardware in the front of the file module. Each enclosure takes up the full 2U height in the rack. See the *Storwize V7000 Unified Problem Determination Guide* PDF on the CD for the full descriptions of the hardware components.
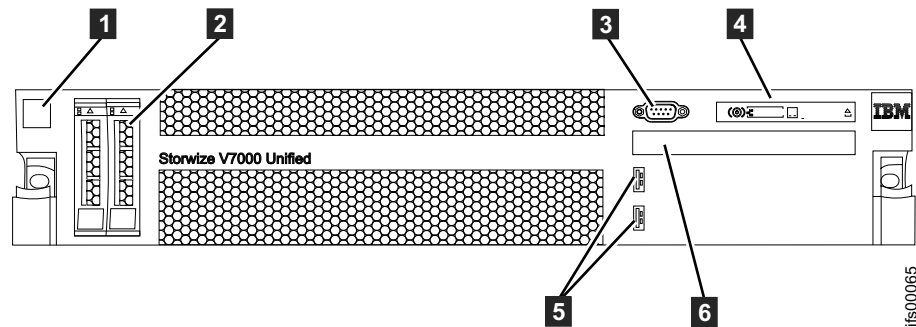
Figure 19. Front view of 2073-720 file module

- **1** File module label with MTM (machine type model) and S/N (serial number)
- **2** Boot drives
- **3** Video port
- **4** Advanced operator panel.
- **5** USB ports
- **6** DVD drive
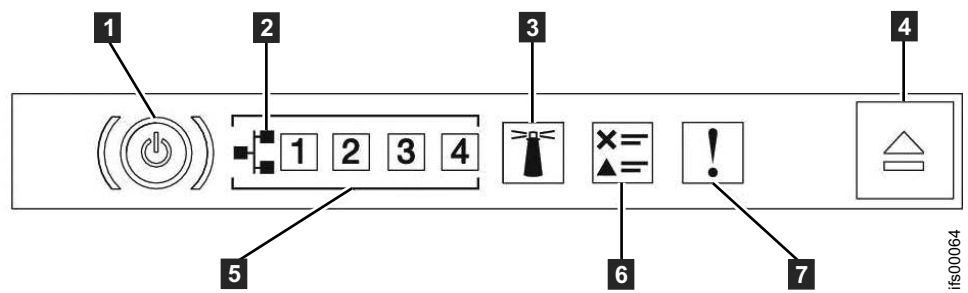
Figure 20. 2073-720 file module advanced operator panel

- **1** Power-control button and power-on LED (green)

- **2** Ethernet icon
- **3** System-locator button and LED (blue)
- **4** Release latch for the light path diagnostics panel
- **5** Ethernet activity LEDs
- **6** Check log LED
- **7** System-error LED: (yellow)

Figure 21 identifies the various ports and hardware in the rear of the file module:
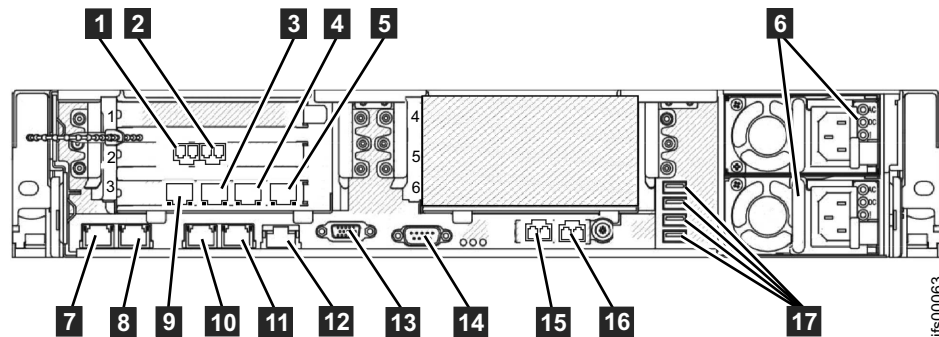
Figure 21. Rear view of 2073-720 file module

- **1** 8 Gbps Fibre Channel port 1 (connected to the control enclosure)
- **2** 8 Gbps Fibre Channel port 2 (connected to the control enclosure)
- **3** Ethernet port 8
- **4** Ethernet port 9
- **5** Ethernet port 10
- **6** Power supplies (1 is lower 2 is upper)
- **7** Ethernet port 1 (connected to the other file module)
- **8** Ethernet port 2 (connected to the other file module)
- **9** Ethernet port 7
- **10** Ethernet port 3
- **11** Ethernet port 4
- **12** Systems-management Ethernet port (NOT USED)
- **13** Video port
- **14** Serial port
- **15** Ethernet port 5 (10 Gbps)
- **16** Ethernet port 6 (10 Gbps)
- **17** USB ports

Miscellaneous hardware

The USB flash drive is packaged with the publications and contains the initialization tool for performing the initial system configuration.

Verifying environmental requirements

Certain requirements for the physical site must be met to ensure that your system works reliably.

This step includes verifying that adequate space in a suitable rack is available and that requirements for power and environmental conditions are met. This documentation assumes that you have completed the physical planning for the environment of your system.

If you have not done the environmental planning for your system, see Chapter 2, "Planning for adding file modules," on page 3.

You must use a supported web browser. Verify that you are using a supported web browser from the following website:

www.ibm.com/storage/support/storwize/v7000

1. From the **Search support** input field, type browser.

   You are shown a search result for "IBM Storwize V7000 Supported Hardware List, Device Driver, Firmware and Recommended Software Levels." Click the search entry.
2. Scroll down to the **Other Hardware and Software** section.
3. Find and select **Management GUI**.

Reviewing enclosure and file module location guidelines

Follow these guidelines to create a plan that identifies the location in the rack for the storage enclosures and an appropriate location for the file modules that you are installing.

These guidelines assume that you are reviewing the existing Storwize V7000 control enclosure and expansion enclosures (between 1 to 20) locations to accommodate the two file modules. You must consider the amount of space available and the length of cables needed in the rack. Refer to the planning information regarding your physical environment that is available from the IBM Storwize V7000 Information Center. publib.boulder.ibm.com/infocenter/storwize/ unified_ic/index.jsp. Refer Figure 22 on page 52 to identify the recommended locations for the your system. Other configurations are possible, but all racks must be close together to accommodate cable lengths. A floor plan showing the layout must be developed prior to the start of the installation.

```
┌─────────────────────────────────┐
│          File Module            │
├─────────────────────────────────┤
│          File Module            │
├─────────────────────────────────┤
│      Expansion Enclosure 8      │
├─────────────────────────────────┤
│      Expansion Enclosure 6      │
├─────────────────────────────────┤
│      Expansion Enclosure 4      │
├─────────────────────────────────┤
│      Expansion Enclosure 2      │
├─────────────────────────────────┤
│        Control Enclosure        │
├─────────────────────────────────┤
│      Expansion Enclosure 1      │
├─────────────────────────────────┤
│      Expansion Enclosure 3      │
├─────────────────────────────────┤
│      Expansion Enclosure 5      │
├─────────────────────────────────┤
│      Expansion Enclosure 7      │
├─────────────────────────────────┤
│      Expansion Enclosure 9      │ ifs00010
└─────────────────────────────────┘
```
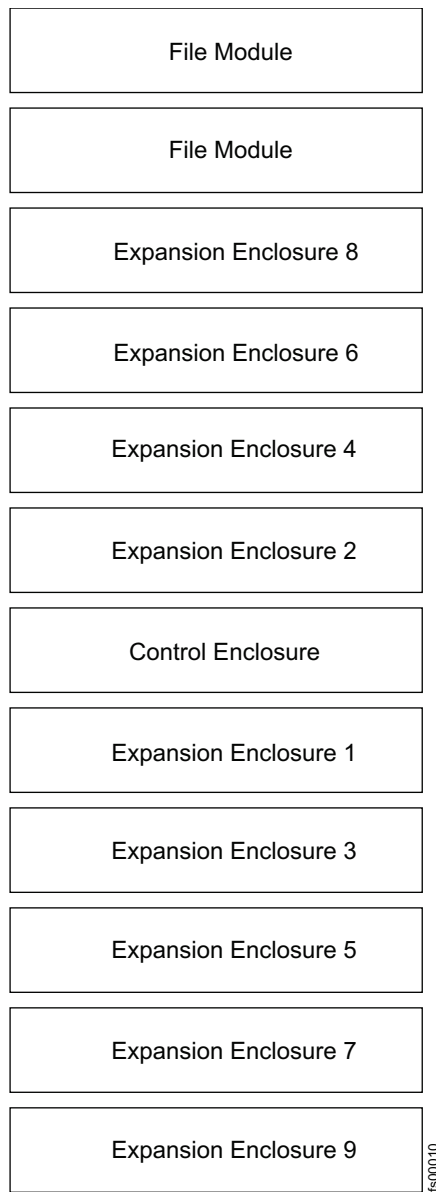
Figure 22. Recommended rack locations

Gather information

Make sure you have IP addresses, system names, and other information needed in order to properly initialize and set up your system.

You will need to have some information ready before you begin the initial setup of your file modules, such as the IP addresses. Refer to "Information required before initializing your system" on page 53.

You also need to have some information ready before you start the initial configuration of your system using the management GUI. Refer to "Information required before starting initial configuration of your system" on page 55.

Information required before initializing your system

This document helps you prepare to initialize your system.

About this task

The following information is required before initializing your system. Fill in all the information needed in the **Value** column before proceeding with this installation.
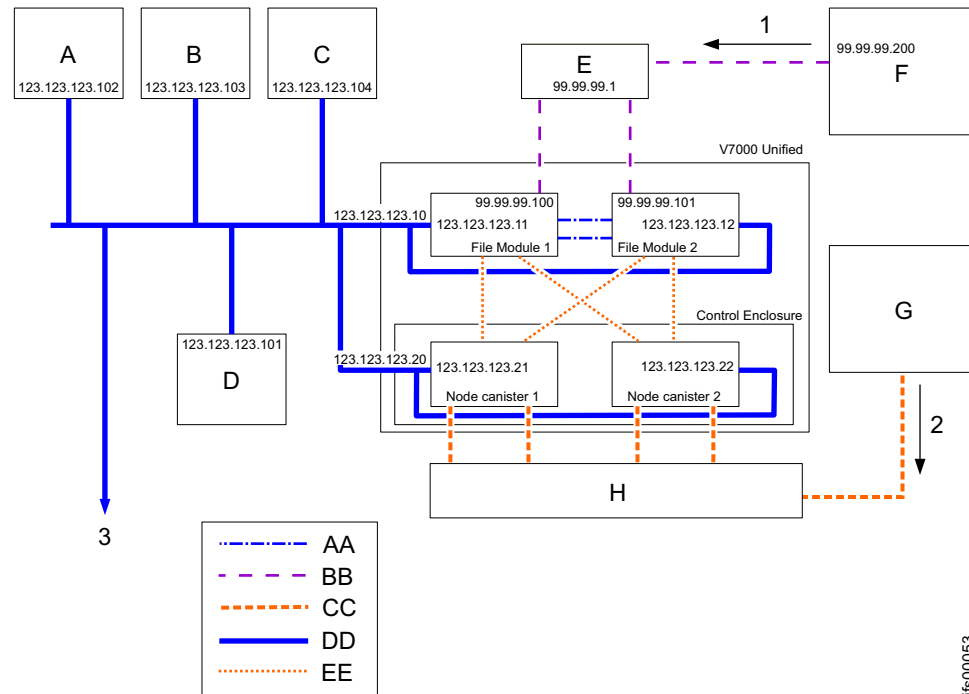
Figure 23. Here are examples of IP addresses, machine names, and so forth. The expansion enclosures are not shown.

Legend for above graphic:
- **1** File storage path
- **2** Block storage path
- **3** Remote support services via internet
- **A** DNS server
- **B** NTP server
- **C** Email server
- **D** Authentication server
- **E** 10 Gbps Ethernet switch
- **F** Client machine
- **G** Client machine
- **H** Fibre Channel switch
- **K** Fibre Channel switch
- **AA** 1 Gbps Ethernet network
- **BB** 10 Gbps Ethernet network
- **CC** Fibre Channel network
- **DD** 1 Gbps Ethernet direct connection

Note: You cannot use VLAN-based subnets to initialize the system management network. To set the file module management IP address, file module 1 and 2 IP addresses, subnet mask, and gateway address, you must provide non-VLAN based network information. Also, all IP addresses entered must be on the same subnet as the Storwize V7000 system IP address. After the system is configured, use the `chnwmgt` command to change the Storwize V7000 Unified network settings to switch to a VLAN-based subnet. This recreates the network with a VLAN-based subnet. You must also use the `chsystem -consoleip` command to show the Storwize V7000 the new management IP address.

Note: The example addresses in this table match the ones given on Figure 23 on page 53.

Table 36. The following IP address information is required before initializing your system. Fill in all the information needed in the Value column before proceeding with this installation.

Field	Value	Notes
Storwize V7000 Primary system IP address		Primary IP address for the Storwize V7000 system (such as 123.123.123.20)
Storwize V7000 Secondary system IP address		Optional Secondary IP address for the Storwize V7000 system (such as 123.123.123.19)
Storwize V7000 node canister 1 service IP address		Service IP address of canister 1 in the control enclosure (such as 123.123.123.20) This is not set by the USB initialize or the management GUI.
Network subnet mask		The Subnet used for management communications (such as 255.255.255.0)
Gateway address		Gateway IP address for the management subnet
Internal IP address range		The internal IP addresses are for internal communication among the Storwize V7000 Unified components for management and maintenance. Select one of the IP address ranges listed below. The range you select must not conflict with the IP addresses used for your Ethernet connections to the management nodes or interface nodes. The available IP address ranges are: 1. 172.31.8.* 2. 192.168.8.* 3. 10.254.8.*

Table 36. The following IP address information is required before initializing your system. Fill in all the information needed in the Value column before proceeding with this installation. (continued)

Field	Value	Notes
Storwize V7000 Unified management IP address		Your designated management IP for the Storwize V7000 Unified system. This gives access to the active management node running on a file module (such as 123.123.123.10)
File module 1 IP address		The service access IP address assigned to be assigned tofile module 1 (such as 123.123.123.10)
File module 2 IP address		The service access IP address to be assigned to file module 2 (such as 123.123.123.11)

Note: The up2nas update checker utility will make sure that the new IP addresses are not already in use somewhere else in your network.

Information required before starting initial configuration of your system
About this task

You must enter specific information into the management GUI. These tables help you record the key values needed before the initial set up and initial configuration.
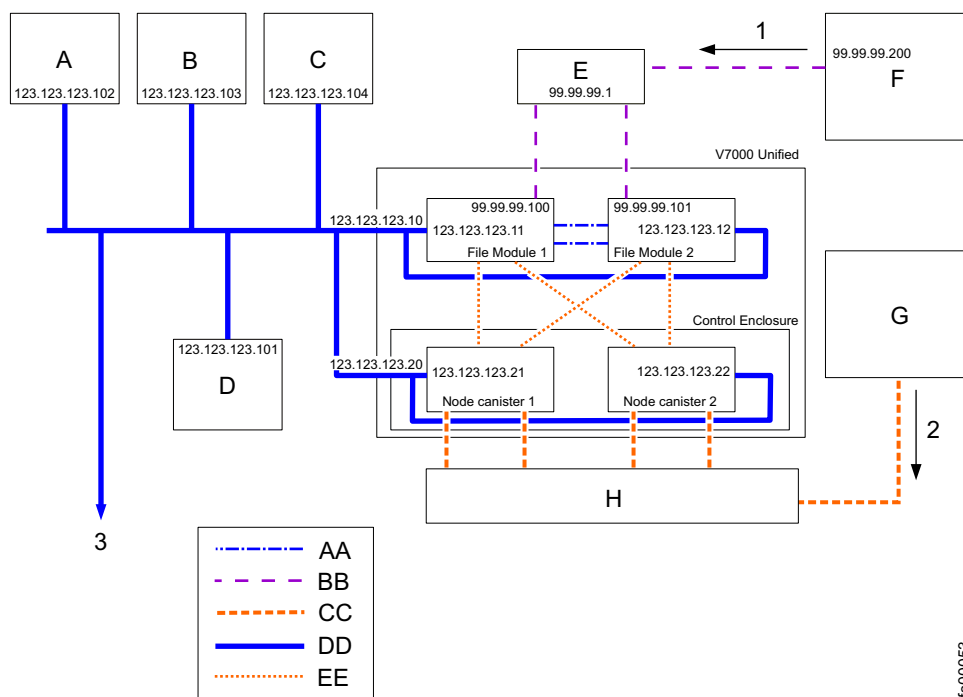
Figure 24. Examples of IP addresses and network services needed for the system. Expansion enclosures are not shown.

