IBM Elastic Storage System 3500
6.1.5

Hardware Planning and Installation Guide

SC28-3427-01

Note

Before using this guide and the product it supports, read the information in Chapter 1, “Notices,” on page 1.

This edition applies to Version 6 release 1 modification 5 of the following product and to all subsequent releases and modifications until otherwise indicated in new editions:

- IBM Spectrum® Scale Data Management Edition for IBM ESS (product number 5765-DME)
- IBM Spectrum Scale Data Access Edition for IBM ESS (product number 5765-DAE)

IBM welcomes your comments; see the topic “How to submit your comments” on page xvi. When you send information to IBM, you grant IBM a nonexclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

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About this information

Who should read this information

This information is intended for administrators of IBM Elastic Storage® System (ESS) that includes IBM Spectrum Scale RAID.

IBM Elastic Storage System information units

Related information

Related information

For information about:

- IBM Spectrum Scale, see IBM Documentation.
- mmvdisk command, see mmvdisk documentation.
- Mellanox OFED (MLNX_OFED_LINUX-4.9-5.1.0.2) Release Notes, go to https://docs.nvidia.com/networking/display/MLNXOFEDv494170/MLNX_OFED+Documentation+Rev+4.9-4.1.7.0+LTS.
- Mellanox OFED (MLNX_OFED_LINUX-5.7-1.0.2.1) Release Notes, go to https://docs.nvidia.com/networking/spaces/viewspace.action?key=MLNXOFEDv571020. (The Mellanox OFED 5.7.x is shipped with ESS 6.1.5.)
- IBM Elastic Storage System, see IBM Documentation.
- IBM Spectrum Scale call home, see Understanding call home.
- Installing IBM Spectrum Scale and CES protocols with the installation toolkit, see Installing IBM Spectrum Scale on Linux® nodes with the installation toolkit.
- Detailed information about the IBM Spectrum Scale installation toolkit, see Using the installation toolkit to perform installation tasks: Explanations and examples.
- CES HDFS, see Adding CES HDFS nodes into the centralized file system.
- Installation toolkit ESS support, see ESS awareness with the installation toolkit.
- IBM POWER8® servers, see https://www.ibm.com/docs/en/power-sys-solutions/0008-ESS?topic=P8ESS/p8hdx/5148_22l_landing.htm.
- IBM POWER9™ servers, see https://www.ibm.com/docs/en/ess/6.1.2_ent?topic=guide-5105-22e-reference-information.

For the latest support information about IBM Spectrum Scale RAID, see the IBM Spectrum Scale RAID FAQ in IBM Documentation.

Conventions used in this information

Table 1 on page xvi describes the typographic conventions used in this information. UNIX file name conventions are used throughout this information.

Table 1. Conventions

Convention	Usage
bold	Bold words or characters represent system elements that you must use literally, such as commands, flags, values, and selected menu options. Depending on the context, **bold** typeface sometimes represents path names, directories, or file names.
bold underlined	bold underlined keywords are defaults. These take effect if you do not specify a different keyword.
constant width	Examples and information that the system displays appear in constant-width typeface. Depending on the context, constant-width typeface sometimes represents path names, directories, or file names.
italic	*Italic* words or characters represent variable values that you must supply. *Italics* are also used for information unit titles, for the first use of a glossary term, and for general emphasis in text.
<*key*>	Angle brackets (less-than and greater-than) enclose the name of a key on the keyboard. For example, <Enter> refers to the key on your terminal or workstation that is labeled with the word *Enter*.

****	In command examples, a backslash indicates that the command or coding example continues on the next line. For example:
	`mkcondition -r IBM.FileSystem -e "PercentTotUsed > 90" \`
	`-E "PercentTotUsed < 85" -m p "FileSystem space used"`

{*item*}	Braces enclose a list from which you must choose an item in format and syntax descriptions.
[*item*]	Brackets enclose optional items in format and syntax descriptions.
<Ctrl-*x*>	The notation <Ctrl-*x*> indicates a control character sequence. For example, <Ctrl-c> means that you hold down the control key while pressing <c>.
***item*...**	Ellipses indicate that you can repeat the preceding item one or more times.
|	In *synopsis* statements, vertical lines separate a list of choices. In other words, a vertical line means *Or*. In the left margin of the document, vertical lines indicate technical changes to the information.

How to submit your comments

To contact the IBM Spectrum Scale development organization, send your comments to the following email address:

scale@us.ibm.com

Chapter 1. Notices

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Homologation statement

This product is not intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks, neither to be used in a Public Service Network. Further certification might be required by law prior to making any such connection. Contact an IBM representative or reseller for any questions.

Safety and environmental notices

Review all safety notices, environmental notices, and electronic emission notices 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.

To find the translated text for a caution or danger notice, complete the following steps.

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

   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)
2. Locate the *IBM Systems Safety Notices* with the user publications that were provided with your system hardware.
3. Find the matching identification number in the *IBM Systems Safety Notices*. Then, review the topics about the safety notices to ensure that you are in compliance.
4. (Optional) Read the multilingual safety instructions on the system website.
   a. Go to www.ibm.com/support
   b. Search for " IBM Elastic Storage System 3500 "
   c. Click the documentation link.

Safety notices and labels

Review the safety notices and safety information labels before you use 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.

Danger notices for the system

Ensure that you are familiar with the danger notices for your system.

Use the reference numbers in parentheses at the end of each notice (for example, D005) 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 the 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. For AC power, disconnect all power cords from their AC power source. For racks with a DC power distribution panel (PDP), disconnect the customer's DC power source to the PDP.
- When connecting power to the product ensure all power cables are properly connected. For racks with AC power, 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. For racks with a DC power distribution panel (PDP), connect the customer’s DC power source to the PDP. Ensure that the proper polarity is used when attaching the DC power and DC power return wiring.

- 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.
- Do not attempt to switch on power to the machine until all possible unsafe conditions are corrected.
- When performing a machine inspection: Assume that an electrical safety hazard is present. Perform all continuity, grounding, and power checks specified during the subsystem installation procedures to ensure that the machine meets safety requirements. Do not attempt to switch power to the machine until all possible unsafe conditions are corrected. Before you open the device covers, unless instructed otherwise in the installation and configuration procedures: Disconnect the attached AC power cords, turn off the applicable circuit breakers located in the rack power distribution panel (PDP), and disconnect any telecommunications systems, networks, and modems.
- 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. For AC power, remove the power cords from the outlets.
  3. For racks with a DC power distribution panel (PDP), turn off the circuit breakers located in the PDP and remove the power from the Customer's DC power source.
  4. Remove the signal cables from the connectors.
  5. 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. For AC power, attach the power cords to the outlets.
  5. For racks with a DC power distribution panel (PDP), restore the power from the Customer's DC power source and turn on the circuit breakers located in the PDP.
  6. 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: Serious injury or death can occur if loaded lift tool falls over or if a heavy load falls off the lift tool. Always completely lower the lift tool load plate and properly secure the load on the lift tool before moving or using the lift tool to lift or move an object. (D010)

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)

Caution notices for the system

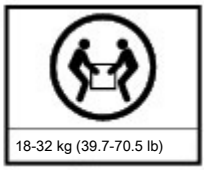
Ensure that you understand the caution notices for the system.

Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM Systems Safety Notices*.

CAUTION:

or

or



The weight of this part or unit is more than 29.3 kg (64.7 lb). It takes two persons to safely lift this part or unit.

CAUTION: To avoid personal injury, before lifting this unit, remove all appropriate subassemblies per instructions to reduce the system weight. (C012)

CAUTION: CAUTION regarding IBM provided VENDOR LIFT TOOL:

- Operation of LIFT TOOL by authorized personnel only
- LIFT TOOL intended for use to assist, lift, install, remove units (load) up into rack elevations. It is not to be used loaded transporting over major ramps nor as a replacement for such designated tools like pallet jacks, walkies, fork trucks and such related relocation practices. When this is not practicable, specially trained persons or services must be used (for instance, riggers or movers). Read and completely understand the contents of LIFT TOOL operator's manual before using.
- Read and completely understand the contents of LIFT TOOL operator's manual before using. Failure to read, understand, obey safety rules, and follow instructions may result in property damage and/or personal injury. If there are questions, contact the vendor's service and support. Local paper manual must remain with machine in provided storage sleeve area. Latest revision manual available on vendor's website.
- Test verify stabilizer brake function before each use. Do not over-force moving or rolling the LIFT TOOL with stabilizer brake engaged.
- Do not raise, lower or slide platform load shelf unless stabilizer (brake pedal jack) is fully engaged. Keep stabilizer brake engaged when not in use or motion.
- Do not move LIFT TOOL while platform is raised, except for minor positioning.
- Do not exceed rated load capacity. See LOAD CAPACITY CHART regarding maximum loads at center versus edge of extended platform.
- Only raise load if properly centered on platform. Do not place more than 200 lb (91 kg) on edge of sliding platform shelf also considering the load's center of mass/gravity (CoG).
- Do not corner load the platform tilt riser accessory option. Secure platform riser tilt option to main shelf in all four (4x) locations with provided hardware only, prior to use. Load objects are designed to slide on/off smooth platforms without appreciable force, so take care not to push or lean. Keep riser tilt option flat at all times except for final minor adjustment when needed.
- Do not stand under overhanging load.
- Do not use on uneven surface, incline or decline (major ramps).
- Do not stack loads. (C048, part 1 of 2)