Legend for above graphic:

- **1** File storage path
- **2** Block storage path
- **3** Remote support services via internet
- **A** DNS server
- **B** NTP server
- **C** Email server
- **D** Authentication server
- **E** 10 Gbps Ethernet switch
- **F** Client machine
- **G** Client machine (fibre channel attached host)
- **H** Fibre Channel switch
- **AA** 1 Gbps Ethernet direct connection between the file modules
- **BB** 10 Gbps Ethernet network
- **CC** Fibre Channel network
- **DD** 1 Gbps Ethernet
- **EE** Fibre Channel direct connection from file module to node canisters

Required information:

Fill out all the information in the following tables in order to navigate through the initial configuration wizard in the management GUI. Your chances of completing the initial configuration successfully are greatly increased if you have carefully planed and completed these tables before you start the initial setup and initial configuration of the system.

Table 37. Information required for the initial configuration wizard in the management GUI. The table entries serve as a guide only. Use the Value column to record your system information.

Field	Value	Notes
System name		The name of the Storwize V7000 Unified system. It is best if this is also the IP name for the management IP address (For example: myfilesystem1)
NetBIOS name		Name used for NetBIOS access to the system. **Note:** To change the NetBIOS name after the initial configuration, use the `cfgcluster` CLI command.
Time zone		Refer to **Time Zone List** in the IBM Storwize V7000 Unified Information Center. Example: If the machine is being installed in Tucson, Arizona, USA, the best match for the time zone is America/Phoenix. You will match this to a drop down menu located in the management GUI.
Network Time Protocol (NTP) Server		Site NTP server address (for example, 123.123.123.103)
Alternate NTP server		Alternate NTP server if applicable
VLAN ID		Optional. This list shows one or more Virtual LAN Identifiers. A VLAN ID must be in the range from 2 to 4095. If you do not use VLANs then leave this field blank.
Domain name		This name is the public network domain name. Example: company.com The system name and domain name are typically used in combination. Example: myfilesytem1.company.com
DNS servers		Numerical address of user Domain Name Server (for example, 123.123.123.102) can be multiple server addresses
DNS search domain		Additional domain names to be used with primary domain name (for example, a.company.com or us.company.com)
Authentication method for network access to file systems		Refer to Table 41 on page 62, Table 42 on page 62, Table 43 on page 64, Table 44 on page 65 to set up your authentication method. When done, return here to continue.
Public subnet or subnets		Where subnet is the numeric IP address of the public network (data path). It is used for all of the Ethernet data path connections. **Note:** The Subnet is entered as the subnet address followed by the CIDR equivalent of the subnet mask (for example 99.99.99.0/24). You may have more than one public network to access the file systems and file sets shared by this system.
Public subnet mask or subnet masks		This is the subnet mask or subnet masks associated with the public subnet or subnets (for example, 255.255.255.0).
CIDR equivalent of the subnet mask		This is the CIDR (/XX) equivalent of the subnet mask that was specified previously. Look up the subnet mask (specified previously) then refer to the Table 40 on page 59 and find the CIDR equivalent and record it on this line. It must be between /0 and /32 (for example, /24).

Table 37. Information required for the initial configuration wizard in the management GUI (continued). The table entries serve as a guide only. Use the Value column to record your system information.

Field	Value	Notes
Default gateway IP address		This is the numeric gateway IP address. It is used for all network access to the file systems. For example, 99.99.99.1
Public IP addresses		The public IP addresses are the data path connections to your network. They are used for all of the Ethernet data path connections the file modules. At least 2 addresses are recommended (1 per node). The data path connections use Ethernet bonding, so a single IP address (along with a subnet mask and gateway) is used for all available Ethernet ports on a single file module. The system automatically load balances between the physical ports on a single file module. (For example, 99.99.99.100, 99.99.99.101,99.99.99.102,99.99.103)
Additional public gateway IP addresses		Additional gateways IP addresses for access to the file systems across each of the public networks.
Email server IP address		The IP address of your email server for outgoing mail (for example, 123.123.123.104)

Table 38. Information that the system provides to IBM Remote Technical Support

Field	Value	Note
Company Name		The name of your company
Address		This is the address where the machines are located. Example: Bldg. 123, Room 456, 789 N Data Center Rd, City, State
Your Contact Phone Number		This is the primary phone number that IBM Remote Technical Support will call, if the system calls home to report a problem.
Your Off Shift Contact Phone Number		This is the alternate phone number that IBM Remote Technical Support will call, if the system calls home to report a problem.
IP address of proxy server (for call home)	_____._____._____._____	Optional. If a proxy server is needed to access the internet for Call Home from the file modules, this is the IP address of that server. If no proxy server is used, leave this field blank.
Port Of Proxy Server (For Call Home)		Optional. If a proxy server is needed, this is the port corresponding to the IP address listed previously. If no proxy server is used, leave this field blank.
Userid For Proxy Server (For Call Home)		Optional. If a proxy server is needed, and the proxy server requires a user ID and password, record the user ID here. If no proxy server is used, or no user ID and password are used, leave this field blank.
Password For Proxy Server (For Call Home)		Optional. If a proxy server is needed, and the proxy server requires a user ID and password, record the password here. If no proxy server is used, or no user ID and password are used, leave this field blank.

If a proxy server is not used, your network must provide access to the following addresses and ports to facilitate call home from each of the file module service IP addresses. Note that call home from one of the storage enclosures is done using email.

Table 39. Required information

Host Name	IP Address	Port	Description
eccgw01.boulder.ibm.com	207.25.252.197	443	ECC transaction gateway
eccgw02.rochester.ibm.com	129.42.160.51	443	ECC transaction gateway
ftp.ecurep.ibm.com	192.109.81.7	20, 21	File upload for status reporting and problem reporting through FTP
www6.software.ibm.com	170.225.15.41	443	File upload for status reporting and problem reporting. Proxy to testcase.boulder.ibm.com
www-945.ibm.com	129.42.26.224	443	Problem reporting server v4
www-945.ibm.com	129.42.34.224	443	Problem reporting server v4
www-945.ibm.com	129.42.42.224	443	Problem reporting server v4
esupport.ibm.com	129.42.56.189, 129.42.60.189, 129.42.54.189	443, 80 (optional)	For the Edge ECC v4 connectivity, we recommend that customers open 129.42.0.0/18 (EI IPv4 address range) to minimize any further issues.
www.ibm.com	129.42.56.216	80, 443	Service provider file (CCF) download
www.ibm.com	129.42.58.216	80, 443	Service provider file (CCF) download
www.ibm.com	129.42.60.216	80, 443	Service provider file (CCF) download
www-03.ibm.com	204.146.30.17	80, 443	Service provider file (CCF) download

Table 40. CIDR subnet mask information

Subnet Mask	CIDR Equivalent	Note
255.255.255.255	/32	Host (single address)
255.255.255.254	/31	Unusable
255.255.255.252	/30	2 usable
255.255.255.248	/29	6 usable
255.255.255.240	/28	14 usable
255.255.255.224	/27	30 usable
255.255.255.192	/26	62 usable
255.255.255.128	/25	126 usable
255.255.255.0	/24	**Class C** 254 usable
255.255.254.0	/23	2 Class Cs
255.255.252.0	/22	4 Class Cs
255.255.248.0	/21	8 Class Cs

Table 40. CIDR subnet mask information (continued)

Subnet Mask	CIDR Equivalent	Note
255.255.240.0	/20	16 Class Cs
255.255.224.0	/19	32 Class Cs
255.255.192.0	/18	64 Class Cs
255.255.128.0	/17	128 Class Cs
255.255.0.0	/16	Class B
255.254.0.0	/15	2 Class Bs
255.252.0.0	/14	4 Class Bs
255.248.0.0	/13	8 Class Bs
255.240.0.0	/12	16 Class Bs
255.224.0.0	/11	32 Class Bs
255.192.0.0	/10	64 Class Bs
255.128.0.0	/9	128 Class Bs
255.0.0.0	/8	Class A
254.0.0.0	/7	2 Class As
254.0.0.0	/6	4 Class As
252.0.0.0	/5	2 Class As
248.0.0.0	/4	8 Class As
224.0.0.0	/3	16 Class As
192.0.0.0	/2	32 Class As
128.0.0.0	/1	64 Class As
0.0.0.0	/0	IP space

Authentication Method Decision Tree:

The Storwize V7000 Unified systems require one, and only one, authentication system to allow network users to access file systems or file sets exported (shared) by the Storwize V7000 Unified system. The authentication system may also be used to provide User ID mapping. Several authentication methods are supported. They are:

- Microsoft Active Directory - with or without SUA / SFU
- Lightweight Directory Access Protocol (LDAP)
- Network Information Service (NIS

A local LDAP server can also be used which runs on the file modules, but this is limited. For example it does not support asynchronous filesystem replication to another Storwize V7000 Unified system. Refer to Managing authentication and ID mapping, located in the Information Center.

Use the flow chart below to assist in deciding which authentication method is right for you. The factors that influence the decision are the types of client hosts, the existing authentication infrastructure (if any), and if asynchronous file system replication is to be utilized.
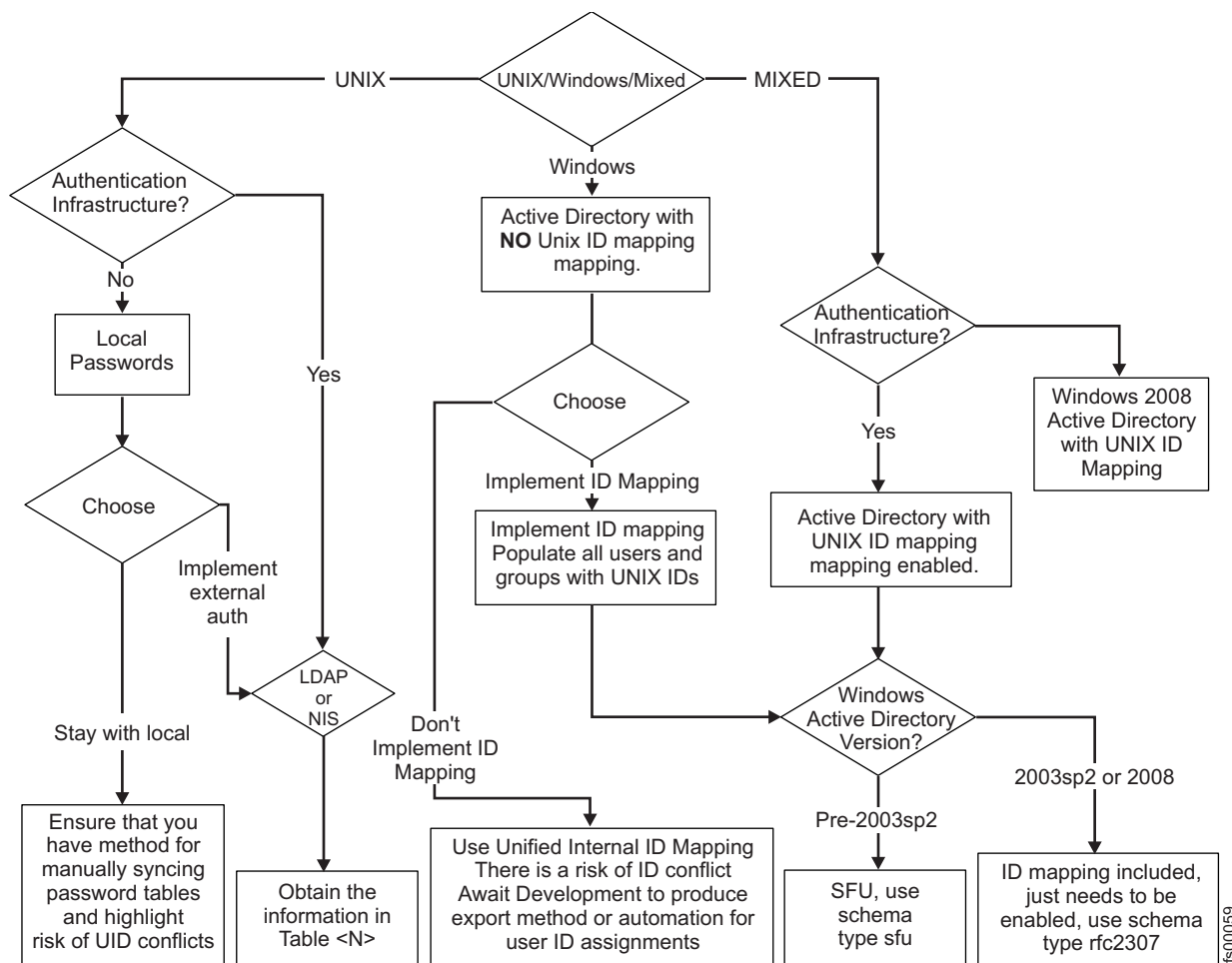
Figure 25. Planning chart for determining an authentication method

Internally the Storwize V7000 Unified system uses IBM General Parallel File System (GPFS). GPFS is a UNIX file system that uses UNIX-style user IDs (UID) and group IDs (GID) to manage file permissions.

For Windows (CIFS) users to access files, there must be some sort of User ID Mapping, such as some way to map the Windows user and group objects to Unix UIDs and GIDs. The Storwize V7000 Unified system supports user ID mapping either internally or externally. While external user ID mapping is preferred, internal mapping can be done using a table local to the Storwize V7000 Unified system to map Windows user and group objects to arbitrary Unix UIDs and GIDs. That table is not accessible externally, even to another Storwize V7000 Unified system for asynchronous file system replication.

Asynchronous replication thus requires external user ID mapping, specifically Windows Active Directory with the Subsystem for Unix (SUA) enabled and populated. Mixed client access, which is having both UNIX and Windows clients access the same files (using NFS and CIFS), requires external user mapping using either Active Directory with SUA/SFU or LDAP with Samba extensions.

Table 41. Authentication method information

Field	Value	Note
Authentication Method	[ ] Microsoft Active Directory [ ] Lightweight Directory Access Protocol (LDAP) [ ] Samba Primary Domain Controller (PDC) - NT4 [ ] None (requires configuring Network information Service (NIS) for NFS NetGroup support)	Check one of the options. If you check **None**, do not select either of the following NIS options.
Options	[ ] Kerberos, compatible with authentication method of LDAP only [ ] Services For UNIX (SFU) - compatible with authentication method of Active Directory only [ ] Network Information Service (NIS) - NFS NetGroup support **without User ID Mapping** - compatible with authentication method of Active Directory or PDC only. [ ] Network Information Service (NIS) - NFS NetGroup support authentication method **with User ID Mapping** - compatible with authentication method of Active Directory or PDC only.	One or more of these optional capabilities may be used to extend the capabilities of the authentication method selected previously. If none of these options are needed then leave this row blank.

If you checked Microsoft Active Directory in the **Authentication Method** field of Table 41, you must complete the following table.

Table 42. Active Directory configuration information

Field	Value	Note
Active Directory Server Ip Address	_____._____._____._____ _____._____._____._____	This is the numeric IP address of the remote Active Directory server (domain controller) on your network.
Active Directory Userid		This is the user ID that must be provided when communicating with the remote Active Directory server. The following user ID and the password are used to authenticate to the Active Directory server.
Active Directory Password		This is the password that must be provided when communicating with the remote Active Directory server.

Table 42. Active Directory configuration information (continued)

Field	Value	Note
SFU DOMAIN NAME		If you checked **Services For Unix (SFU)** in the **Options** field of Table 41 on page 62, then you must complete this field. If you did not check SFU, leave this field blank. This field is used to specify the Trusted Domain Name for the Active Directory server.
SFU RANGE	Upper range: _____ Lower range: _____	If you checked **Services For Unix (Sfu)** in the **Options** field of Table 41 on page 62, then you must complete this field. If you did not check SFU, leave this field blank. This field is used to specify the Lower and Upper bounds of the User Identifier (UID) and Group Identifier (GID) ranges for the storage system. Use the format Lower-Upper (for example, 25-37). The SFU Range must contain the UNIX UID/GID numbers corresponding to users/groups who need to access the system with SFU. The primary group assigned to the SFU users must be an existing Active Directory group with a valid UNIX GID assigned to it. The SFU users must have the same UNIX Attribute primary group and Windows primary group. The UNIX UID/GID that are assigned to such users/groups must be in the ID range provided with -cp parameter of the **cfgsfu** command. The range for UID/GID must not intersect with 10000000-11000000, this range is used by Scale Out Network Attached Storage internally for other UID/GID mapping
SFU SCHEMA MODE	[ ] SFU [ ] rfc2307	If you checked **Services For Unix (Sfu)** in the **Options** field of Table 41 on page 62, then you must complete this field. If you did not check SFU, leave this field blank. This field is used to specify the schema Mode. The schema Mode can be either **sfu** or **rfc2307**depending on the operating system of the Active Directory domain server. If the operating system of the domain server is Microsoft Windows 2008 or Windows 2003 with SP2R2 packages use the schemaMode of **rfc2307** for Windows 2000 and Windows 2003 with SP1, use **sfu**.

If you checked **LDAP** in the **Authentication Method** field of Table 41 on page 62, you must complete this table.