- **Do not operate while under the influence of drugs or alcohol.**
- **Do not support ladder against LIFT TOOL.**
- **Tipping hazard. Do not push or lean against load with raised platform.**
- **Do not use as a personnel lifting platform or step. No riders.**
- **Do not stand on any part of lift. Not a step.**
- **Do not climb on mast.**
- **Do not operate a damaged or malfunctioning LIFT TOOL machine.**
- **Crush and pinch point hazard below platform. Only lower load in areas clear of personnel and obstructions. Keep hands and feet clear during operation.**
- **No Forks. Never lift or move bare LIFT TOOL MACHINE with pallet truck, jack or fork lift.**
- **Mast extends higher than platform. Be aware of ceiling height, cable trays, sprinklers, lights, and other overhead objects.**
- **Do not leave LIFT TOOL machine unattended with an elevated load.**
- **Watch and keep hands, fingers, and clothing clear when equipment is in motion.**
- **Turn Winch with hand power only. If winch handle cannot be cranked easily with one hand, it is probably over-loaded. Do not continue to turn winch past top or bottom of platform travel. Excessive unwinding will detach handle and damage cable. Always hold handle when lowering, unwinding. Always assure self that winch is holding load before releasing winch handle.**
- **A winch accident could cause serious injury. Not for moving humans. Make certain clicking sound is heard as the equipment is being raised. Be sure winch is locked in position before releasing handle. Read instruction page before operating this winch. Never allow winch to unwind freely. Freewheeling will cause uneven cable wrapping around winch drum, damage cable, and may cause serious injury. (C048, 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 (compliance ID RACK-001) or 22U (compliance ID RR001) 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 (compliance ID RACK-001) or 22U (compliance ID RR001) level, unless the received configuration specifically allowed it.
- 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 or in an earthquake environment bolt the rack to the floor.
  - 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:

High levels of acoustical noise are (or could be under certain circumstances) present.

Use approved hearing protection and/ or provide mitigation or limit exposure. (L018)

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Special caution and safety notices

This information describes special safety notices that apply to the system. These notices are in addition to the standard safety notices that are supplied; they address specific issues that are relevant to the equipment provided.

General safety

When you service the IBM Elastic Storage System 3500 , 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.

Inspecting the system for unsafe conditions

Use caution when you are working in any potential safety hazardous situation that is not covered in the safety checks. If unsafe conditions are present, determine how serious the hazards are and whether you can continue before you correct the problem.

Before you start the safety inspection, make sure that the power is off, and that the power cord is disconnected.

Each device has the required safety items that are installed to protect users and support personnel from injury. Only those items are addressed.

Important: Good judgment must also be used to identify potential safety hazards due to the attachment of non-IBM features or options that are not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard might be and whether you can continue without first correcting the problem. For example, consider the following conditions and their potential safety hazards:

Electrical hazards (especially primary power)
Primary voltage on the frame can cause serious or lethal electrical shock.

Explosive hazards
A damaged CRT face or a bulging capacitor can cause serious injury.

Mechanical hazards
Loose or missing items (for example, nuts and screws) can cause serious injury.

To inspect each node for unsafe conditions, use the following steps. If necessary, see any suitable safety publications.

1. Turn off the system and disconnect the power cord.
2. Check the frame for damage (loose, broken, or sharp edges).
3. Check the power cables by using the following steps:
   a) Ensure that the third-wire ground connector is in good condition. Use a meter to check that the third-wire ground continuity is 0.1 ohm or less between the external ground pin and the frame ground.
   b) Ensure that the power cord is the appropriate type, as specified in the parts listings.
   c) Ensure that the insulation is not worn or damaged.
4. Check for any obvious nonstandard changes, both inside and outside the unit. Use good judgment about the safety of any such changes.
5. Check inside the node for any obvious unsafe conditions, such as metal particles, contamination, water or other fluids, or marks of overheating, fire, or smoke damage.
6. Check for worn, damaged, or pinched cables.
7. Ensure that the voltage that is specified on the product-information label matches the specified voltage of the electrical power outlet. If necessary, verify the voltage.
8. Inspect the power-supply assemblies and check that the fasteners (screws or rivets) in the cover of the power-supply unit are not removed or disturbed.
9. Check the grounding of the network switch before you connect the system to the storage area network (SAN).
10. Contact technical support if there are any issues.

Checking external devices

Ensure that you complete an external device check before you install or service the system.

To conduct an external device check, complete the following steps:

1. Verify that all external covers are present and are not damaged.
2. Ensure that all latches and hinges are in the correct operating condition.
3. Check for loose or broken feet when the system is not installed in a rack cabinet.
4. Check the power cords for damage.
5. Check the external signal cables for damage.
6. Check the cover for sharp edges, damage, or alterations that expose the internal parts of the device.
7. Check the bottom of the external cover for any loose or broken feet.
8. Contact technical support if there are any issues.

Checking internal devices

Ensure that you complete an internal device check before you install or service your system.

To conduct the internal device check, use the following steps.

1. Check for any non-IBM changes that were made to the device.
2. Check the condition of the inside of the device for any metal or other contaminants, or any indications of water, other fluid, fire, or smoke damage.
3. Check for any obvious mechanical problems, such as loose components.
4. Check any exposed cables and connectors for wear, cracks, or pinching.

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 2 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 system, 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 system 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 the required environmental notices for IBM Systems products in English and other languages.

The *IBM Systems Environmental Notices* 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.

FCC certification

The FCC certification pertains solely to the ESS 3500 itself. Any components that are installed by the customer might impact the certifications, and it is the customer's responsibility to ensure that the certification requirements are met in the geography where the ESS 3500 will be used.

Electromagnetic compatibility notices

The following Class A statements apply to IBM products and their features unless designated as electromagnetic compatibility (EMC) Class B in the feature information.

When attaching a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

IBM Elastic Storage System 3500 meets all regulatory EMC compliance requirements as offered, including auxiliary equipment and cables that may be ordered from IBM to be used in conjunction with IBM Elastic Storage System 3500.

Canada Notice

CAN ICES-3 (A)/NMB-3(A)

European Community and Morocco Notice

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This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

Warning: This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.

Germany Notice

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaatenund hält die Grenzwerte der EN 55032 Klasse A ein.

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Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten
Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)." Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

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Verantwortlich für die Einhaltung der EMV-Vorschriften ist der Hersteller:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
Tel: 914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

IBM Deutschland GmbH
Technical Relations Europe, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 800 225 5426
e-mail: Halloibm@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55032 Klasse A.

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仕様ページ参照

This statement applies to products less than or equal to 20 A per phase.

高調波電流規格 JIS C 61000-3-2 適合品

This statement applies to products greater than 20 A, single phase.

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- 回路分類：6（単相、ＰＦＣ回路付）
- 換算係数：0

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- 換算係数：0

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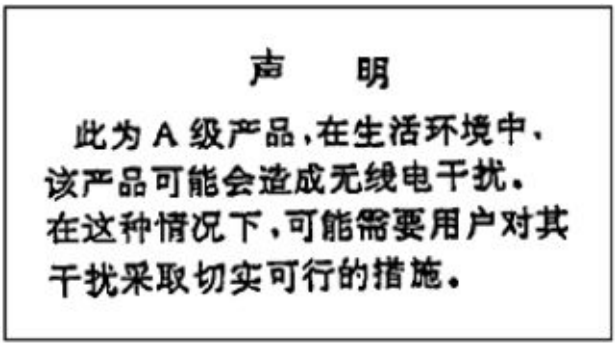

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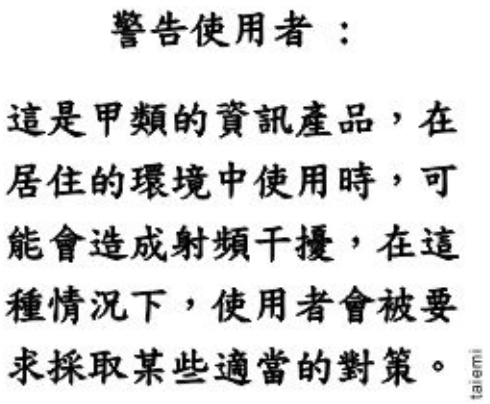

taiemi

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Properly shielded, grounded, and approved cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than approved cables and connectors, or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device might not cause harmful interference, and (2) this device must accept any interference received, including interference that might cause undesired operation.

Responsible Party:
International Business Machines Corporation
New Orchard Road
Armonk, NY 10504
Contact for FCC compliance information only: fccinfo@us.ibm.com

Chapter 2. Technical overview

The technical overview topics provide information about the key concepts of IBM Elastic Storage System 3500.