Table 43. LDAP configuration information

Field	Value	Note
LDAP SERVER IP ADDRESS	____.____.____.____ ____.____.____.____	This is the numeric IP address of the remote LDAP server on your network.
SECURITY METHOD	[ ] Off [ ] SSL (Secure Sockets Layer) [ ] TLS (Transport Layer Security)	The communications link between the Storwize V7000 Unified system and your LDAP server may be open (unencrypted), or may be secured (encrypted). If secured, one of two methods is used: SSL or TLS. **Note:** When SSL or TLS is used, a security certificate file must be copied from your LDAP server to the Storwize V7000 Unified Management Node.
Certificate Path		If the SSL method is Off, leave this field blank. If the SSL method is SSL or TLS, record the path on the Storwize V7000 Unified Management Node where you copy the Certificate file. As an example, if the Certificate File is cacert.pem and you store it in a directory called /certificates, then record **/certificates/cacert.pem**.
User Suffix		Specifies the LDAP user suffix to be used.
Group Suffix		Specifies the LDAP group suffix to be used.
Bind Distinguished Name		This is the bind distinguished name from the /etc/openldap/slapd.conf file on your LDAP server. In the example following note 1 below, the bind distinguished name is **cn=Manager,dc=v7kuldap,dc=com**
Bind Password		This is the bind password from the /etc/openldap/slapd.conf file on your LDAP server. In the example following note 1 below, the bind password is **secret.**
Kerberos Server Name		If you checked **Kerberos** in the **Options** field of Table 41 on page 62, you must complete this field. If you did not check Kerberos, leave this field blank. This field is the name of the Kerberos server used with your LDAP environment.
Kerberos Realm		If you checked **Kerberos** in the **Options** field of Table 41 on page 62, then you must complete this field. If you did not check Kerberos, leave this field blank. This field is the Realm for the Kerberos server used with your LDAP environment.
Kerberos Keytab File		If you checked **Kerberos** in the **Options** field of Table 41 on page 62, then you must complete this field. If you did not check Kerberos, leave this field blank. This field is the file name for the Kerberos KeyTab file.

Table 44. NIS configuration information

Field	Value	Note
NIS MODE	[ ] Basic - NIS is used (to provide NFS NetGroup support) in an environment without Active Directory, LDAP, or Samba Primary Domain Controller (PDC). [ ] Extended - NIS is used (to provide NFS NetGroup support or to map UNIX IDs to Windows IDs) for an environment where Active Directory or Samba Primary Domain Controller (PDC) is used for Authentication.	NIS is typically used for one of the following purposes: • NIS can be used to provide NFS Netgroup support in an environment **without** Active Directory, LDAP, or PDC. • NIS can be used to provide NFS Netgroup support in an environment **with** Active Directory, or PDC. • NIS can be used to provide NFS NetGroup support and map UNIX user IDs (which are numeric) to Windows user IDs (which are text strings), allowing UNIX servers to access Network Attached Storage devices that use Microsoft Active Directory or PDC to authenticate users. If you checked **None** in the **Authentication Method** field of Table 41 on page 62, then select Basic. If you checked either of the **NIS** items in the **Options** field of Table 41 on page 62, then select Extended.
Domain Map		If the NIS Mode is Basic, leave this field blank. If the NIS mode is Extended, this field is optional. This field can be used to specify the mapping between Active Directory domains and different NIS domains. When specifying a domain map, use a colon between the Active Directory domain and the NIS domain or domains. Example: ad_domain:nis_domain1 If more than one NIS domain is specified, use a comma-separated list. Example: ad_domain:nis_domain1,nis_domain2 To specify more than one Active Directory domain, use a semicolon. Example: ad_domain1:nis_domain1,nis_domain2; ad_domain2:nis_domain3,nis_domain4

Table 44. NIS configuration information (continued)

Field	Value	Note
Server Map		This field must be used to specify the mapping between NIS servers and NIS domains. When specifying a server map, use a colon between the NIS server and the NIS domain or domains. Example: nis_server:nis_domain1 If more than one NIS domain is specified, use a comma-separated list. Example: nis_server:nis_domain1,nis_domain2 To specify more than one NIS server, use a semicolon. Example: nis_server1:nis_domain1,nis_domain2; nis_server2:nis_domain3,nis_domain4
User Map		If the NIS Mode is Basic, leave this field blank. This optional field can be used to specify the handling for a user who is not known to the NIS server. Only one rule can be specified for each Active Directory or PDC domain. The handling is specified using one of the following keywords: • DENY_ACCESS - denies any user from the specified domain access if they do not have a mapping entry in the NIS. Example: ad_domain1:DENY_ACCESS • AUTO - a new ID for the user is generated from the specific domain which does not have an entry in the NIS. This ID is generated from a pre-specified ID range and is auto-incremented. The administrator must make sure that existing NIS IDs do not fall in this provided ID range. This mapping is kept in Scale Out Network Attached Storage and NIS is not aware of this ID mapping. The ID range can be specified using the ID Map User Range and ID Map Group Range options. Example: ad_domain1:AUTO • DEFAULT - any user from the specified domain who does not have a mapping entry in the NIS server is mapped to a specified user (typically a guest user). Example: ad_domain1:DEFAULT:ad_domain\guest To specify rules for multiple Active Directory or PDC domains, separate the rules with a semicolon. Example: ad_domain1:DENY_ACCESS; ad_domain2:AUTO; ad_domain3:DEFAULT:ad_domain3\guest
NIS DOMAIN		This field must be used to specify the NIS Domain that is stored in the registry.

Table 44. NIS configuration information (continued)

Field	Value	Note
Use Id Map	[ ] Use ID Map - NIS is used to map UNIX IDs to Windows IDs for an environment where Active Directory or Samba Primary Domain Controller (PDC) is used for Authentication.	If the NIS Mode is Basic, leave this field blank. If you checked NIS - NFS NetGroup support **without User ID Mapping** in the **Options** field of Table 41 on page 62, leave this field blank.If you checked NIS - NFS NetGroup support **with User ID Mapping** in the **Options** field of Table 41 on page 62, then check the Use ID Map field.
ID MAP USER RANGE		If the Use ID Map field is blank, leave this field blank. If the Use ID Map field is checked AND at least one User Map rule is AUTO then you must specify a User Range and/or a Group Range. Example: 10000-20000. **Note:** The User Range values must be a minimum of 1024.
ID MAP GROUP RANGE		If the Use ID Map field is blank, leave this field blank. If the Use ID Map field is checked AND at least one User Map rule is AUTO then you must specify a User Range and/or a Group Range. Example: 30000-40000. **Note:** The Group Range values must be a minimum of 1024.

Procedure

1. Go to a personal computer that has an Ethernet connection to the management IP address (refer to Table 37 on page 57), and point a supported browser to that address. Use https prefix (for example, https://123.123.123.9). You must use a supported browser. You can verify that you are using a supported browser by going to the Support home website at www.ibm.com/storage/support/storwize/v7000 and doing the following steps:

   a. From the Search support input field, type **browser**. You are shown a search result for **IBM Storwize V7000 Supported Hardware List, Device Driver, Firmware and Recommended Software Levels**. Click the search entry.

   b. Scroll down to the **Other Hardware and Software** section.

   c. Find and select **Management GUI**.

2. Log in with the admin password **admin001**.

Chapter 4. Preparing for installation

Follow these steps to prepare the Storwize V7000 for adding file modules.

Make Fibre Channel ports available

Make Fibre Channel port 1 and port 2 available on each Storwize V7000 control enclosure node canister, following the planning that you did earlier in Chapter 2, "Planning for adding file modules," on page 3.

Disconnecting Fibre Channel ports from the switch

Make sure it is safe to disconnect Fibre Channel ports 1 and 2 from the switch.

For each node canister in IO group 0, check that Fibre Channel port 1 and 2 have no SAN connectivity:

- From Settings chose: Settings > Nework > Fibre Channel panel from the management GUI
- From **View connectivity for:** choose Nodes from the dropdown menu, and then the node (such as node1) from the second dropdown menu
- Select **Show Results**
- Local Port 1 should not be shown in the results table
- Local Port 2 should not be shown in the results table

Record and delete event notification settings

Use the Storwize V7000 management GUI to record and delete the event notification settings because they will be overwritten by the Storwize V7000 Unified management GUI during initial configuration of the Storwize V7000 Unified system.

Perform the following:

1. Navigate to Settings > Event Notifications > Email in the V7000 management GUI
   - Make a note of the following:
     - Email Servers
     - Support User
     - Email Contact
     - Inventory Service
2. Select the **Edit** button.
   - Select the red **X** to delete each email server and support user.
   - Select the **Save** button.
3. Navigate to Settings > Event Notifications > SNMP in the V7000 management GUI
   - Note the SNMP Servers.
   - Select the red **X** to delete each server.

Record the NTP Server IP address

Use the Storwize V7000 management GUI to record the NTP Server IP address that will be changed by the Storwize V7000 Unified management GUI during initial configuration of the Storwize V7000 system.

Note that the management GUI sets the Storwize V7000 NTP Server IP address to the file modules management ip address. The file module that is the active management node runs an NTP server.

Navigate to Settings > General > Date and Time in the Storwize V7000 management GUI. Make a note of the settings for the NTP Server IP Address.

Record the user settings

The user settings are not affected by adding the file modules but you may want to add similar administrative users to the Storwize V7000 Unified so that you do not use the Storwize V7000 management GUI any more.

From the Storwize V7000 management GUI:
- Navigate to Access > Users
- Record the settings for each user and user group.

Check the IP addresses

Check that you can ping each of the IP addresses, you should be able to ping without any packet loss.

Ping each of the IP addresses that you intend to assign to the file modules and make sure that they get 100% packet loss.

Ping each of the IP addresses in the internal IP address range that you intend to choose for file module to file module communication. They must give 100% packet loss otherwise you need to choose a different range.

Note: You will not be able to change the internal IP address range later if there are problems without first returning the file modules to an out-of-box state, thus, losing your initial IP address range.

Chapter 5. Performing the hardware installation

You have completed the initial steps of verifying the shipping contents and becoming familiar with the hardware components. You have verified that the power and environmental requirements are met and have planned the location of the enclosures and file modules. You made it safe to add the file modules without adversely effecting the current Volume IO. You gathered all of the configuration information that you need for initial setup and initial configuration.

You are now ready to begin installing the file modules and connecting the data cables and power cords.

Be familiar with the following information

CAUTION:
The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb). It takes two persons to safely lift this part or unit. (C009)

- Where it is applicable, a CAUTION notice indicates situations that can be potentially hazardous to you. Before doing a step that contains a caution notice, read and understand the statement that accompanies it.
- **Sliding drawers:** Do not pull out or install any drawer or feature (like the file module) if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.
- **Fixed drawers:** Any fixed drawer (like the Storwize V7000) must not be removed for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.
- Use safe practices when lifting. The fully populated control enclosure weighs about 57.2 lbs (26 kg). Each file module weights 46.5 lbs (21.09 kg) to 55 lbs (25 kg), depending on the configuration. At least two people are required to lift and install or to remove either unit from the rack.
- Do not use rack-mounted devices as a shelf or workspace. Do not place any object on top of rack-mounted devices.

Relocating the enclosures

These instructions guide you through repositioning existing enclosures, if you want to, in order to accommodate the file modules and make the system conforms to the recommended layout.

About this task

These instructions cover removing and repositioning the control enclosure and any additional expansion enclosures in the case where you decide to relocate them. Make sure that you follow the rack layout plan that you created in the planning process. Skip to "Installing the support rails for file module slides" on page 81 if you do not intend to change the location of the storage enclosures in the existing Storwize V7000 system.

In this section, you need to remove the enclosure and its respective rails and relocate them in the desired location. The enclosure rails differ from those of the file modules.

Review the documentation that comes with the rack cabinet for safety and the cabling information. Before you begin, review the following guidelines

- Two or more people are required to install devices 2U or larger in a rack cabinet.
- Make sure that the room air temperature is below 35°C (95°F).
- Do not block any air vents; usually 15 cm (6 inch) of space provides proper airflow.
- Do not leave open spaces above or below an installed control enclosure in the rack cabinet. To help prevent damage to control enclosure components, always install a blank filler panel to cover the open space and to help ensure proper air circulation. Install the control enclosure only in a rack cabinet with perforated doors.
- Plan the device installation starting from the bottom of the rack cabinet.
- Install the heaviest device in the bottom of the rack cabinet.
- Do not extend more than one device out of the rack cabinet at the same time.
- Remove the rack doors and side panels to provide easier access during installation.
- Connect the control enclosure to a properly grounded outlet.
- Do not overload the power outlet when you install multiple devices in the rack cabinet.
- Install the control enclosure in a rack that meets the following requirements:
  - Minimum depth of 70 mm (2.76 inch) between the front mounting flange and inside of the front door.
  - Minimum depth of 157 mm (6.18 inch) between the rear mounting flange and inside of the rear door.
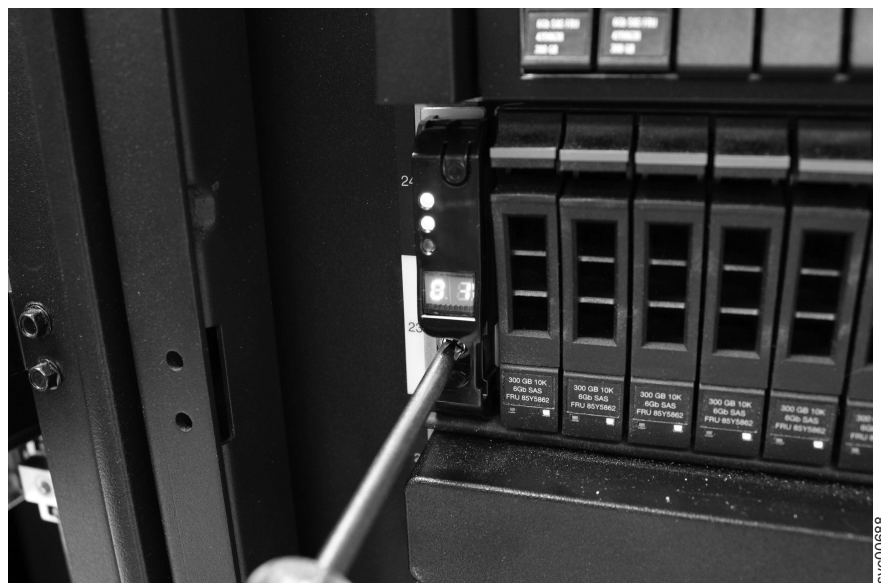
Figure 26. Securing an enclosure to a rack cabinet

- Minimum depth of 718 mm (28.27 inch) and maximum depth of 762 mm (30 inch) between the front and rear mounting flanges to support the use of the cable management arm.

Removing the enclosures

About this task

CAUTION:
The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb). It takes two persons to safely lift this part or unit. (C009)

DANGER

Observe the following precautions when working on or around your IT rack system:

- **Heavy equipment–personal injury or equipment damage might result if mishandled.**
- **Always lower the leveling pads on the rack cabinet.**
- **Always install stabilizer brackets on the rack cabinet.**
- **To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.**
- **Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.**

- **Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.**
- **Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.**
- **An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.**

(R001 part 1 of 2)

1. On either side of the drive assemblies, remove the enclosure end caps by squeezing the middle of the cap and pulling it away from the front of the enclosure as shown. You can also use a flat-blade screwdriver to remove the cap.

Figure 27. Removing the enclosure end cap

2. Remove a screw from the hole behind each enclosure end cap, as shown below.
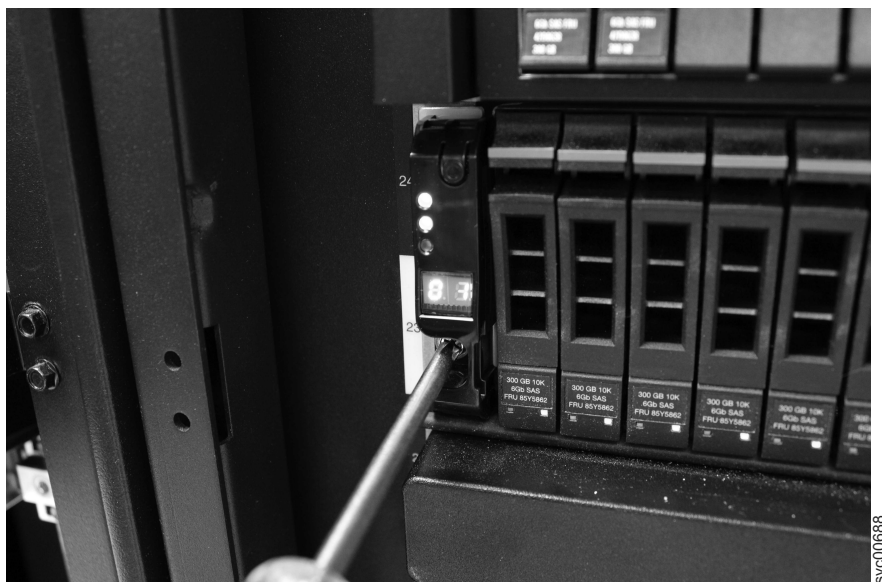
Figure 28. Securing an enclosure to a rack cabinet

3. Carefully slide the enclosure out of the rack along the rails.
4. Repeat this procedure for each additional enclosure that you remove.

Removing and reinstalling the enclosure rails

These instructions guide you through repositioning existing enclosure rails.

About this task

Removing the enclosure and rails

After you have removed the enclosure that you want to relocate, remove the rails. This guide covers removing and then installing the rails at a preferred rack location.

1. Figure 29 shows two rack units with the back mounting holes identified at the rear of the rack.
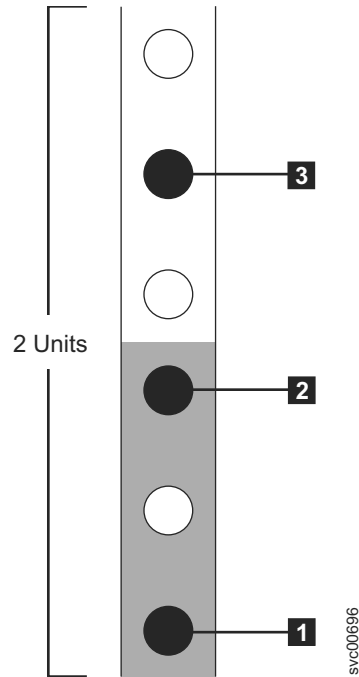
Figure 29. Hole locations in the back of the rack

- **1** Bottom rail location pin hole
- **2** Rack mounting screw hole
- **3** Top rail location pin hole

Remove the clamping screw that inserts into the rack mounting hole **2**, located between the rail location pins.

2. Remove the rail location pins that are in holes **1** and **3** in the rack cabinet.

3. Working at the front of the rack cabinet, identify the two standard rack units of space in the rack.

Figure 30 on page 76 shows two rack units with the front mounting holes identified.
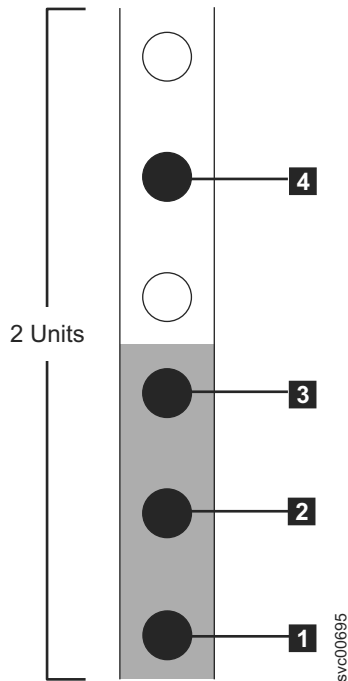
Figure 30. Hole locations in the front of the rack

- **1** Bottom rail location pin hole
- **3** Rack mounting screw hole
- **4** Top rail location pin hole

4. Remove a clamping screw that inserts into the rack mounting hole **3**, located between the rail location pins.
5. Remove the rail location pins at positions **1** and **4**, located in the rack cabinet.
6. Repeat the steps to remove the opposite rail to the rack cabinet.
7. Repeat the procedure for each additional enclosure.

Installing the enclosure and rails

To install the support rails, perform the following steps:

1. Locate the rack mounting rails and screws.

   The rail assembly is made up of two sets of rails. One set of rails is already installed, or preinstalled, on the sides of the enclosures. The other set of rails must be installed in the rack cabinet. The rails on the sides of the enclosures slide into the rails that are installed in the rack cabinet.

2. Working at the front of the rack cabinet, identify the two standard rack units of space in the rack into which you want to install the support rails.

   Figure 31 on page 77 shows two rack units with the front mounting holes identified.
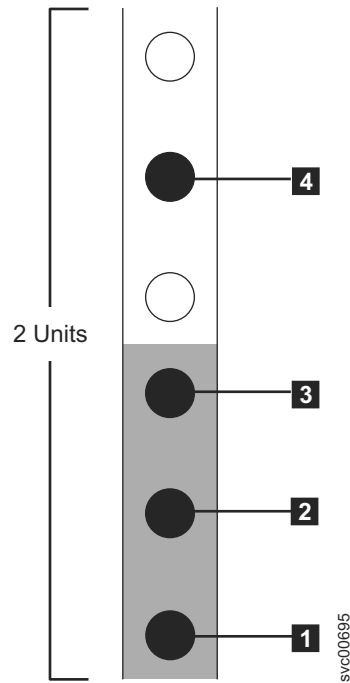
Figure 31. Hole locations in the front of the rack

- **1** Bottom rail location pin hole
- **2** Enclosure mounting screw hole. Do not insert the screw until the enclosure is installed.
- **3** Rack mounting screw hole
- **4** Top rail location pin hole

3. Align the bottom of the rail with the bottom of the two rack units. Insert the rail location pins **1** and **4** through the holes in the rack cabinet.
4. Insert a clamping screw into the rack mounting hole **3** between the rail location pins.
5. Tighten the screw to secure the rail to the rack.
6. Working from the rear of the rack cabinet, extend the rail that you secured to the front to align the bottom of the rail with the bottom of the two rack units.

   Note: Ensure that the rail is level between the front and the back.

   Figure 32 on page 78 shows two rack units with the back mounting holes identified.
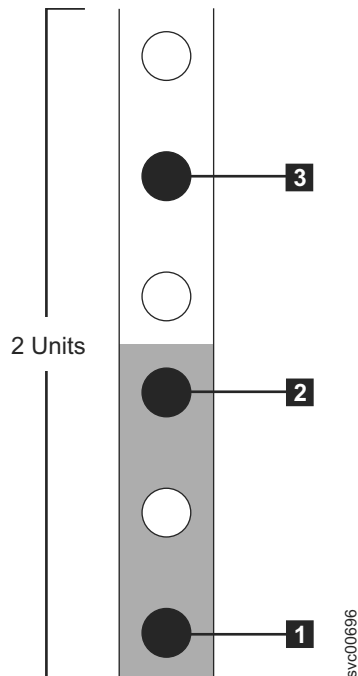
Figure 32. Hole locations in the back of the rack

- **1** Bottom rail location pin hole
- **2** Rack mounting screw hole
- **3** Top rail location pin hole

7. Insert the rail location pins through the holes **1** and **3** in the rack cabinet.
8. Insert a clamping screw into the rack mounting hole **2** between the rail location pins.
9. Tighten the screw to secure the rail to the rack from the back side.
10. Repeat the steps to secure the opposite rail to the rack cabinet.
11. Repeat the procedure for each additional enclosure.

Installing the enclosures

Follow all safety procedures when installing the enclosures in the rack.

About this task

CAUTION:
The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb). It takes two persons to safely lift this part or unit. (C009)

DANGER

> **Observe the following precautions when working on or around your IT rack system:**
>
> - **Heavy equipment–personal injury or equipment damage might result if mishandled.**
> - **Always lower the leveling pads on the rack cabinet.**
> - **Always install stabilizer brackets on the rack cabinet.**
> - **To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.**
> - **Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.**
>
>
>
> - **Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.**
> - **Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.**
> - **An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.**
>
> **(R001 part 1 of 2)**

Following your enclosure location plan, install the correct type of enclosure starting from the bottom.

1. On either side of the drive assemblies, remove the enclosure end caps by squeezing the middle of the cap and pulling it away from the front of the enclosure.

Figure 33. Removing the enclosure end cap

2. Align the enclosure with the front of the rack cabinet.
3. Carefully slide the enclosure into the rack along the rails until the enclosure is fully inserted.

   Notes:

   a. The preinstalled rails on the sides of the enclosure must fit into the rack-mounted rails that you previously installed.
   b. The rails are not designed to hold an enclosure that is partially inserted. The enclosure must always be in a fully inserted position.
   c. Do not have more than one enclosure extended out of the rack at the same time to avoid the danger of the rack toppling over.

4. Insert a screw into the hole behind each enclosure end cap and tighten the screw.

Figure 34. Securing an enclosure to a rack cabinet

5. After matching each end cap's serial number to the serial number found on the rear of each enclosure, push the end caps back into position.

6. Repeat this procedure for each additional enclosure that you install.

Reconnect the SAS cables to the expansion enclosures

About this task

In the event that you repositioned the control enclosure and any expansion enclosures, reconnect the SAS cables. The cables lengths may have changed in some cases, depending on your site plan.

Installing the support rails for file module slides

The file module's rails differ from those of the enclosures.

Before you begin

Review the documentation that comes with the rack cabinet for safety and cabling information. Before you install the file module in a rack cabinet, review the following guidelines:

- Two or more people are required to install devices 2U or larger in a rack cabinet.
- Make sure that the room air temperature is below 35°C (95°F).
- Do not block any air vents; usually 15 cm (6 inch) of space provides proper airflow.
- Do not leave open spaces above or below an installed file module in the rack cabinet. To help prevent damage to file module components, always install a blank filler panel to cover the open space and to help ensure proper air circulation.
- Install the file module only in a rack cabinet with perforated doors.
- Plan the device installation starting from the bottom of the rack cabinet.
- Install the heaviest device in the bottom of the rack cabinet.

- Do not extend more than one device out of the rack cabinet at the same time.
- Remove the rack doors and side panels to provide easier access during installation.
- Do not overload the power outlet when you install multiple devices in the rack cabinet.
- Install the file module in a rack that meets the following requirements:
  - Minimum depth of 70 mm (2.76 inch) between the front mounting flange and inside of the front door.
  - Minimum depth of 157 mm (6.18 inch) between the rear mounting flange and inside of the rear door.
  - Minimum depth of 718 mm (28.27 inch) and maximum depth of 762 mm (30 inch) between the front and rear mounting flanges to support the use of the cable management arm.

  Note: The maximum distance between the front and the rear EIA rails of the rack is 810 mm (31.9 inch). Also, cage nuts and clip nuts are not required to install the file module in a rack cabinet.
- Install the cable management arm on either side of the file module. These instructions are shown with the cable management arm mounted on the left side. The installation instructions in this document can be reversed if you are installing the cable management arm on the side of the file module not shown.

Figure 35 shows the items that you need to install the file module in the rack cabinet. If any items are missing or damaged, contact your place of purchase. The contents from the slide rail box and the cable management arm box are necessary for this installation.
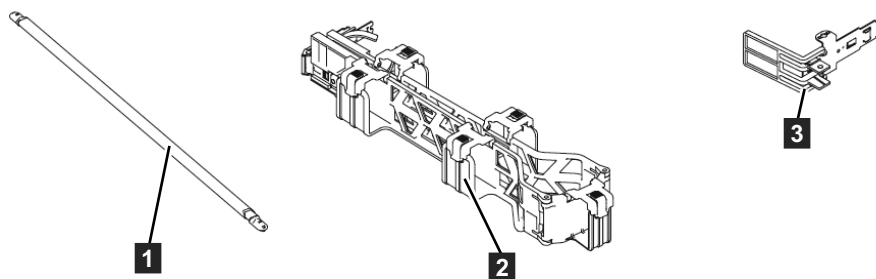
Figure 35. Cable management arm box contents

1 Cable-management support bar
2 Cable-management arm assembly
3 Cable-management stop bracket

Figure 36 on page 83 shows the friction rail box contents.
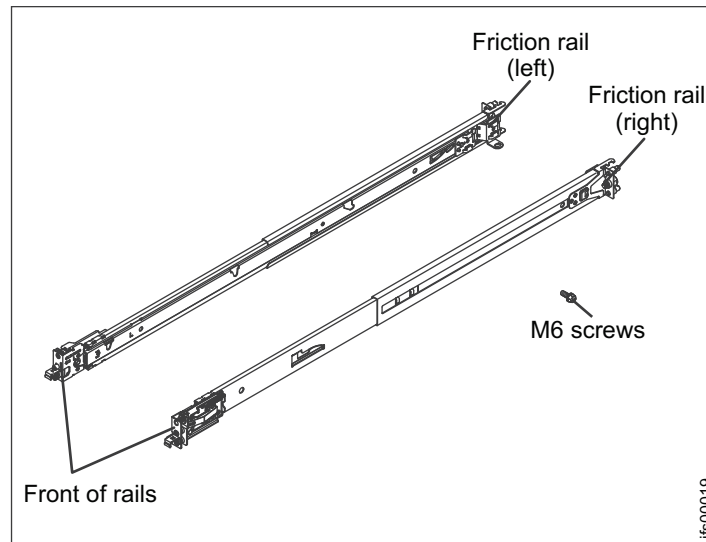
Figure 36. Friction rail box contents

Procedure

To install the support rails, complete the following steps.

1. If the slide rails in your rack installation kit came with shipping thumbscrews, remove them.

2. Select an available 2U space in the rack to install the file modules. Refer to Figure 37.
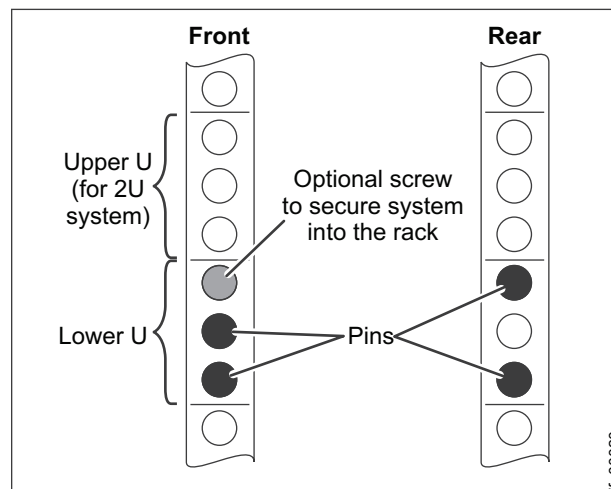
Figure 37. Locate a 2U space in the lower section of the rack.

3. Each slide rail is marked with either an R (right) or an L (left). Select one of the slide rails and pull the rear bracket all the way back. If a thumbscrew is installed in the slide rail, remove it. Refer to Figure 38 on page 84.
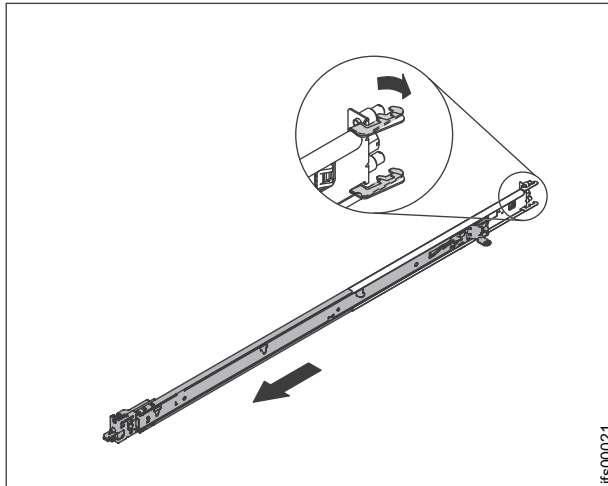
Figure 38. Opening the rear slide rail hooks

> **Note:** If you are installing the slide rails into a 1U space with devices already installed directly above and below this 1U space, you need to extend the slide rails to slide the rear of the slide rails into the rear of the rack. When installing a 2U device, be sure to install the slide rails in the bottom positon of the 2U area in the rack.

4. From the front of the rack, line up the two pins on the rear of the slide rail in the selected unit on the rear of the rack. Push the rails so that the pins go into the holes and slide the rails into the rack to lock the rear of the slide rails into the rack. Refer to Figure 39
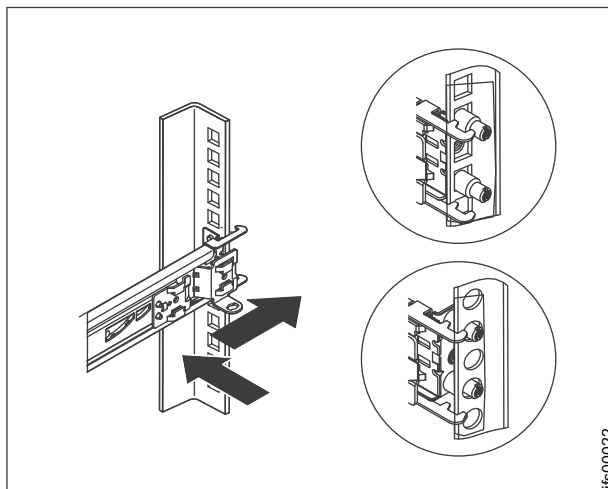
Figure 39. Installing the rear end of the slide rails

5. Push the blue button to allow the latch to slide forward, as shown in Figure 40 on page 85.
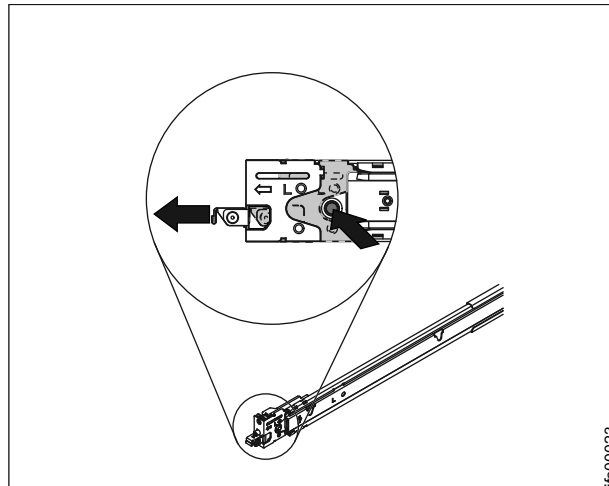
Figure 40. Install the rear end of the slide rails

6. Pull the slide rail forward and locate the front latch in the appropriate unit space in front of the rack EIA rail. Adjust the length of the rail.