Target audience of this chapter: Customers and IBM Service Support Representative (SSR).

System overview

An IBM Elastic Storage System 3500 enclosure contains Non-Volatile Memory Express (NVMe) attached SSD drives and a pair of server canisters.

IBM Elastic Storage System 3500 is an all-Flash array platform. This storage platform uses NVMe-attached SSD drives to provide significant performance improvements as compared to SAS-attached flash drives.

IBM Elastic Storage System 3500 can contain up to 24 NVMe-attached SSD drives. You can either use 12 drives in a half-populated configuration or 24 drives in a fully populated configuration. These drives are accessible from the front of IBM Elastic Storage System 3500, as shown in the following figure.

Note: The minimum number of drives is 12. In a 12-drive configuration, drives must be plugged into slots 1 - 6 and then 13 - 18.

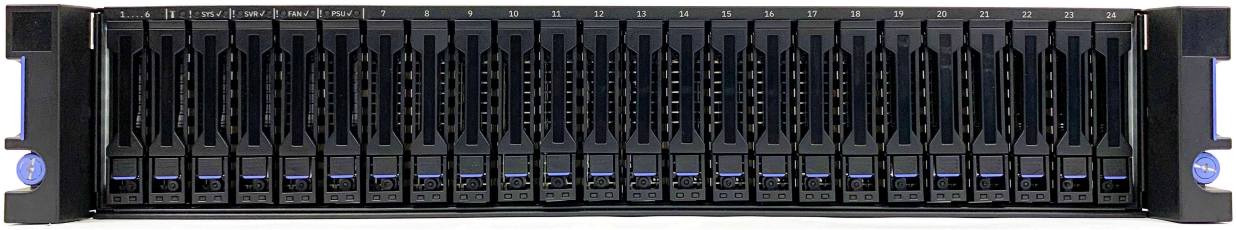


Figure 1. Front view of IBM Elastic Storage System 3500

Each IBM Elastic Storage System 3500 contains two identical server canisters. The following figure shows two server canisters and two power modules.

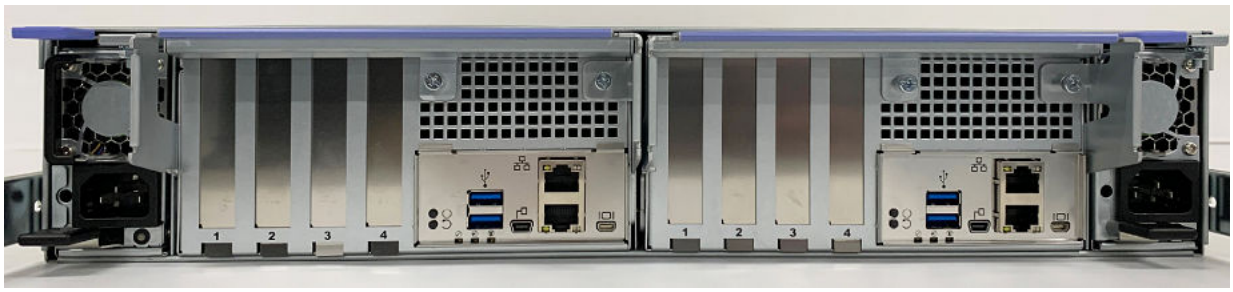


Figure 2. Rear view of IBM Elastic Storage System 3500

The IBM Elastic Storage System uses a single socket AMD EPYC Rome processor per server canister. The following table provides an overview of IBM Elastic Storage System.

Table 2. Overview of IBM Elastic Storage System 3500 system				
Product	**Number of DIMMs per server canister**	**Total memory per server canister**	**Total storage (raw capacity) per IBM Elastic Storage System 3500**	**Server Canister features**
IBM Elastic Storage System 3500	8 (64 GB DIMM)	512 GB	Up to 360 TB per ESS 3500 unit	Single socket AMD EPYC 7642 48-core processor. Dual 960 GB NVMe boot drives.
	8 (128 GB DIMM)	1024 GB	Up to 720 TB per ESS 3500 unit	

The major key characteristics of the IBM Elastic Storage System 3500 system are as follows:

- IBM Spectrum Scale software with enclosure-based, all-inclusive software feature licensing.
- NVMe transport protocol for high performance of 2.5-inch (SFF) NVMe-attached SSD drives and flash drive:
  - Support for industry-standard 2.5-inch NVMe-attached SSD drive options with the following storage capacities: 3.84 TB, 7.68 TB, 15.36 TB, and 30.72 TB mentioned in Table 3 on page 18.

Table 3. Storage capacities and feature codes of NVMe-attached SSD drives		
Feature Code	**Description**	**FRU Part number**
AJP4	3.84 TB 2.5-inch PCIe Gen4 NVMe-attached SSD drive	01LL727
AJP5	7.68 TB 2.5-inch PCIe Gen4 NVMe-attached SSD drive	01LL728
AJP6	15.36 TB 2.5-inch PCIe Gen4 NVMe-attached SSD drive	01LL729
AJPT	30.72 TB 2.5-inch PCIe Gen4 NVMe-attached SSD drive	01LL993

- 12 or 24 drives per enclosure configurations are available.
- Onboard ports:
  - One RJ45 x1 Gbps for Mgmt
  - One RJ45 x1 Gbps for BMC inter canister communication
  - One micro HDMI port for console display
  - One USB 3.1 Gen 1 Type A upper port for crash-cart keyboard
  - One USB 3.1 Gen 1 Type A lower port for SSR
  - One USB Mini-B for service
- Four Gen4 x16 PCIe slots each, per canister that supports the following adapter options:
  - AJZL - CX-6 InfiniBand/VPI in PCIe form factor (InfiniBand and Ethernet), HHHL PCIe G4 adapter.
  - AJZN - CX-6 DX in PCIe form factor (Ethernet only), HHHL PCIe G4 adapter.
  - AJP1 - CX-5 PCIe4 2Port VPI 100Gb IB-EDR (InfiniBand and Ethernet), HHHL PCIe G4 adapter.

Networking details

The networking details of IBM Elastic Storage System 3500 are shown in the following figure.

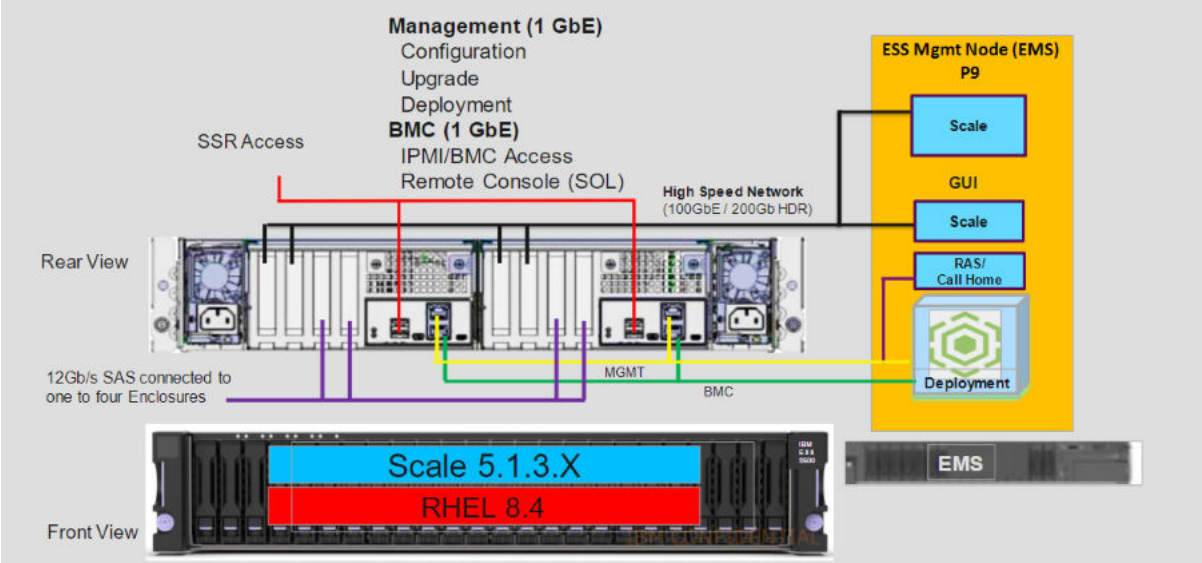


Figure 3. IBM Elastic Storage System 3500 Networking

- AJZL: CX-6 InfiniBand/VPI in PCIe form factor
  - InfiniBand - HDR200 200 Gb / HDR100 100 Gb / EDR 100 Gb
  - Ethernet - 100 GbE / 200 GbE
- AJZN: CX-6 DX in PCIe form factor (Ethernet - 100 GbE)
- AJP1: CX-5 InfiniBand/VPI in PCIe form factor
  - InfiniBand - EDR 100 Gb
  - Ethernet - 100 GbE

You can configure ESS 3500 in a mixed cluster where other ESS products are used. The following figure shows the ESS network topology of a mixed ESS cluster that contains ESS 5000, ESS 3500, ESS 3200, and ESS 3000 systems.