7. Press the blue button to release the bracket. Push the front latch in all the way. Make sure the latch is fully engaged. Refer to Figure 41.

8. Repeat this procedure to install the other rail into the rack Make sure that each front latch is fully engaged.
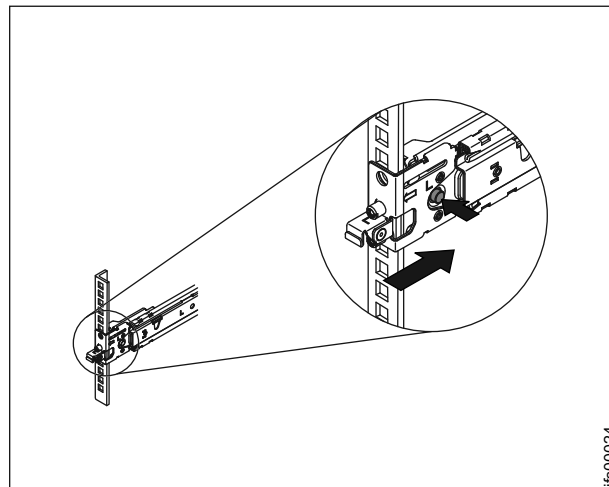
Figure 41. Install the front end of the slide rails

Installing the file modules in the rack

About this task

To install each file module in the rack, follow these instructions:

1. Pull the slide rails forward **1** until they click, two times, into place. Carefully lift the file module and tilt it into position over the slide rails so that the rear nail heads **2** on the device line up with the slide rails. Slide the file module down until the rear nail heads slip into the two rear slots, and then slowly lower the front of the file module **3** until the other nail heads slip into the

other slots on the slide rails.
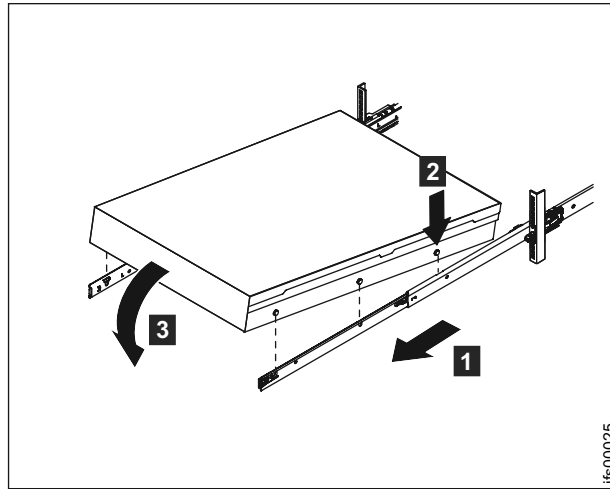
Figure 42. Install the file module on the slide rails.

2. Lift the locking levers **1** on the slide rails and push the file module **2** all the way into the rack until it clicks into place.
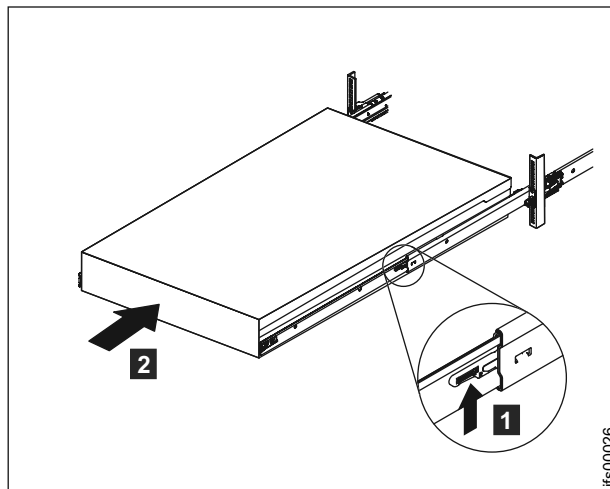
Figure 43. Slide the file module into the rack.

3. Insert both ends of the cable management support arm to the slide rail.
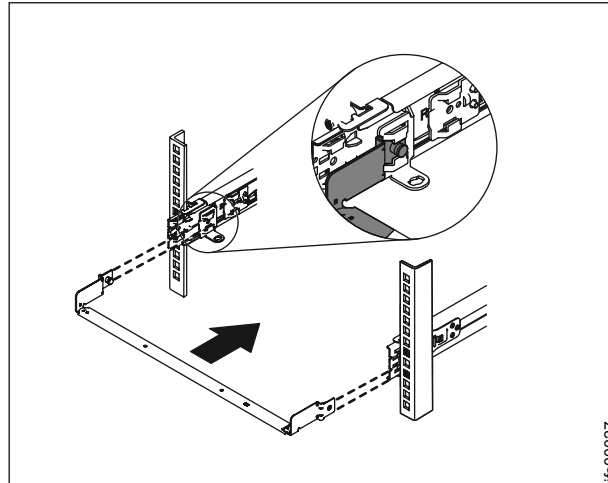
Figure 44. Install the cable management support arm. It can be installed on either side (left or right). The graphic shows the rear of the rack.

4.

> **Note:** Make sure the arm with junctions is facing the file module.
> Place the cable management arm on the support arm. Pull out both cable
> management arm pins and then slide the cable management arm tabs into the
> slots on both inside and outside of the slide rail. Push the tabs until they snap
> into place.

Arm junctions
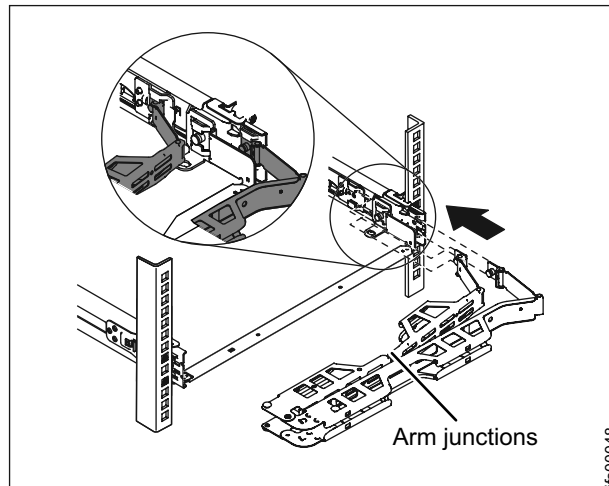
Figure 45. Install the cable management arm.

5. Make sure that the support rail is located between the 2 nail head features.
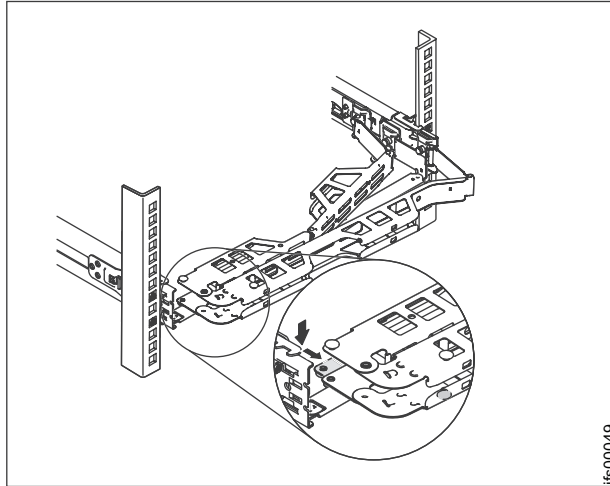
Figure 46. Adjust the location of the cable management arm.

6. Attach the power cords and other cables to the rear of the file module (including keyboard, monitor, and mouse cables, if required).

    Route the cables and power cords on the cable management arm **1** and secure them with cable ties or hook-and-loop fasteners.

    Note: Allow slack in all cables to avoid tension in the cables as the cable management arm moves.
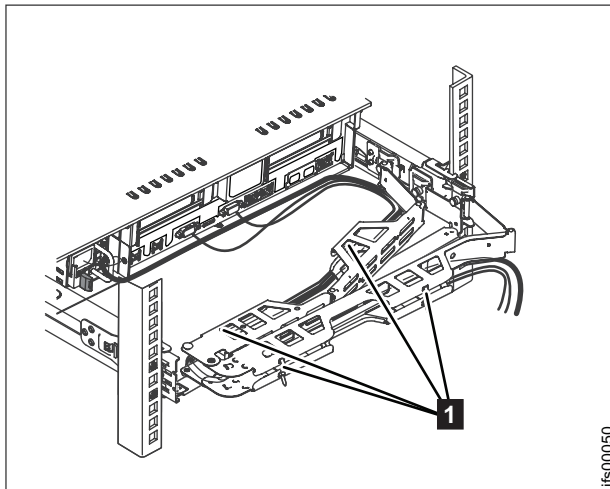
Figure 47. Connect and route the cables.

7. Insert the M6 screws to the rear of the slides. Use a cable tie to secure the free end of the cable management arm to the rack, if needed.
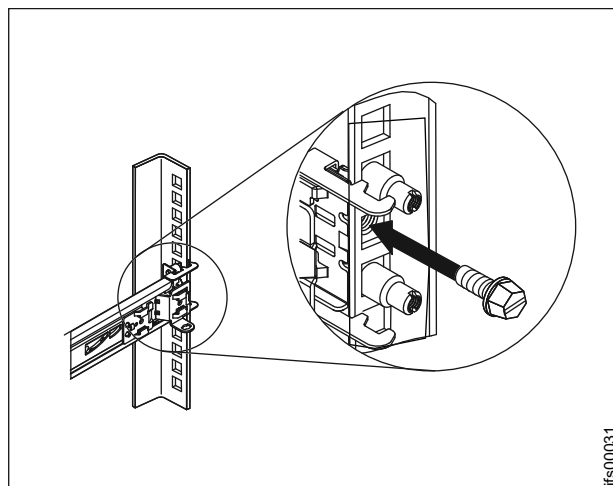
Figure 48. Secure the cable management arm and the file module in the rack for shipping if needed.

8. Slide the file module into the rack until it snaps into place. To slide the file module out of the rack, press on the release latches **1** .

   Note: When you move the rack cabinet, or if you install the rack cabinet in a vibration-prone area, insert the M6 screws **2** in the front of the file module.
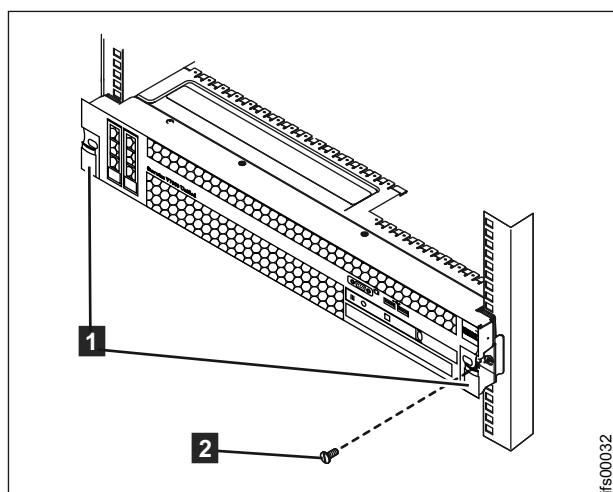
Figure 49. Install the front screws.

Attach the Ethernet cables

About this task

This task assumes that your initial planning has determined where the Ethernet cables are to be located. The Storwize V7000 Unified control enclosure requires at least one and a maximum of two 1 Gbps Ethernet connections to each node canister. Refer to Figure 50 on page 90, Figure 51 on page 90, Figure 52 on page 91, and Figure 53 on page 92; also Table 45 on page 91 and Table 46 on page 92. For the file modules, the first two 1 Gbps Ethernet ports labeled **5** and **6** in Figure 54 on page 93 are used for internal communications between the file modules. The third and fourth 1 Gbps Ethernet ports are used for management

and data (if needed). All 10 Gbps Ethernet ports are dedicated to data. Management cannot be performed over the 10 Gbps Ethernet.

Note: It is important that the file modules are able to communicate over the network with the Storwize V7000 control enclosure for management, service and optional file access.
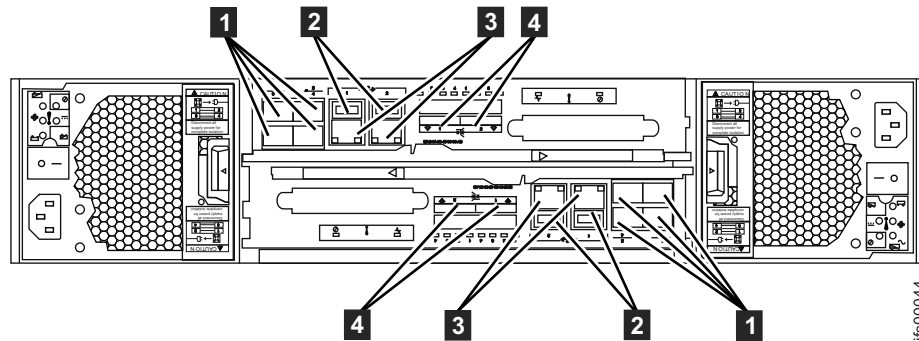
Figure 50. Control enclosure Ethernet network connections.

- **1** Fibre Channel ports (8 Gbps). Each canister has four Fibre Channel ports. They are in a block of four in two rows of two connectors. The ports are numbered 1 - 4 from left to right, top to bottom. Two ports connect to the file modules and two are connected to the SAN.
- **2** USB ports. Each canister has two USB ports. The ports are side by side on the canister and are numbered 1 on the left and 2 on the right. One port is used during installation.
- **3** Ethernet ports (1 Gbps). Each canister has two Ethernet ports. The ports are side by side on the canister. They are numbered 1 on the left and 2 on the right on the upper canister. The port locations are inverted for the lower canister. Port 1 must be connected first; the use of port 2 is optional.
- **4** Serial-attached SCSI (SAS) ports (6 Gbps). Each canister has two SAS ports. The ports are side by side on the canister. They are numbered 1 on the left and 2 on the right. Port 1 must be connected first if you are adding one expansion enclosure. Port 2 must be connected if you are adding a second expansion enclosure.
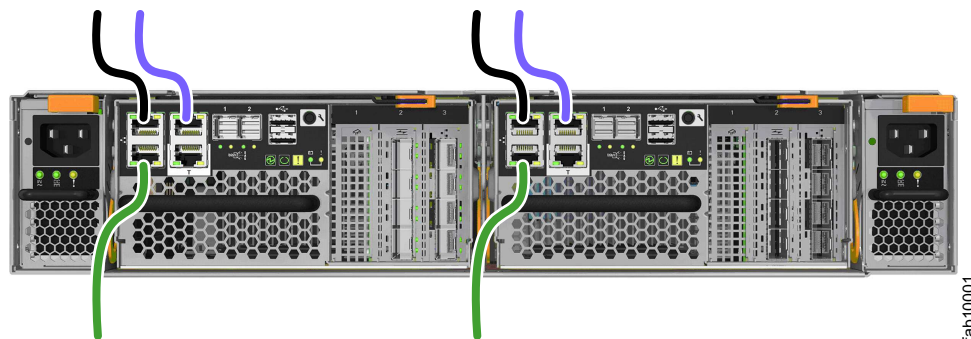
Figure 51. Storwize V7000 Gen2 control enclosure Ethernet network connections
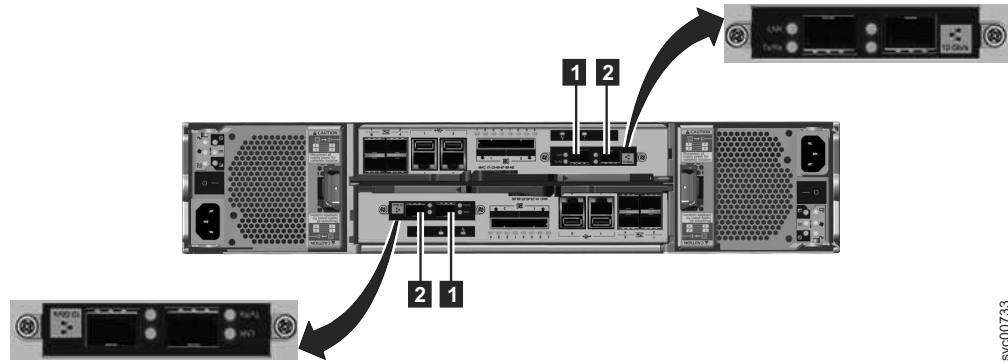
Figure 52. 10 Gbps Ethernet ports on the rear of the Storwize V7000 enclosure

- **1** 10 Gbps Ethernet port 3 which is the left port.
- **2** 10 Gbps Ethernet port 4 which is the right port.

Table 45. Ethernet connections available with the control enclosure

Item	Port	Purpose	IP address is assigned by InitTool	Use
3 (left port, Figure 50 on page 90)	Built-in Ethernet port 1	1 Gbps external network connection	Yes	Management and service port for each canister, optional iSCSI. (The Storwize V7000 control enclosure must be able to communicate over the network with the file modules.)
3 (right port Figure 50 on page 90)	Built-in Ethernet port 2	1 Gbps external network connection	No	Optional management and service port, optional iSCSI
1 (Figure 52)	Ethernet port 3 on a 2076-312 or 2076-324	10 GbE external network connection	No	Optional iSCSI
2 (Figure 52)	Ethernet port 4 on a 2076-312 or 2076-324	10 GbE external network connection	No	Optional iSCSI

If optional 4-port 10 Gbps Ethernet interface adapters are installed in the node canisters, connect each port to the network that will provide connectivity to that port. Connect both node canisters in a control enclosure to the same networks to provide redundant connectivity.