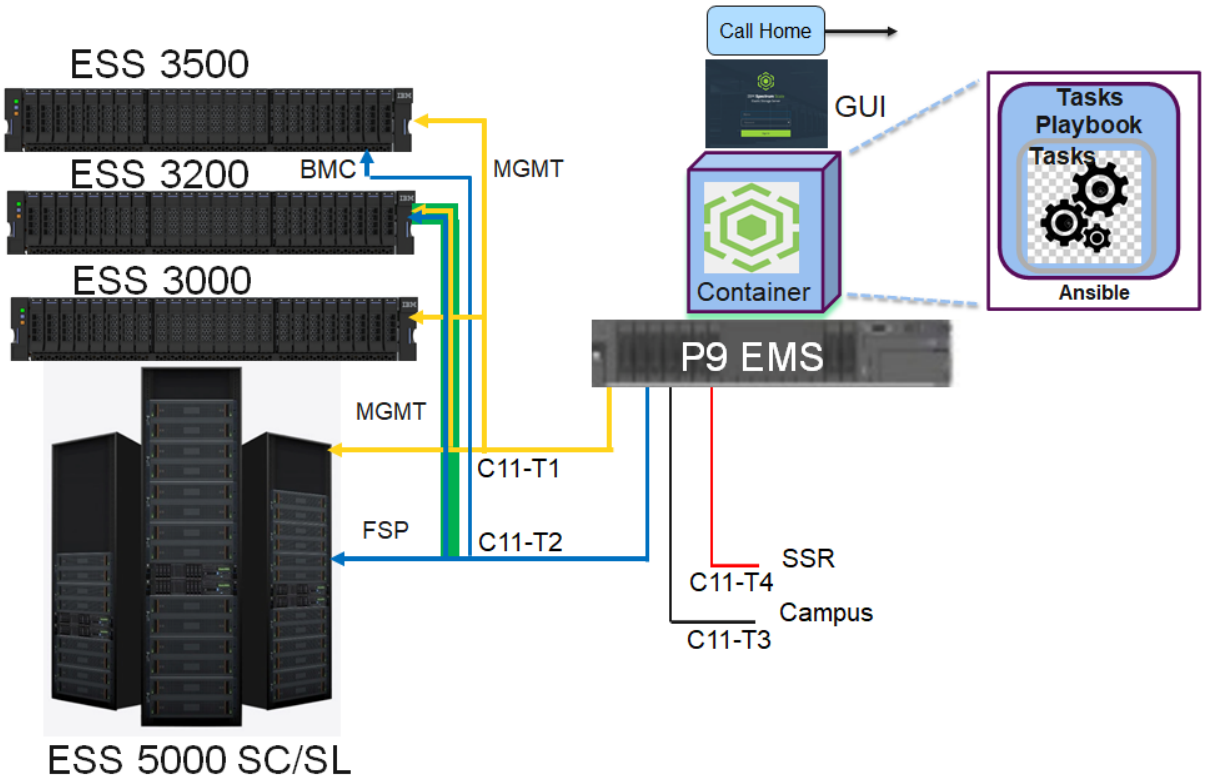


Figure 4. Network topology

NVMe transport protocol in IBM Elastic Storage System 3500

The IBM Elastic Storage System 3500 systems use the Non-Volatile Memory express (*NVMe*) drive transport protocol.

- NVMe is designed specifically for flash technologies. It is a faster and less complicated storage drive transport protocol than SAS.
- The NVMe-attached drives support multiple queues so that each CPU core can communicate directly with the drive. This avoids the latency and overhead of core-to-core communication to give the best performance.
- NVMe offers better performance and lower latencies exclusively for solid-state drives through multiple I/O queues and other enhancements.
- High-performance IBM Spectrum Scale RAID supports the following RAID code options:
  - 3WayReplication
  - 4WayReplication
  - 8+2p
  - 8+3p

  Note: For information about RAID code options, see *IBM Spectrum Scale RAID Administration guide*.
- The NVMe transport protocol supports industry standard NVMe flash drives.

Enterprise-level software and support

IBM Elastic Storage System 3500 consists of two server canisters that run the IBM Spectrum Scale software, which is a part of the IBM Spectrum Storage family. For more information about the IBM Spectrum Scale capabilities, see IBM Spectrum Scale.

Enterprise-level software and support are available based on the IBM Spectrum Scale software stack.

System topology

The following figure shows high-level architecture and topology.

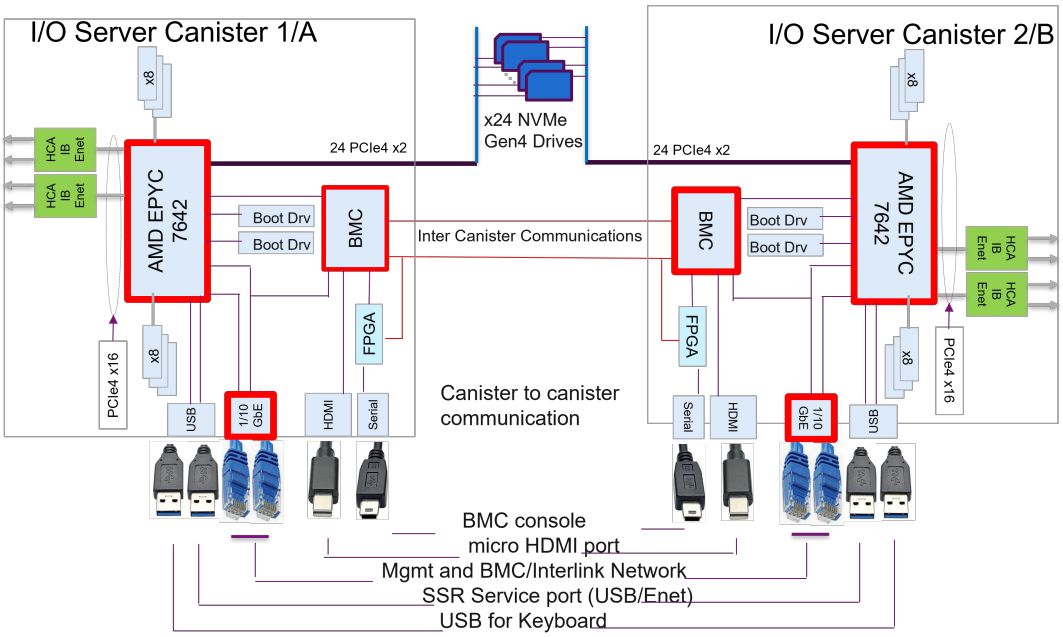


Figure 5. IBM Elastic Storage System 3500 high-level architecture and topology

EMS node

A POWER9 EMS node (5105-22E) is a management server that is required for each ESS system of one or more building blocks. If you have an existing POWER9 EMS node, you can use it to manage IBM Elastic Storage System 3500.

You need a minimum of one POWER9 EMS node as a part of your ESS cluster. When IBM Elastic Storage System 3500 is added to an existing ESS cluster that has a POWER9 EMS node, the same POWER9 EMS node can also be used to manage IBM Elastic Storage System 3500. The POWER9 EMS node can be ordered as a part of IBM Elastic Storage System 3500.

IBM Elastic Storage System 3500 is supported only on the POWER9 EMS. The minimum release level on the IBM Elastic Storage System 3500 canisters is ESS 6.1.3.

For more information about the POWER9 EMS node, see Model 5105-22E server specifications.

The EMS node also serves as a third IBM Spectrum Scale quorum node in a configuration with one building block.

System management

An EMS node in an IBM Elastic Storage System 3500 cluster provides system management functions. IBM Elastic Storage System 3500 GUI and call home run on the EMS nodes and provide management and health monitoring capabilities. The EMS node also runs a container with Ansible playbook that can provide orchestration of complex tasks, such as cluster configuration, file system creation, and code update. Figure 4 on page 20 shows high-level view of system management topology.

Drives

IBM Elastic Storage System 3500 supports industry-standard 2.5-inch NVMe-attached SSD drive options.

The following storage capacities are supported: 3.84 TB, 7.68 TB, 15.36 TB, and 30.72 TB.

Drives are hot swappable from the front of the enclosure.

Drive slots

A drive slot represents the location in an enclosure into which a drive can be inserted.

Each drive slot must contain either a drive or an empty carrier. The empty carriers do not have drive indicators. The numbering scheme for the drive slots is indicated on the enclosure.

The following figure displays enclosures that have 24 drives, with 2.5-inch drive slots. The drive slots are arranged in one row of vertically mounted drive assemblies.

IBM Elastic Storage System 3500 supports 12 and 24 drive configurations. All drives must be identical in an IBM Elastic Storage System 3500 enclosure. In a 12 drive configuration, drives must be installed in slots 1 - 6 and 13 - 18.

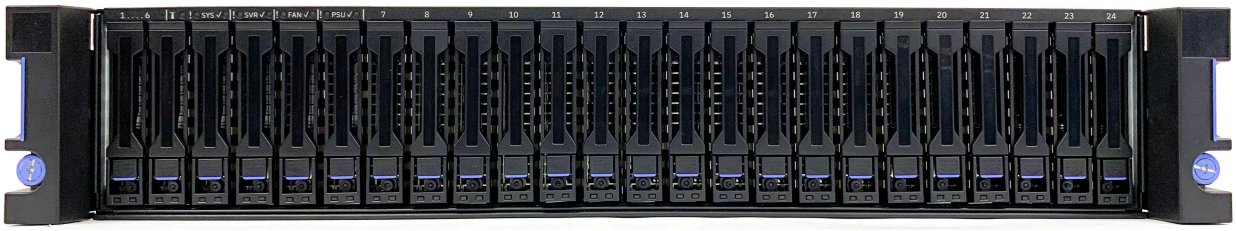


Figure 6. Front view of IBM Elastic Storage System 3500 with drives installed

Power modules

Power modules are subcomponents of enclosures. A power module takes electrical power from the rack Power Distribution Units (PDUs) and distributes the power to other components in the enclosure.

For redundancy, two power modules are installed in the enclosure.

Figure 7. Power module

SSR access port

The bottom USB-A port is the SSR access port on the back panel of the canister that a service personnel can use to initialize a system.

You can use the SSR access port to set the IP address of the management interface. For more information, see “Best practices for network configuration (Customer reference task)” on page 67.

In each of the IBM Elastic Storage System 3500 server canister, the bottom USB-A port is designated as the SSR access port, as shown in the following figure.

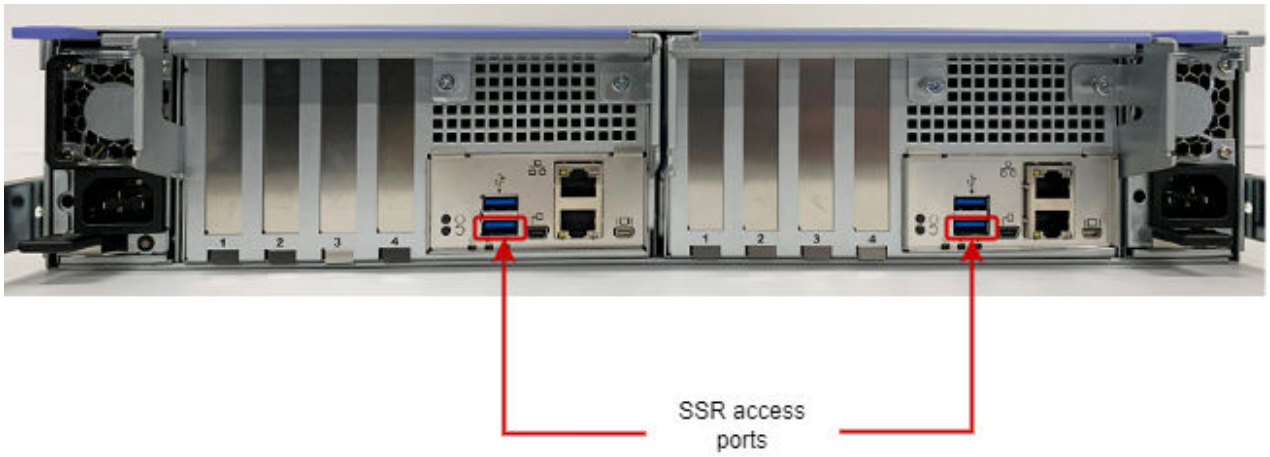


Figure 8. SSR access port

Hardware specification sheets

EMS node specifications

IBM Elastic Storage System 3500 uses one EMS node in the basic configuration. The EMS node acts as the management server and provides infrastructure for hardware monitoring and hosts GUI.

The EMS server has the following roles:

- Quorum node
- GUI server
- Call home server

For more information on the POWER9 EMS (FC ESZX) node, see Model 5105-22E server specifications.

Chapter 3. Planning for hardware

Before the IBM Service Support Representative (SSR) installs the system hardware, the customer must provide a plan that explains where and how the hardware will be installed, configured, and connected in the customer's network. Ensure that the system's physical configuration records are easily accessible to be used as a reference as needed.

The customers have to work with the IBM technical team to plan for installation and deployment of IBM Elastic Storage System 3500.

Planning for site preparation

This information is intended to help you prepare your physical site for the installation of IBM Elastic Storage System 3500. Marketing and installation planning representatives are also available to help you plan your installation. Proper planning for your new system facilitates a smooth installation and a fast system startup.

The use of the terms, “server”, “processor”, “system” and “all models” in the following information refer to the IBM Elastic Storage System 3500.

Site preparation and physical planning

For detailed guidelines about site preparation and physical planning, see the Site preparation and physical planning document.

Planning for hardware installation

Before the IBM SSR installs the system, you must plan the physical configuration and the initial data configuration.

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, network and environmental conditions are met.

Important: The IBM SSR refers to these system configuration details when they perform the system installation, so it is important that these records are complete and accurate.

1. Review all the guidelines in the Planning topics to understand where the system can be installed and identify all prerequisites, such as building structure, equipment rack, environmental controls, power supply, and accessibility.

   If there are dependencies identified, you need to resolve them before the IBM SSR installs your system hardware.
2. Use the hardware locations of enclosures and other devices to identify the rack locations where the IBM SSR will install each enclosure.

Planning for racks

For detailed rack specification information on the 7965-S42 rack, see: Planning for the 7965-S42 rack.

If you do not have a 7965-S42 rack and want to install the system into a non-IBM rack, see “ IBM Elastic Storage System 3500 requirements” on page 29. Ensure that the physical environment meet the specified requirements, such as rack space, power, and environmental conditions.

Reviewing IBM Elastic Storage System 3500 location guidelines

Consult these guidelines when you plan the location of IBM Elastic Storage System 3500 and any existing Elastic Storage System in your environment, including any IBM Spectrum Scale client or protocol node.

IBM Elastic Storage System 3500 contains two server canisters. Each IBM Elastic Storage System 3500 cluster consists of the following components:

- One or more IBM Elastic Storage System 3500 systems – each system requires 2U (standard rack units) in a rack.
- One EMS node - requires 2U space in a rack.
- 1 GbE Network switch for management network - requires 1U in rack.
- High-Speed InfiniBand or Ethernet network for internode communication – requires 1U space in rack.

IBM Elastic Storage System 3500 model

The model contains two hot swappable server canisters that have one CPU each.

Planning for power for server canister

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

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 connect the power cords of the power supplies on the right side of the enclosures to another power source.

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

The following figure shows the rear view of an IBM Elastic Storage System 3500. Each power module is located on the sides of IBM Elastic Storage System 3500.

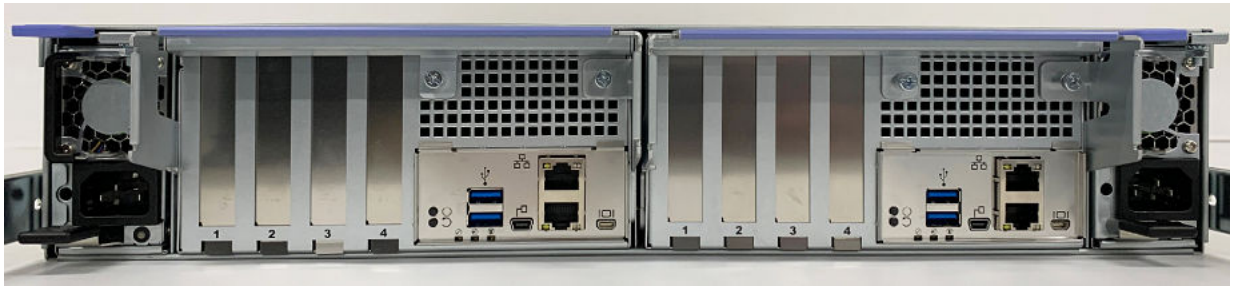


Figure 9. Rear view of an IBM Elastic Storage System 3500

Planning for cable connections to PDUs

Each enclosure must be connected to a pair of power outlets by selecting appropriate feature codes while ordering the system. The following table lists the feature codes of the power cords.