Figure 53 on page 92 shows the additional Ethernet ports when an optional 10 Gbps Ethernet interface adapter is present in PCI slot 3.
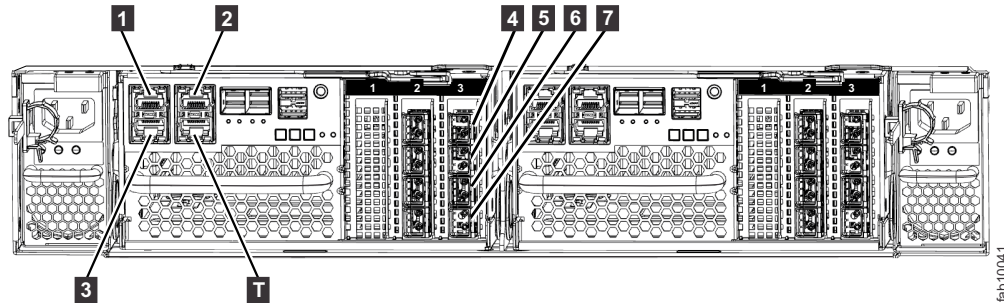
Figure 53. Ethernet ports when an optional 10 Gbps Ethernet interface adapter is present in PCI slot 3

T is the technician port. Never connect a technician port to a network switch.

Table 46. Ethernet connections available with the Storwize V7000 Gen2 control enclosure

Item	Port	Purpose	IP address is assigned by InitTool	Use
1 (Figure 53)	Built-in Ethernet port 1	1 Gbps external network connection	Yes	Management and service port for each canister; optional iSCSI. (The Storwize V7000 control enclosure must be able to communicate over the network with the file modules.)
2 (Figure 53)	Built-in Ethernet port 2	1 Gbps external network connection	No	Optional management and service port; optional iSCSI
3 (Figure 53)	Built-in Ethernet port 3	1 Gbps external network connection	No	Optional management and service port; optional iSCSI
4 (Figure 53)	Ethernet port 4	10 GbE external network connection	No	Optional iSCSI
5 (Figure 53)	Ethernet port 5	10 GbE external network connection	No	Optional iSCSI
6 (Figure 53)	Ethernet port 6	10 GbE external network connection	No	Optional iSCSI
7 (Figure 53)	Ethernet port 7	10 GbE external network connection	No	Optional iSCSI
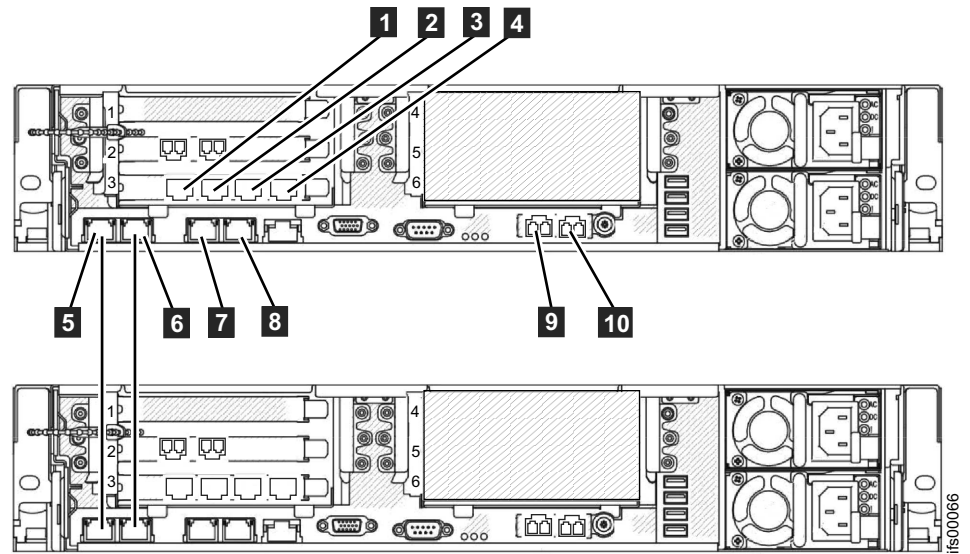
Figure 54. File module Ethernet connections.

Table 47. Ethernet connections available with the file modules

Item	Port	IP address is assigned by InitTool	Use
1	Ethernet port 7		Connect to a switch for public file access
2	Ethernet port 8		Connect to a switch for public file access
3	Ethernet port 9		Connect to a switch for public file access
4	Ethernet port 10		Connect to a switch for public file access
5	Ethernet port 1	From the internal IP address range	Connect to the other file module
6	Ethernet port 2	From the internal IP address range	Connect to the other file module
7	Ethernet port 3	File module service and system management IP address	Connect to a switch for public file access and system management
8	Ethernet port 4		Connect to a switch for public file access
9	Ethernet port 5 (10 Gbps optical)		Connect to a switch for public file access and optional system management
10	Ethernet port 6 (10 Gbps optical)		Connect to a switch for public file access

Attention: The default service IP addresses on your new Storwize V7000 Unified control enclosure might conflict with existing devices that are attached to the network or with other new control enclosures that you are installing. The service IP address 192.168.70.121 subnet mask 255.255.255.0 is preconfigured on Ethernet port 1 of the upper canister, canister 1. The service IP address 192.168.70.122 subnet mask 255.255.255.0 is preconfigured on Ethernet port 1 of the lower canister, canister 2.

If you encounter that situation, change the service IP addresses on the new nodes before connecting the Ethernet cables. For details, see Figure 54 on page 93 or see the *Storwize V7000 Unified Problem Determination Guide* PDF on the DVD for further information about setting service IP addresses using a USB flash drive.

Follow these steps:

1. For each node canister in the control enclosure, connect an Ethernet cable between Ethernet port 1 of the canister and the Ethernet network.

   Note: Ethernet cables are not supplied as part of your order. A CAT 5 unshielded twisted pair (UTP) is the minimum requirement for an Ethernet cable.

   Ensure that cables are installed in a tidy manner to reduce the risk of cable damage.

2. Optionally attach Ethernet cables between Ethernet port 2 on each node canister and your Ethernet network.

File module to file module:

- Connect an Ethernet cable from Ethernet port 1 on the first file module to the first Ethernet port on the second file module. Refer to Figure 54 on page 93 for port locations.

  Note: Ethernet cables for the internal network are provided by IBM with the file modules.

- Connect an Ethernet cable from Ethernet port 2 on first file module to Ethernet port 2 on the second file module.

- Route the Ethernet cables through the cable management arms, and secure any excess using the cable retention features of the rack.

File module management ports:

- Connect an Ethernet cable from Ethernet port 3 on the first file module to an Ethernet network. If using two Ethernet cables (as recommended), connect another Ethernet network cable to Ethernet port 4. When using only one Ethernet port, the network status is marked as degraded and an associated warning event is listed in the health center.

- Repeat the previous step for the second file module.

- Route the Ethernet cables through the cable management arm, and secure any excess using the cable retention features of the rack.

File modules to external (host ports) network (10 GB Fibre Ethernet):

You have two 10 Gbps Fibre Ethernet ports available for host connections from each file module. The ports are on the PCI adapter located in slot 4. Connect your network cables to the Ethernet ports in these slots as applicable. Refer to Figure 54 on page 93.

Network connections:

Connect Ethernet ports 3 and 4 to the network. Then connect the 10 Gbps Ethernet ports to the 10 Gbps Ethernet network.

Attaching the Fibre Channel cables

Attach the Fibre Channel cables from the Fibre Channel ports on the file modules to the Fibre Channel ports of the control enclosure.

About this task

File modules:

To attach the Fibre Channel cables, follow these steps:
- Connect two Fibre Channel cables from the first file module to the control enclosure. Be sure to plug one cable into one node canister on the control enclosure and the other cable into the other node canister for redundancy. Route the Fibre Channel cables through the Cable Management Arms.

  Note: You may have ordered Fibre Channel cables with the file modules or you may be providing your own.
- Repeat the previous step for the other file module.
- Before you continue, make sure that you have connected the Fibre Channel cabling as shown in Figure 55 on page 96 or Figure 56 on page 97 to ensure proper redundancy. Incorrect cabling may result in a loss of service during system maintenance procedures.
- Secure any excess cable length using the cable retention features of the rack.

Note: After the blue indicator light appears when the file modules are powered on, the amber LED (with the number 8 stamped on the metal next to each Fibre Channel port) should be lit to show that the link speed is 8 Gbps.
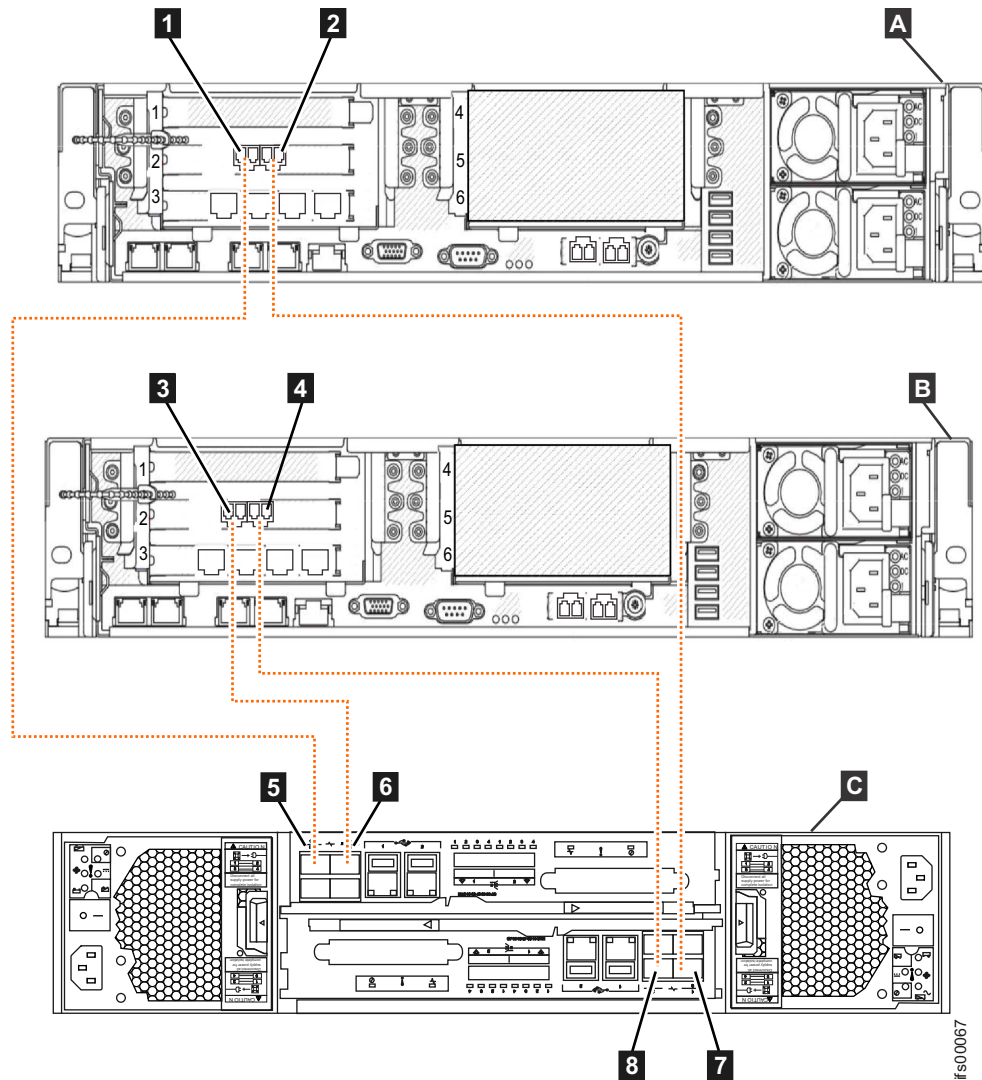
Figure 55. Connecting the file modules to the Storwize V7000 Gen1 control enclosure using Fibre Channel cables

- A File module 1
- B File module 2
- C Storwize V7000 control enclosure
- 1 File module1 - Fibre Channel port 1
- 2 File module 1 - Fibre Channel port 2
- 3 File module 2 - Fibre Channel port 1
- 4 File module 2 - Fibre Channel port 2
- 5 Upper node canister - Fibre Channel port 1
- 6 Upper node canister - Fibre Channel port 2
- 7 Lower node canister - Fibre Channel port 1
- 8 Lower node canister - Fibre Channel port 2

Note: If you want this control enclosure to communicate with other Storwize V7000 control enclosures, storage controllers, the Storwize V7000 Unified or block hosts, then connect the Fibre cables from your Fibre Channel switch to the

remaining node canisters Fibre Channel ports 3 and 4.
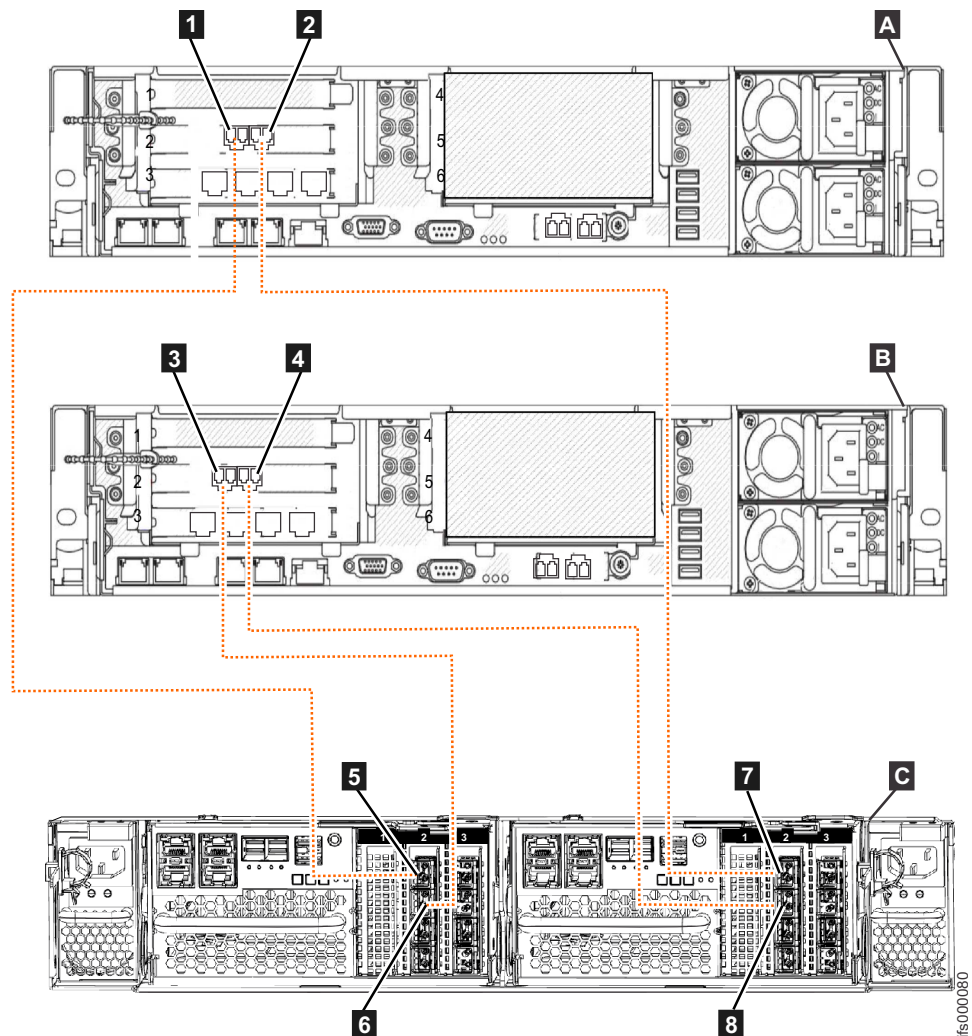
Figure 56. Connecting the file modules to a Storwize V7000 Gen2 control enclosure that has a Fibre Channel interface adapter in PCI slot 2 of each node canister

- **A** File module 1
- **B** File module 2
- **C** Storwize V7000 Gen2 control enclosure (2076-524)
- **1** File module 1 - Fibre Channel port 1
- **2** File module 1 - Fibre Channel port 2
- **3** File module 2 - Fibre Channel port 1
- **4** File module 2 - Fibre Channel port 2
- **5** Node canister 1 (left) - Fibre Channel port 1
- **6** Node canister 1 (left) - Fibre Channel port 2
- **7** Node canister 2 (right) - Fibre Channel port 1
- **8** Node canister 2 (right) - Fibre Channel port 2

Note: If you want this control enclosure to communicate with other Storwize V7000 control enclosures, storage controllers, Storwize V7000 Unified or block hosts, then connect the Fibre cables from your Fibre Channel switch to the

remaining node canisters Fibre Channel ports 3 and 4 (or 3 - 8 if the second Fibre Channel interface adapter is fitted in PCI slot 3).