Table 4. Power cord feature codes

Feature codes	Description
6577	Power Cable - Drawer to IBM PDU, 200-240V/10A C13/C14
END3	Power Cable - Drawer to IBM PDU, 200-240V/10A C13/C14
ELC5	Power Cable - Drawer to IBM PDU (250V/10A) C13/C20

Table 4. Power cord feature codes (continued)	
Feature codes	**Description**
END7	Power Cable - Drawer to IBM PDU (250V/10A) C13/C20
6458	Power Cord 4.3 m (14 ft), Drawer to IBM PDU (250V/10A) C13/C14
6671	Power Cord 2.7 m (9 ft), Drawer to IBM PDU (250V/10A) C13/C14
6672	Power Cord 2M (6.5 ft), Drawer to IBM PDU, 250V/10A C13/C14
END0	Power Cord 2M (6.5 ft), Drawer to IBM PDU, 250V/10A C13/C14
END1	Power Cord 2.7 m (9 ft), Drawer to IBM PDU, (250V/10A) C13/C14
END2	Power Cord 4.3m (14 ft), Drawer to IBM PDU, (250V/10A) C13/C14
6665	Power Cable 2.8m (9.2 ft), Drawer to IBM PDU, (250V/10A) C13/C20
ELC9	Power Cord 4.3m (14 ft), C13/C20 Drawer to IBM PDU, (250V/10A) C13/C20
END5	Power Cord 2.8m (9.2 ft), Drawer to IBM PDU, (250V/10A) C13/C20
END9	Power Cord 4.3m (14 ft), C13/C20 Drawer to IBM PDU, (250V/10A) C13/C20

Attention: Ensure that sufficient power supply circuits are available to provide the total power requirements of the equipment that is connected to each power supply circuit.

EMS node power planning

The following table lists the documentation that can be used as a reference while planning for power requirements.

Table 5. Power planning reference information	
For this information...	**Go to...**
Planning for power for EMS node	https://www.ibm.com/docs/en/power9?topic=shp-planning-power-8
Determining your power requirements	https://www.ibm.com/docs/en/power9?topic=pp-determining-your-power-requirements-8
Server Information Form 3A	https://www.ibm.com/docs/en/power9?topic=dypr-server-information-form-3a-8
Workstation Information Form 3B	https://www.ibm.com/docs/en/power9?topic=dypr-workstation-information-form-3b-8
Plugs and receptacles	https://www.ibm.com/docs/en/power9?topic=pp-plugs-receptacles-8

Table 5. Power planning reference information (continued)	
For this information...	**Go to...**
Supported power cords	https://www.ibm.com/docs/en/power9?topic=pr-supported-power-cords-8
Modification of IBM-provided power cords	https://www.ibm.com/docs/en/power9?topic=pp-modification-provided-power-cords-8
Power distribution unit and power cord options for 7014, 7953, and 7965 racks	https://www.ibm.com/docs/en/power9?topic=pp-power-distribution-unit-power-cord-options-7014-7953-7965-racks-9
Planning for cables	https://www.ibm.com/docs/en/power9?topic=shp-planning-cables-8
Power cord routing and retention	https://www.ibm.com/docs/en/power9?topic=cm-power-cord-routing-retention-8
System calculators	https://www.ibm.com/docs/en/power9?topic=ps-system-calculators-8

Physical installation planning

Before you set up your system environment, you must verify that the prerequisite conditions for the system are met.

This information applies to the supported hardware components. Answer the following questions before you start the installation process:

- Does your physical site meet the environment requirements for your system?

  The system requires the physical site to meet the environment requirements. For detailed guidelines about site preparation and physical planning, see the Site preparation and physical planning document.
- Do you have adequate rack space for your hardware?

  The system requires two Electronic Industries Alliance (EIA) units for each IBM Elastic Storage System 3500.
- Do the power circuits that you are planning to use have sufficient capacity and the correct sockets for your 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.
- Have you provided appropriate connectivity by preparing your environment?

  The appropriate power requirements for each power supply unit are provided. For more information, see “Power requirements for each power supply (two per enclosure)” on page 30.

Operating environment

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

Supported hosts

IBM Spectrum Scale needs to be installed on the host server before it is connected to IBM Elastic Storage System 3500. IBM Spectrum Scale provides the high-performance scale-out clustering capabilities. For a list of supported host type and OS, see IBM Spectrum Scale Frequently Asked Questions.

User interfaces

The system provides the following user interfaces:

- The management GUI, which is a web-accessible graphical user interface (GUI) that supports flexible and rapid access to storage management information. The IBM Elastic Storage System 3500 GUI also provides a Directed Maintenance Procedure (DMP) for drive replacement.
- A command-line interface (CLI) that uses Secure Shell (SSH).

IBM Elastic Storage System 3500 requirements

Before you install a 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.

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 must not exceed the maximum enclosure operating ambient temperature of 32-degrees C, using any optical cable or discrete optical transceiver, including all Ethernet cables and InfiniBand that are >=3 meter in length.

  In particular, the rack front and rear doors must be at least 60% perforated to enable sufficient airflow through the enclosure. If there is less airflow, additional mechanisms are required to cool the enclosure. An appropriate IBM rack configuration would be the 7965-S42 IBM Rack Model S42, with standard rear door and feature code 6069 Front Door For 2.0 Meter Rack (High Perforation).
- 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 that is 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.

Table 6. System maximum measured power specifications

Product	kVA	Amps	Power Supplies	Inlet	Watts
5141-FN2	1.550	7.75	2	C14	1500

To aid in power and cooling requirements planning, the following table lists the rating of each power module by enclosure.

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

Table 7. Power rating specifications per power module				
Model and type	**Power module**	**Input power requirements**	**Maximum input current**	**Maximum power output**
5141-FN2	2000 W (2)	200 V to 240 V single phase AC At a frequency of 50 Hz or 60 Hz IEC C14 standardized	10A (x2)	2000 W

Note: The data in Table 6 on page 30 and Table 7 on page 31 measurements are presented as an example. Measurements that are obtained in other operating environments might vary. Conduct your own testing to determine specific measurements for your environment.

Each IBM Elastic Storage System 3500 enclosure contains two power modules for redundancy. The total power consumption values represent the total power that is drawn by both power modules when operating together or a single power module when operating in a maintenance or failure mode.

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 each canister.

Ensure that your environment falls within the ranges that are listed in the following table.

Table 8. Temperature requirements			
Environment	**Ambient temperature**	**Altitude**	**Relative humidity**
Operating	5°C to 35°C[1] (41°F to 95°F)	-61 to 3048 m[2, 3] (-200 to 10000 ft)	20% to 80% non-condensing
Non-operating	5°C to 45°C (41°F to 113°F)		10% to 90% non-condensing
Transit	-40°C to 60°C (-40°F to 140°F)	-61 to 12192 m (-200 to 40000 ft)	10% to 90% non-condensing

Note:

- Max ambient temperature environment = 32C / 950 m
- Max altitude environment = 25C / 3,050 m
- Decrease the maximum air temperature by 1 degree C per 300 m above 950 m.
- The maximum ambient operating temperature when using an optical cable or discrete optical transceiver is 32C, which includes all Ethernet (100 Gb) cables and InfiniBand (100 Gb EDR) that are greater than or equal to 3 meter in length.

Dimensions and weight requirements for rack installation

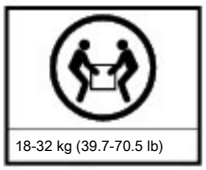
Ensure that space is available in a standard 19" rack that is capable of supporting the enclosure. The rack rail kit supports racks with threaded round and square rail mounting holes. The following table lists the dimensions and weights of the enclosures.

Table 9. Physical characteristics of the enclosures				
Enclosure	**Height**	**Width**	**Depth (including cable management arm)**	**Maximum weight**
IBM Elastic Storage System 3500 with 24 drive slots	87 mm (3.5 in.)	483 mm (19 in.)	940 mm (37.00 in.) from front EIA surface to rear of CMA assembly. 700 mm (27.55 in.) from front EIA surface to rear surface of the enclosure arm.	29.3 kg (64.7 lb)

CAUTION:

or

or



The weight of this part or unit is more than 29.3 kg (64.7 lb). It takes two persons to safely lift this part or unit.

The following table shows the rack space requirements for IBM Elastic Storage System 3500 in tabular form.

Table 10. Rack space requirements for the IBM Elastic Storage System 3500	
Minimum rail length	**Maximum rail depth (including cable management arm)**
686 mm (27 in.)	940 mm (37 in.)

Service Envelope Illustration

The following figure provides a close-up view of the IBM Elastic Storage System 3500 mounting envelope.

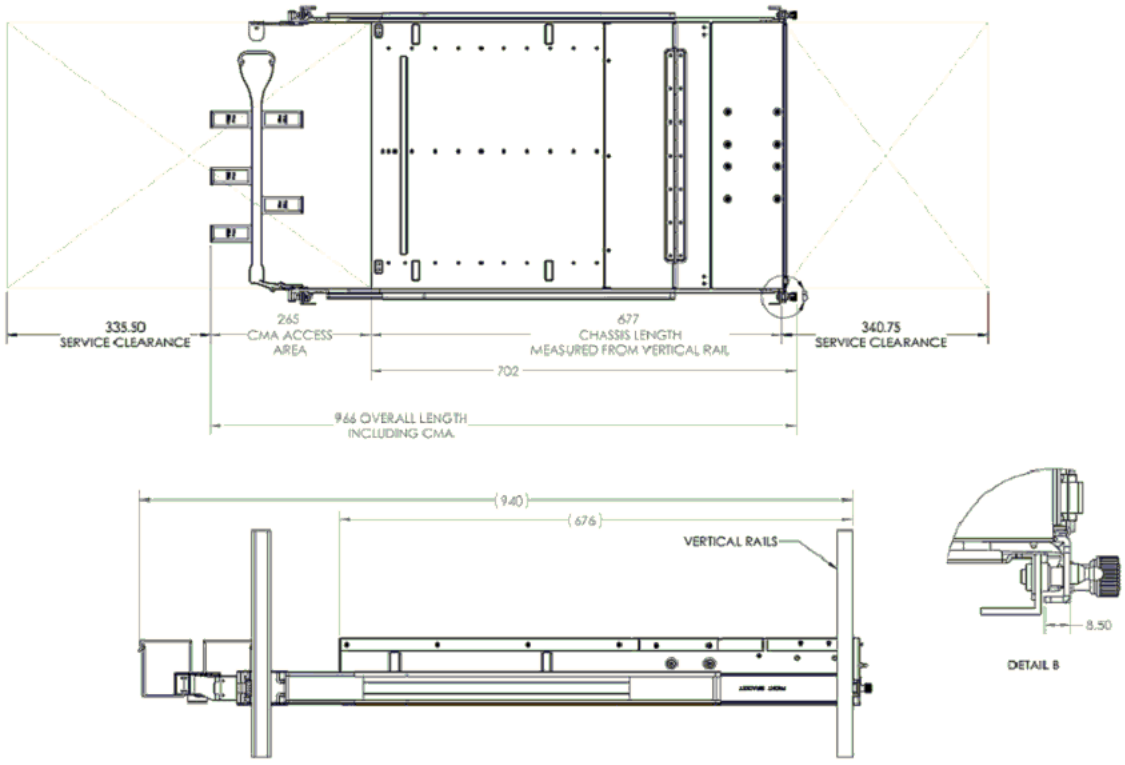


Figure 10. Service envelope illustration (Dimensions in millimeters)

Service clearance for IBM Elastic Storage System 3500

The service clearance area is the area around the rack which is needed for the authorized service representatives to service the enclosure as shown in the sample illustration in the following figure.

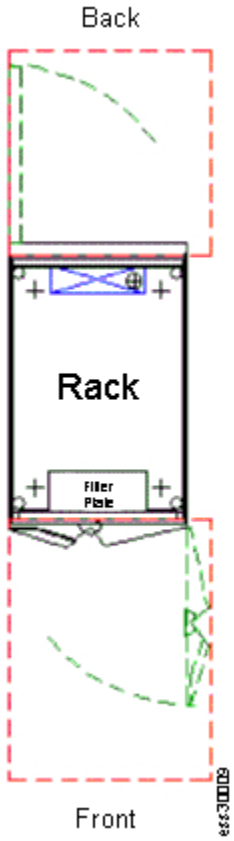


Figure 11. Sample illustration to show space around the rack

For IBM Elastic Storage System 3500, use the recommended measurements that are given in the following table.

Table 11. Service clearance requirements

Front[1]	**Back**
915 mm (36 in.)	915 mm (36 in.)
[1]Storage racks require larger service clearances in the front of the rack.	

For more information on the layout of the room, see *Computer room layout*.

See the Site preparation and physical planning section to help you prepare your physical site for the installation of IBM Elastic Storage System 3500.

Additional space requirements

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

Table 12. Clearances

Location	Additional space requirements	Reason
Left and right sides	50 mm (2 in.)	Cooling air flow
Back	Minimum: 100 mm (4 in.)	Cable exit

Supported drives

The following table provides drive specifications for your IBM Elastic Storage System 3500 system.

Table 13. Drive specifications

Model and type	2.5-inch drives
IBM Elastic Storage System 3500 with 24 2.5-inch drive slots	12/24 dual port NVMe drives

For more information about the feature codes of the NVMe drives, see Table 3 on page 18.

Acoustical declaration with noise hazard notice

The following figure indicates the declared noise emissions values in accordance with ISO 9296.

SSRs must be enrolled in a hearing conservation program and use hearing protection when servicing the system.

Declared noise emission values in accordance with ISO 9296 [1-7]

Product Description: ESS 3500 MTM 5141-FN2	Mean A-weighted sound power level, $L_{WA,m}$ (B)		Mean A-weighted emission sound pressure level, $L_{pA,m}$(dB)							Statistical adder for verification, K_v (B)	
			Front			Rear					
	Operating	Idle	1.0m Height	1.18m Height (System Level)	1.5m Height	1.0m Height	1.18m Height (System Level)	1.5m Height	Bystander Average	Operating	Idle
Typical configuration, 23 ± 2° C	7.3	7.2	-	-	64	-	-	60	60	0.3	0.3
Typical configuration, 27° C	7.4	7.4	-	-	63	-	-	60	59	0.3	0.3
Maximum configuration, 37° C	7.3	7.4	-	-	62	-	-	61	59	0.3	0.3
Maximum configuration, 37° C Service Position	-	-	68	70	68	67	69	66	-	0.3	0.3

1. Declared level $L_{WA,m}$ is the upper-limit A-weighted sound power level.
2. Declared level $L_{pA,m}$ is the mean A-weighted emission sound pressure level that is measured either at the 0.5-meter operator positions with doors open or 1-meter bystander positions with doors closed.
3. The statistical adder for verification, K_v, is a quantity to be added to the declared mean A-weighted sound power level, $L_{WA,m}$, such that there is a 95% probability of acceptance, when using the verification procedures of ISO 9296, if no more than 6.5% of the batch of new equipment has A-weighted sound power levels greater than ($L_{WA,m}$ + K_v).
4. The quantity $L_{WA,c}$ (formerly called L_{WAd}), can be computed from the sum of $L_{WA,m}$ and K_v.
5. All declared data for systems that are obtained through a combination of measurements made in accordance with ISO 7779 and modeled results. All measurements made in conformance with ISO 7779 and declared in conformance with ISO 9296.
6. 10 dB (decibel) equals 1 B (bel).
7. Under certain environments, configurations, system settings, or workloads, there is an increase in fan speeds that results in higher noise levels.

Notice: Government regulations (such as those prescribed by OSHA or European Community Directives) might govern noise level exposure in the workplace and might apply to you and your server installation. The actual sound pressure levels in your installation depend upon various factors, including the number of racks in the installation; the size, materials, and configuration of the room where you designate the racks to be installed; the noise levels from other equipment; the room ambient temperature, and employees' location in relation to the equipment. Further, compliance with such government regulations also depends upon various extra factors, including the duration of employees' exposure and whether employees wear hearing protection. IBM recommends that you consult with qualified experts in this field to determine whether you are in compliance with the applicable regulations.

Figure 12. Acoustical declaration with noise hazard notice

Shock and vibration specifications for IBM Elastic Storage System 3500 enclosures

Table 14 on page 36 and Table 15 on page 36 provide the shock and vibration testing results for your IBM Elastic Storage System 3500 system.

Table 14. Shock testing results

Shock categories	Test level	Sweep rate of shocks
Operational	5 g 11 ms 1/2 Sine	3 positive shocks 3 negative shocks
Non-operational	10 g 11 ms 1/2 Sine	3 positive shocks 3 negative shocks

Table 15. Vibration testing results

Vibration categories	Test level	Frequency range
Operational	0.10 g Swept Sine	5 - 500 Hz
Non-operational	0.75 g Swept Sine	5 - 500 Hz
Operating random vibration	0.15 g	5 - 500 Hz
Non-operating random vibration	0.5 g	5 - 500 Hz

Table 16. Random vibration PSD profile breakpoints[1]

Class	5 Hz	17 Hz	45 Hz	48 Hz	62 Hz	65 Hz	150 Hz	200 Hz	500 Hz
V1L/V2	$2.0x10^{-7}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$
V1H [2]	$1.0x10^{-7}$	$5.2x10^{-6}$	$5.2x10^{-6}$	$5.2x10^{-6}$	$5.2x10^{-6}$	$5.2x10^{-6}$	$5.2x10^{-6}$	$5.2x10^{-6}$	$5.2x10^{-6}$
V3	$2.0x10^{-5}$	$3.0x10^{-4}$	$3.0x10^{-4}$	$3.0x10^{-4}$	$3.0x10^{-4}$	$3.0x10^{-4}$	$3.0x10^{-4}$	$8.0x10^{-5}$	$8.0x10^{-5}$
V5L	$2.0x10^{-5}$	$1.1x10^{-3}$	$1.1x10^{-3}$	$8.0x10^{-3}$	$8.0x10^{-3}$	$1.0x10^{-3}$	$1.0x10^{-3}$	$5.0x10^{-4}$	$5.0x10^{-4}$
V5H	$1.0x10^{-5}$	$4.0x10^{-4}$	$4.0x10^{-4}$	$3.0x10^{-3}$	$3.0x10^{-3}$	$5.0x10^{-4}$	$5.0x10^{-4}$	$2.0x10^{-4}$	$2.0x10^{-4}$

Note:

- [1] All values in this table are g^2/Hz.
- For reference only, no test required.