Fibre Channel switch connected file modules:

Note: The small form-factor pluggable (SFP) transceivers connected to the Fibre Channel switches must support data transfer speeds of 8 Gbps. Otherwise, the system shows a yellow health status indicating that the connection between the file modules and the Storwize V7000 control enclosures is of 4 Gbps instead of the required 8 Gbps.

If you are using Fibre Channel switches for connecting the Fibre Channel ports on the file modules to the Fibre Channel ports of the control enclosures, only the following configuration is supported. Any deviation from this configuration results in a cabling error.

Table 48. Supported configuration for Fibre Channel switch connected file modules

Control enclosure ports	Remote ports
Node canister 1 - Fibre Channel port 1	Fibre Channel switch port to file module 1, Fibre Channel port 1 and any zoned Fibre Channel port
Node canister 1 - Fibre Channel port 2	Fibre Channel switch port to file module 2, Fibre Channel port 1 and any zoned Fibre Channel port
Node canister 1 - Fibre Channel port 3	Fibre Channel switch port to any zoned Fibre Channel ports
Node canister 1 - Fibre Channel port 4	Fibre Channel switch port to any zoned Fibre Channel ports
Node canister 2 - Fibre Channel port 1	Fibre Channel switch port to file module 1, Fibre Channel port 2 and any zoned Fibre Channel port
Node canister 2 - Fibre Channel port 2	Fibre Channel switch port to file module 2, Fibre Channel port 2 and any zoned Fibre Channel port
Node canister 2 - Fibre Channel port 3	Fibre Channel switch port to any zoned Fibre Channel ports
Node canister 2 - Fibre Channel port 4	Fibre Channel switch port to any zoned Fibre Channel ports

Connect the 4 file module power cords

About this task

Control enclosure:

Two power supply units are located in each enclosure. Ensure that the power switches for the control enclosure and expansion enclosures power supply unit are switched off.

Note: Each power supply unit comes with an attached cable retention bracket that fastens around the power cord to prevent the cord from being removed accidentally.
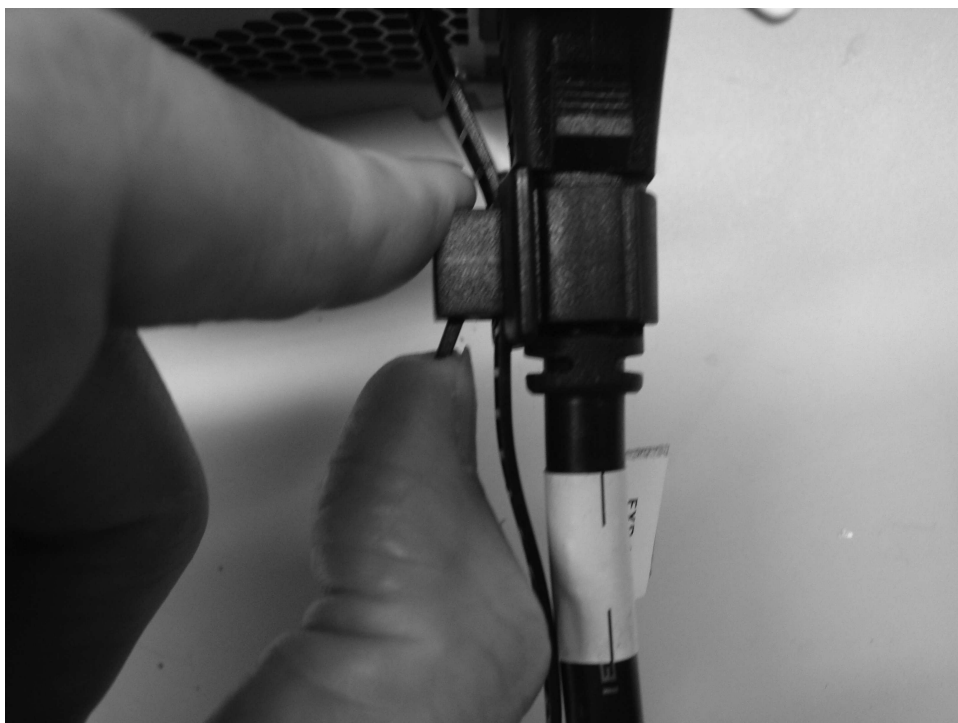
Perform the following steps when you attach the power cord to each power supply unit:

1. Straighten the cable tie on the cable retention bracket. The cable retention bracket is attached to the power supply unit.
2. Open the cable retention bracket.

Figure 57. Unlocking the cable retention bracket

3. Slide the cable retention bracket away from the power supply unit until there is enough room to attach the cable retention bracket to the cable. When sliding the bracket away from the cable plug-in, pull the lever on the bracket that controls the cable tie slightly towards the center of the canister. You do not need to pull the lever to slide the bracket towards the cable plug-in.
4. Attach a power cord to each of the two power supply units in each enclosure. Ensure that cables are installed in an orderly way to reduce the risk of cable damage when replaceable units are removed or inserted.
5. Place the cable retention bracket around the end of the cable that plugs into the power supply unit.
6. Slide the cable retention bracket along the cord until it fits snugly against the plug end of the cable.

Figure 58. Sliding the cable retention bracket directly behind the power cord

7. Tighten the fastener around the plug.
8. Repeat the steps for each additional power cord.
9. Plug the power cords into a properly grounded electrical outlet. To provide power failure redundancy, plug the power cords for the individual power supply units for each enclosure and file module into separate power distribution units, if possible.

File modules:

Perform the following steps when you attach the power cord to each power supply unit:

1. Connect two power cords from a file module rack power supply. Plugging them into separate Power Distribution Units (PDUs) is recommended for redundancy. Route the power cords through the Cable Management Arms.
2. Repeat the previous step for the other file module.
3. Secure any excess cable length using the cable retention features of the rack.

Power on the file modules

Wait for the blue identify LED to start flashing on each file module.

About this task

Follow the procedures below for powering on the expansion enclosures and control enclosure, if they are not already on, then follow the procedure to power on the file modules.

Attention: Do not operate the system when the drive assemblies are missing. Drive assemblies that are missing disrupt the airflow; the drives do not receive sufficient cooling. You must insert blank carriers into unused drive bays.

Powering on an expansion enclosure:

1. Power on the enclosures if they are not already on. Use the power switch on each of the two power supply units in the back of the expansion enclosure.

2. Use the information in Table 50 on page 102 to verify the state of the light emitting diodes (LEDs) on the system. Verify that no faults are detected. See the *Storwize V7000 Unified Problem Determination Guide* book or PDF on the CD, Information Center, or refer to the Troubleshooting section of the Storwize V7000 Unified Information center if problems are encountered.

Both Figure 59 andFigure 60 show the location of the LEDs on the power supply units, located at the front of the expansion enclosure.Figure 61 on page 102 shows the location of the LEDs on the power supply units, located at the rear of the expansion enclosure. The LEDs are located at position **1** .

Figure 59. 24 drives and two end caps
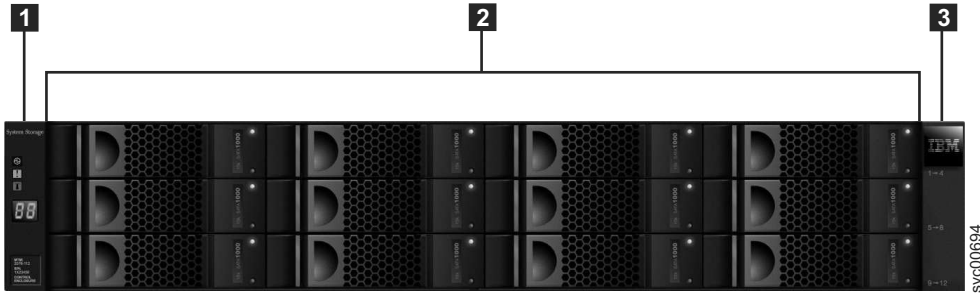
Figure 60. Storwize V7000 Gen1 12 drives and two end caps

Table 49. LED status front of control enclosure or expansion enclosure. Refers to item [1] in the figures above.

Hardware component	LED name and symbol	If power on and no fault is detected
Left enclosure end cap, front of enclosure	Power, top ⊘	LED is on.
	Fault, middle !	LED is off.
	Identify, bottom 📡	LED is off.

Figure 61. LEDs on the power supply units of the expansion enclosure

Table 50. LED status rear of expansion enclosure.

Hardware component	LED name and symbol	If power on and no fault is detected
Expansion canister, rear. The reference to the top and bottom locations applies to canister 1, which is the upper canister. The LED locations are inverted for canister 2, which is the lower canister.	Canister status, top ⩘	LED is on.
	Fault status, bottom ❗	LED is off.
	SAS ports	When a SAS port is functioning correctly, all four green LEDs above the port are on. If no cable is plugged into the port, or if the canister at either end of the cable is not yet fully started, the LEDs are not on.
Power supply unit, expansion enclosure. The reference to the left and right locations applies to power supply unit 1, which is the left power supply. The LED locations are inverted for power supply unit 2, which is the right power supply.	Power supply, upper right ⏻	LED is on.
	Fan failure ❁	LED is off.
	dc power failure ⚏	LED is off.
	ac power failure ∿	LED is off.

Powering on a control enclosure:

1. Power on the control enclosure, if it is not already powered on and configured. Use the power switch on each of the two power supply units, located in the back of the enclosure.
2. Use Table 51 to verify the state of the LEDs on the system. Verify that no faults are detected.

Figure 62 shows the location of the LEDs on the power supply units in the rear of the control enclosure.
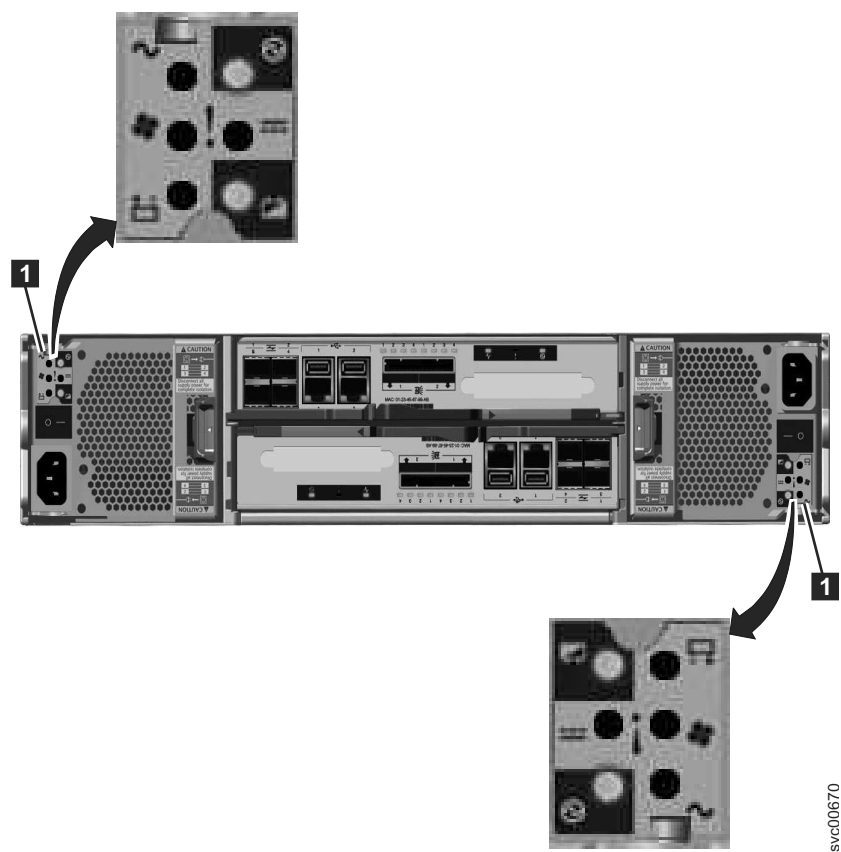

Figure 62. LEDs on the power supply units of the control enclosure

Table 51. LED status when control enclosure is powered on

Hardware component	LED name	If power on and no fault is detected
Left enclosure end cap, front of enclosure	Power, top ⊘	LED is on.
	Fault, middle ❗	LED is off.
	Identify, bottom 📡	LED is off.

Table 51. LED status when control enclosure is powered on (continued)

Hardware component	LED name	If power on and no fault is detected
Node canister, rear. The reference to the top and bottom locations applies to canister 1, which is the upper canister. The LED locations are inverted for canister 2, which is the lower canister.	Fibre Channel port	If the Fibre Channel port is used: One or more LEDs are on or flashing per port. The LEDs are located between the Fibre Channel ports. The arrow-shaped LEDs point toward the affected port.
	Ethernet port, if used	One or more LEDs are on per port.
	SAS ports	When a SAS port is functioning correctly, all four green LEDs above the port are on. If no cable is plugged into the port, or if the canister at either end of the cable is not yet fully started, the LEDs are not on.
	System status, left $\sqrt{}$	LED is flashing or on. The status is on if the node canister is an active member of a clustered system. The LED is flashing if the node canister is in service or candidate state. If the LED is off, the node canister might still be booting up. Wait up to 5 minutes for the node canister to complete booting up.
	Fault status, middle !	LED is off.
	Power status, right ⊘	LED is on.
Power supply unit, control enclosure. The reference to the left and right locations applies to power supply unit 1, which is the left power supply. The LED locations are inverted for power supply unit 2, which is the right power supply.	Power supply, upper right ①	LED is on.
	ac power failure ∿	LED is off.
	dc power failure ☰	LED is off.
	Fan failure ❁	LED is off.
	Battery failure ⊡	LED is off
	Battery good, lower right ⊿	LED is on or flashing.

Attention: Do not go to the next section until the LEDs are in the required states. If any error lights are displayed, see the *Storwize V7000 Unified Problem Determination Guide* documentation CD for more information about light path issues.

File module power features:

When the file module is connected to a power source but is not turned on, the operating system does not run, and all core logic except for the integrated management module is shut down. However, the file module can respond to requests from the integrated management module, such as a remote request to turn on the file module. The power-on LED flashes to indicate that the file module is connected to power but is not turned on. The power on LED is found in the front of the file module.

Powering on the file module

Approximately 3 minutes after the file module is connected to power, the power-control button becomes active. Also, one or more fans might start running to provide cooling while the file module is connected to power. You can turn on the file module and start the operating system by pressing and releasing the power on button. The power on button is located at the front of the file module.

Turning off the file module

When you turn off the file module and leave it connected to power, the file module can respond to requests from the integrated management module. For example, it can respond to a remote request to turn on the file module. While the file module remains connected to power, one or more fans might continue to run. To remove all power from the file module, you must disconnect it from the power source.

Important: To view the error LEDs on the system board, leave the file module connected to a power source.

The operating systems requires an orderly shutdown before you turn off the file module. If you have a problem powering off the system, refer to Administering > Turning on and turning off the system > Turning off the system, located in the Storwize V7000 Unified Information Center (http://publib.boulder.ibm.com/infocenter/storwize/unified_ic/index.jsp).

CAUTION:
The power-control button on the device does not turn off the electrical current supplied to the device. The device might also have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals. (C031)

Press and release the power on button to start an orderly shutdown of the operating system and turn off the file module, if your operating system supports this feature.

Attention: If you have a problem powering off the system, refer to Administering > Turning on and turning off the system > Turning off the system, located in the Storwize V7000 Unified Information Center (http://publib.boulder.ibm.com/infocenter/storwize/unified_ic/index.jsp).

The Type will change from Unknown to NAS after initial setup of the file modules is complete.

Check the system

For each node canister, check that Fibre Channel port 1 can see one file module and that it is different from the one seen on Fibre Channel port 2

About this task

The update to NAS checker utility (up2nas) checks this for you.

To check the Fibre Channel connects for each node canister:
- Select Settings > Network > Fibre Channel panel of the Storwize V7000 management GUI.
- From **View connectivity for:** , choose Nodes from the dropdown menu, and then the node (such as node1) from the second dropdown menu
- Select **Show Results**
- Local Port 1 should have only 1 line in results table.
- Local Port 2 should have only 1 line in results table.
- These lines should have Type = Unknown
- The same file module is connected to both ports of a node canister, if the remote WWPN connected to local port 1 is one away from the remote WWPN connected to local port 2, on both node canister in IO group 0.

Chapter 6. Start adding the file modules

This document helps you set up your file modules for the first time.

About this task

Before you begin, make sure that you have completed the tasks in Chapter 3, "Before you begin adding file modules," on page 41 and Chapter 4, "Preparing for installation," on page 69. This section guides you through setting up your file modules for the first time.

You should have already installed the latest version of the update to NAS checker utility (up2nas) on the Storwize V7000 and run it as part of working through the Chapter 3, "Before you begin adding file modules," on page 41 section of this guide. Run up2nas again to start the initial setup of the file modules. You must provide the management IP addresses that the file modules will use and the USB flash drive that came in the documentation pack with the file module shipment.

Begin by running up2nas again on the Storwize V7000 system CLI:
- up2nas checks that the Storwize V7000 is in a good state for file modules to be added.
- up2nas asks you for the new management IP addresses which it checks.
- up2nas asks you to put the USB flash drive into the Storwize V7000 control enclosure on which up2nas is running so that it can put the files onto it which starts the initial setup of the file modules.
- You are instructed to insert the USB flash drive into the upper file module so that it becomes node 1. The configuration files put onto it by the control enclosure are used to setup the management communication paths in the Storwize V7000 Unified system.
- You are instructed to wait for the blue identify indicator on each file module to go out or to start blinking again. This should only take a few minutes but it can take more than one hour if the Storwize V7000 Unified software level is later than 1.3.2.
- You will be instructed to put the USB flash drive into a Windows PC and run the initialization tool executable program on it.
- If this part of the initial setup of the file modules has completed successfully then the initialization tool provides a link to the management GUI where the progress to completion of the initial setup can be seen.
- If there was a problem with this part of the initial setup of the file modules then the initialization tool provides the error code and links you to the Information Centre page that helps you to troubleshoot the problem.
- If you cannot run InitTool.exe then look for Output Result in the SONAS_result.txt file on the USB flash drive.
- If the initial setup does not complete successfully then the management GUI provides the error code and links you to the Information Center page that helps you to troubleshoot the problem.

Chapter 7. Problems with initial setup

This topic helps you to solve initial setup problems.

About this task

If USB flash drive is missing or faulty:
- Contact the IBM Support Center.
- Install the latest InitTool.exe (or reinstall if tool is not launching). Go to http://www-933.ibm.com/support/fixcentral/options and select the following options to locate the tool. The options are listed under the **Select product** tab, at the bottom of the page:
    - Product Group: **Storage Systems**
    - Product Family: **Disk Systems**
    - Product: **IBM Storwize V7000 Unified**
    - Release: **All**
    - Platform: **All**

Before loading the USB flash drive verify it has a FAT32 formatted file system. Plug the USB flash drive into the laptop. Go to Start (my computer), right-click the USB drive. The general tab next to File system should say FAT32.
- If the USB flash drive is not formatted as FAT32, format it. To format, right-click it, select format, under filesystem. Select FAT32 and then click Start. Continue as prompted.

InitTool.exe is not loaded on the USB flash drive or fails to launch:
- Install the latest InitTool.exe (or reinstall if tool is not launching). Go to http://www-933.ibm.com/support/fixcentral/options and select the following options to locate the tool. The options are listed under the **Select product** tab, at the bottom of the page:
    - Product Group: **Storage Systems**
    - Product Family: **Disk Systems**
    - Product: **IBM Storwize V7000 Unified**
    - Release: **All**
    - Platform: **All**

Amber LED on node canister does not stop flashing during install:

Allow at least 15 minutes for the LED to stop flashing. If flashing continues beyond 15 minutes, remove the USB flash drive and insert in your laptop. Navigate to the satask_results.html file and scan for errors and follow the service action recommendation. Take that action and retry installation.

An error is posted in the satask_results html:

Take the recommended service action given by **sainfo lsservicerecommendation** in the satask_results html file, reboot the node, and restart the initial setup procedure.

If satask_results.html contains node error code 835 or node error code 550 then this can indicate that the node canisters were not able to communicate with each other at some time during the creation of the block cluster. This can occur because the PCIe link between the node canisters is temporarily broken when the nodes are restarted, as part of the create cluster process. This can generate node error codes 835 and 550. These are transitional errors that can be ignored if the nodes are now in active state with no errors. Follow this procedure to check that the errors are gone, using the USB flash drive:

- Save a copy of satask.txt and satask_results.html.
- Make sure that there is no satask.txt file on the USB flash drive before you plug it into the control enclosure. Plug the USB flash drive into the control enclosure. The orange fault light should go on for a short time only (such as a slow blink for a few seconds). Wait for the orange fault light to go out then unplug the USB flash drive and plug it into another computer so that you can look at the contents of the satask_results.html file on the USB flash drive. The satask_results.html will contain the output from a number of sainfo commands.
- Check the following:
  - The cluster_status under **sainfo lsservicenodes** should be Active.
  - The node_status should be Active   for both node canisters in the cluster under **sainfo lsservicenodes**. Otherwise, follow the service action under sainfo lsservicerecommendation.
  - There should be nothing in the error_data column against each node under sainfo lsservicenodes. Otherwise, follow the service action under s**ainfo lsservicerecommendation**.

This is an example of what the satask_results.html can contain on a healthy storage system, with which you can compare your results:

```
Service Command Results
Thu Apr 19 08:23:42 UTC 2012
satask.txt file not found.

System Status

sainfo lsservicenodes
  panel_name  cluster_id        cluster_name          node_id node_name relation node_status
error_data
  01-1        00000200A4E008BA Cluster_9.71.18.184   1       node1     local    Active
  01-2        00000200A4E008BA Cluster_9.71.18.184   2       node2     partner  Active
sainfo lsservicestatus
 panel_name 01-1
 cluster_id 00000200a4e008ba
 cluster_name Cluster_9.71.18.184
 cluster_status Active
 cluster_ip_count 2
 cluster_port 1
 cluster_ip 9.71.18.184
 cluster_gw 9.71.18.1
 cluster_mask 255.255.255.0
 ...
 ...
sainfo lsservicerecommendation
 service_action
 No service action required, use console to manage node.
```

Blue LED on file module, where the USB flash drive was inserted, keeps flashing (does not turn solid as stated in the instructions):

- Allow 5 minutes at least, remove the USB flash drive, insert it into your laptop. Verify that the InitTool set up information is correct, navigate to the

SONAS_results.txt file, and open it. Check for errors and corrective actions. Refer to *Storwize V7000 Unified Problem Determination Guide* PDF on the CD.
- If no errors are listed, reboot the server (allow server to start), reinsert the USB flash drive, and try again.

Blue LED on the other file module (without USB flash drive) keeps flashing (does not turn solid or off as listed in instructions):

Wait for the primary file module to start flashing, remove the USB flash drive, insert it into you laptop, verify the InitTool set up information is correct , navigate to the SONAS_results.txt file and open it. Check for errors and corrective actions (refer to *Storwize V7000 Unified Problem Determination Guide* PDF on the CD). If no errors are listed, reboot both file modules, allow file modules to boot completely, reinsert the USB flash drive as originally instructed and try again.

Installed with the incorrect control enclosure or file module IP addresses:

If it is determined that the addresses were entered incorrectly, they can be changed at the command line as user **admin** with the following commands:
- For control enclosure IP changes use: `svctask chsystemip`
- For file module management node changes use: `chnwmgt`

Refer to the man pages for usage.

The file module initialization may have failed because of a duplicate IP address:

The control enclosure may have been set up with an IP address which is already in use by another machine on your network but the initial setup of the file modules has failed. Refer to Checking that IP addresses are not already in use from the Information Center, under the Installing topic.

Chapter 8. Using the initial configuration wizard

About this task

Use the management GUI to complete the initial configuration of your Storwize V7000 Unified system

What to do next

You will only be able to access the management GUI after the USB flash drive part of the initial setup has completed successfully. If you log on to the management GUI before the initial setup of the system has completed, then you will see an indication of the progress towards completion of initial setup. If you log on to the management GUI for the first time after the initial setup of the system has completed, then you will be shown the licence agreement. Proceed as follows:

1. Accept the license agreement.

2. Complete the system attributes as required. Refer to Table 37 on page 57. Select **Next**.

3. At the **System License** window, leave the values at **0** if you are not using this feature. For more information about external virtualization go to www.ibm.com/storage/support/storwize/v7000. In the **Search support** box enter **external virtualization**.

4. If multiple entries from the **Domain Name Service (DNS)** are needed, enter one address then hit the **+** (plus) to add more.

5. Review the hardware image and verify that it reflects your configuration. Refer to the on-screen instructions and take the recommended actions if necessary.

   Note: Depending on your file module and storage enclosure placement in the frame, the rack locations may not match.

6. You can ignore error messages about not having enough drives to configure storage because all of the drives in the storage enclosures may already be members of RAID arrays.

7. You will be able to decide if you want to configure the following now or wait until later:

   - NAS services

   - Support

   Not configuring the NAS services now, allows you to re-configure network link bonding and the maximum Ethernet packet size by using CLI commands, without needing to suspend network access for the changes to take effect. Refer to Chapter 10, "Next steps," on page 119 for how to change the bonding. Note that the appropriate configuration wizard automatically opens if you attempt to set up a feature that requires a configuration that has not been completed.

8. If you configure NAS services, then at the Public Networks window select the **New Network** button to add one or more public network addresses. Refer to Table 37 on page 57 for information to set up the public network information.

   - The Subnet is entered as the subnet address followed by the CIDR equivalent of the subnet mask (for example 9.11.100.100/32).

- The Interface drop down menu specifies the network interface (for example, ethX1) to use for attaching the network. It is important to make a selection. If you leave the selection as **Not Attached** you are unable to attach new public addresses to the network

Chapter 9. Post configuration of the Storwize V7000 Unified system

Perform these tasks after the initial configuration of the Storwize V7000 Unified system.

About this task

Management GUI and CLI:

You should stop using the Storwize V7000 management GUI and CLI. Everything you need to do should now be covered by the Storwize V7000 Unified management GUI and CLI which are accessed through the management IP address of the system.

What was known as the management IP address of the Storwize V7000 is usually refereed to as the system IP address of the storage system now that it is part of a Storwize V7000 Unified system.

Information Center:

You should stop using the Information Center and any hard copy Guides for the Storwize V7000 system. From now on use the Information Center for the Storwize V7000 Unified system.

http://pic.dhe.ibm.com/infocenter/storwize/unified_ic/index.jsp

The Information Center includes some helpful e-learning modules to help you become familiar with the Storwize V7000 Unified system.

System health check:

The management GUI will have checked the system health before it completed. There is also a health indicator in the bottom right of each panel of the management GUI.

Root access:

It is best practice to change the root password for the file modules and store it in a place that only those with a need to know will be able to access it. You or IBM support may need this root password for use in some problem determination and recovery procedures.

Administrative users:

If you had created any user IDs on the V7000 for administration of the system then you may now create similar administrative User IDs on the Storwize V7000 Unified management GUI (management GUI).

Update the Storwize V7000 Unified software

About this task

Use the management GUI to install the latest Storwize V7000 Unified software.

Select **Settings** and then **System** from the management GUI. From the **System** menu, select **Update**. This page will help you to search for updates, get updates, and install an update.

Root access:

It is best practice to change the root password for the file modules and store it in a place that only those with a need to know will be able to access it. You or IBM support may need this root password for use in some problem determination and recovery procedures.

Administrative users:

If you had created any user IDs on the Storwize V7000 for administration of the system then you may now create similar administrative User IDs on the Storwize V7000 Unified management GUI (management GUI).

Refer to Managing administrative users.

Enable IBM Tivoli Assist On-Site (AOS)

About this task

IBM Tivoli® Assist On-Site (AOS) is a lightweight remote support program intended primarily for help desks and support engineers to diagnose and fix problems without the need of any external dependencies. Assist On-Site is based on the IBM Tivoli Remote Control technology.

Assist On-Site has been developed specifically to meet functionality, security, and privacy requirements of IBM and IBM customers. Support engineers and their customers can run it on various platforms. It currently has a native version for the 32 bit Windows environment and generic Linux compatible operating systems. Assist On-Site uses IBM AES MARS encryption, NTLM authentication, and IBM intranet authentication for IBM support engineers. Assist On-Site can also support lightweight Rational® Host Access Transformation Services emulator sessions for computers running z/OS® and IBM i.

Assist On-Site provides a launch-in-context feature such that support engineers can start Assist On-Site from within the session of the third-party support tool. For restricted use only, Assist On-Site supports IBM diagnostic tools to function over the Assist On-Site connection for the purpose of debugging hardware devices and IBM software.

The AOS feature is disabled by default To enable it, do the following:
1. From the Storwize V7000 Unified GUI, select **Support**, under **Setting** icon.
2. Click the **AOS** tab.
3. Click the **Edit** button at the bottom.
4. Click **Enable Assist on Site (AOS)**.

5. Select either **Lights On** or **Lights Out**. For Storwize V7000 Unified it is recommend to select **Lights Out**. **Lights On** establishes a connection through the local console of the system and thus requires the specific file module to have a keyboard, mouse, and monitor attached for local access and connectivity. **Lights Out** allows for remote support connection to be accepted automatically by the system.

6. Enter any proxy settings if required for AOS.

   Note: Establishment of an AOS connection requires access to ports 80, 443, and 8200. The AOS connection provides the ability to make direct outgoing TCP connections, availability of a SOCKS server, or an HTTP proxy.

7. Click on **OK** to complete this procedure.

Registering for My Notification

IBM periodically issues updates to products, which help improve overall quality and reliability, through My Notifications.

About this task

Register for My Notifications to establish quick links to important information and to receive daily or weekly notifications of the following product specific information:

- Downloads and drivers
- Flashes
- Forums/discussion groups
- Problem solving information
- Product information and publications

Procedure

To register for My Notifications:

1. Establish an IBM ID and password at https://www.ibm.com/account/myibm/profile.do?cc=us&lc=en&page=reg.
2. Then go to https://www.ibm.com/support/mynotifications to set up your notification preferences.

Chapter 10. Next steps

After you have completed the initial setup and initial configuration of your system here are some pointers to the next configuration steps.

Pointers to the configuration tasks that you may want to do next

- If you wish to change the bonding of the public network ports on the file modules, for example to change the bond mode to 4. It is best to do this before defining the public IP addresses, so that you do not have to detach and reattach the Public networks (ethX0 and ethX1). Thus, client computers will not lose access to files because access has not, yet, been configured. In addition, it is also convenient to increase the maximum Ethernet packet size at the same time. Refer to Changing a bond network interface on a file module, located in the Information Center, for information on changing network bonding.
- If you have connected the second 1 Gbps Ethernet port on each node canister in each control enclosure to your network then you can configure it with the secondary system IP address to give a redundant path for the active management node running on a file module to ssh block storage CLI commands to the main configuration node running on one of the node canisters in one of the control enclosures. Refer to Ethernet connectivity from file modules to the control enclosure, located in the Information Center, for examples of using the **chsystemip** and **chstoragesystem** CLI commands.
- Investigate the Suggested tasks by selecting the **Suggested Tasks** button in the **Home > Overview** panel of the management GUI. For example you can set up the service IP addresses for the node canisters in the control enclosures and you can set up event notifications if you skipped that during initial configuration.
- The Storwize V7000 control enclosure has the ability send an inventory information email to IBM at regular intervals. Refer to Setting up email event notifications and inventory reports using the CLI for how to set up inventory reporting. This topic is listed in the Information Center.
- For other configuration tasks refer to the Configuring section of the Information Center.
- For other administration tasks refer to the Administering section of the Information Center.

Schedule a periodic backup of the TDB:

The Trivial DataBase (TDB) is used to store various types of information used to manage the system. It is recommended that you set up a periodic backup of the TDB, so backups are available to support personnel, in the event a TDB becomes lost or corrupted.

1. ssh to the file module management IP address (refer to Table 36 on page 54). Log in with user ID **admin** and password **admin001**.
2. Type **mktask BackupTDB --minute 0 --hour 2 --dayOfWeek "*"**

   Note: If you are prompted with following message, the management service is probably not up from the reboot. Wait a few minutes and try again:

   ```
   IBM SONAS management service is stopped
   EFSSG0026I Cannot execute commands because Management Service is stopped.
   Use startmgtsrv to restart the service
   ```

The previous command schedules a backup of the Trivial DataBase at 2:00 a.m.
every day. If you want to schedule the backup at a different time, change the
number following the hour parameter. The 2 in the command can range from 0
(midnight) to 23 (11 p.m.).

3. Press **Enter**.
4. Exit the ssh session.

Appendix. Accessibility features for IBM Storwize V7000 Unified

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

Accessibility features

These are the major accessibility features for the Storwize V7000 Unified:

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. HTML documents have been tested using JAWS version 15.0.
- This product uses standard Windows navigation keys.
- Interfaces are commonly used by screen readers.
- Keys are discernible by touch, but do not activate just by touching them.
- Industry-standard devices, ports, and connectors.
- You can attach alternative input and output devices.

The Storwize V7000 Unified online documentation and its related publications are accessibility-enabled. The accessibility features of the online documentation are described in Viewing information in the information center .

Keyboard navigation

You can use keys or key combinations to perform operations and initiate menu actions that can also be done through mouse actions. You can navigate the Storwize V7000 Unified online documentation from the keyboard by using the shortcut keys for your browser or screen-reader software. See your browser or screen-reader software Help for a list of shortcut keys that it supports.

IBM and accessibility

See the IBM Human Ability and Accessibility Center for more information about the commitment that IBM has to accessibility.

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Germany Electromagnetic Compatibility Directive

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taiemi

Taiwan Contact Information

This topic contains the product service contact information for Taiwan.

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VCCI-A

Japan Electronics and Information Technology Industries Association Statement

This statement explains the Japan JIS C 61000-3-2 product wattage compliance.

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