IP address allocation and usage

As you plan your installation, you must consider IP address requirements and service access for the system.

IBM Elastic Storage System 3500 uses 100GbE/200GbE/100Gb EDR/200Gb HDR network for cluster communication and data transport. For IP port usage requirement, see IBM Spectrum Scale Documentation.

For configuration and management, you must allocate an IP address to the system. This IP address is referred to as the *management IP address*. The storage system also has a BMC IP address, which is known as the *service IP address*. The addresses must be fixed. Only IPv4 addresses are supported for management and service.

Attention: The address for a management IP cannot be the same as the service IP. Using the same IP address causes communication problems.

Name servers are not used 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.

Planning for high availability

IBM Spectrum Scale can provide rack level redundancy and stretched cluster using file system data replication. AFM-DR can be used for site-level disaster recovery. For more details, see IBM Spectrum Scale documentation.

Storage configuration planning

IBM Elastic Storage System 3500 provides optimal configuration of IBM Spectrum Scale RAID. For further customization, see *IBM Spectrum Scale RAID Administration guide*.

Planning your network and storage network

You need to plan to provide the network infrastructure and the storage network infrastructure that your system requires.

Planning for high-speed network adapter

Review the prerequisite system requirements and installation considerations before deployment.

It is helpful to be familiar with the following term when you are considering the features of the high-speed network adapter for these connections.

Remote Direct Memory Access (RDMA)
RDMA is a networking standard that allows the adapters to transfer data directly to or from the endpoints in a connection without using CPU resources on either of the endpoints. These transfers occur simultaneously with other system operations and do not impact overall system performance. When the system performs an I/O operation over an RDMA-based connection, data is sent directly to the network, which reduces latency and increases the speed of data transfers.

Review the following elements when you are deciding to install the high-speed network adapters:

- The following adapters are available:
  - AJZL: CX-6 InfiniBand/VPI in PCIe form factor
    - InfiniBand - HDR200 200 Gb / HDR100 100 Gb / EDR 100 Gb
    - Ethernet - 100 GbE / 200 GbE
  - AJZN: CX-6 Dx in PCIe form factor (Ethernet - 100 GbE)
  - AJP1: CX-5 Infini|and/VPI in PCIe form factor
    - InfiniBand - EDR 100 Gb
    - Ethernet - 100 GbE

Planning for cables

Connections for IBM Elastic Storage System 3500

Care must be taken to note the orientation of each server canister in IBM Elastic Storage System 3500 so that the interconnect cables are properly connected.

IBM Elastic Storage System 3500 contains two server canisters. In the following figure, server canister A/1 is on the left side and server canister B/2 is on the right side.

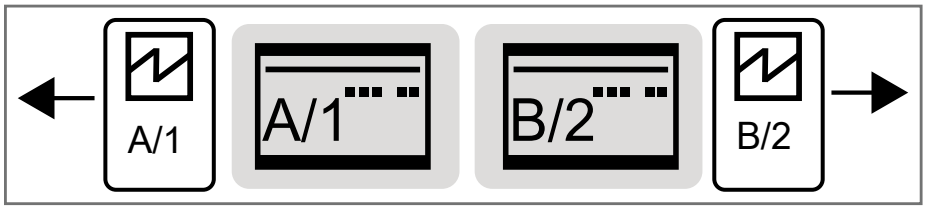


Figure 13. Illustration showing the orientation of rear view of the server canisters and power modules

For example, the following figure shows the ports on IBM Elastic Storage System 3500.

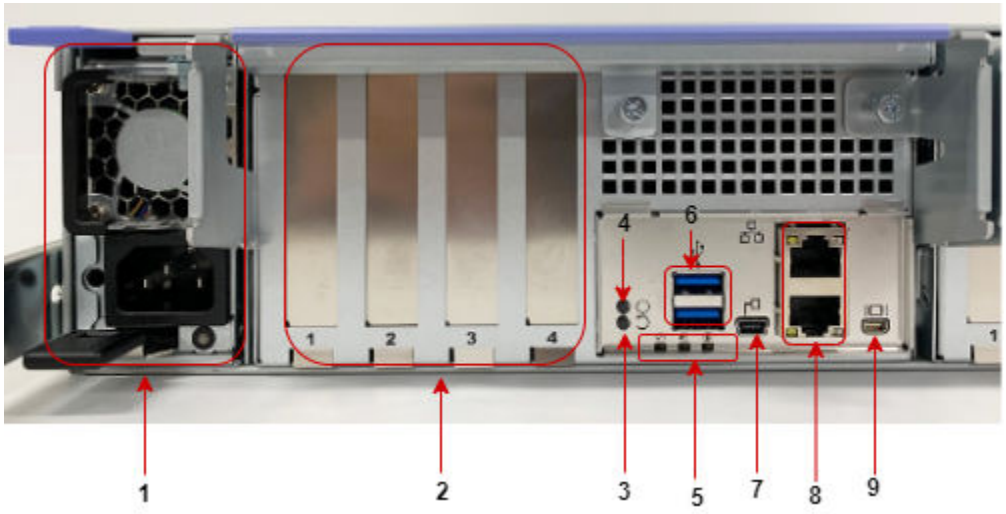


Figure 14. Orientation of ports on IBM Elastic Storage System 3500

Table 17. Ports on ESS 3500		
Item number	**Feature**	**Description**
1	Power module	Provides power supply to the system. One per canister
2	PCIe Gen 4 Add-in Card Slot	Provide slots up to four x16 PCIe Gen 4 card(s) per server canister.
3	CPU reset	Allows operator to reset CPU. If CPU is reset, canister reboots.
4	Power button	Provides power on/off option.
5	Server canister panel LEDs	Provides status of server canister.

Table 17. Ports on ESS 3500 (continued)

Item number	Feature	Description
6	USB 3.1 Gen 1 type A Access Port for USB to Ethernet adapter	Provides two USB 3.1 Gen 1 type A ports for high-speed data transfer rates. The lower port is used for SSR port. It provides the SSR access to the operating system for system setup and configuration. Fixed IP address from factory gets assigned when SSR cables are inserted for service and hardware configuration. Use the following credentials to access canisters: **User ID: essserv1** User ID will be same for both canisters. **Password: <{Enclosure serial number}A|B>** For example, if the enclosure serial number is 01YM312, the password for the left canister will be 01YM312A or 01YM312B for the right canister. Serial number of the enclosure can be obtained from the front tag located at the left side of the enclosure.
7	USB Mini-B Console Port	Provides a serial console connection to BMC. **User ID: sysadmin** **Password: <{Enclosure serial number}A|B>**
8	1 GbE RJ45 Port	Provides two 1 GbE RJ45 ports. The top port is management port and the bottom port is BMC port.
9	BMC Micro HDMI Display Port	Provides for a micro HDMI video connection to the BMC.

Onboard Ethernet ports on each canister provide system management and BMC connections. The 1 Gbps Ethernet ports on each server canister use RJ45 connection.

Each I/O canister has two Ethernet cables to connect management and BMC port.

Each IBM Elastic Storage System 3500 server canister has four Gen4 x16 PCIe slots to support optional host interface adapters. The host interface adapters can be supported in any of the interface slots. The following table provides an overview of the host interface adapters.

Table 18. Summary of supported host interface adapters				
Protocol	**Feature**	**Ports**	**FRU part number**	**Quantity supported per Canister**
200 Gb IB-HDR/ Ethernet	AJZL	2 per adapter	01LL648	1-4
100 Gb Ethernet	AJZN	2 per adapter	01LL634	1-4
100 Gb IB-EDR	AJP1	2 per adapter	01LL586	1-4
Note: Both server canisters in an IBM Elastic Storage System 3500 system must have an identical configuration.				

Planning for adapters

IBM Elastic Storage System 3500 contains two server canisters. Each server canister has four PCIe interface slots to support extra adapters. InfiniBand and Ethernet adapters are supported in any of the interface slots.

Supported environment

Refer to the IBM support website for up-to-date information about the supported environment for your system.

Environmental topics can include updates about the following items:

- Host attachments
- Switches
- Firmware levels
- Other support hardware

Chapter 4. Installing

This section covers how to rack, stack, unpack, and install IBM Elastic Storage System 3500. It also guides the customer on how to fill out the installation worksheet.

The Service Support Representatives (SSR) can refer to "SSR considerations before arriving customer site" on page 43 to perform a hardware checkout and to set the management interface IP, BMC interface IP, and VLAN tag.

Note: Much of the information in this section is intended only for IBM authorized service providers. Customers need to consult the terms of their warranty to determine the extent to which they must attempt any IBM Elastic Storage System maintenance.

Tasks to be done by the Customers or an IBM SSR are marked in this chapter.

Installation overview

The installation and initial configuration of your system is carried out by an IBM Service Support Representative (SSR), following the plan that you provide to them.

Network switch VLAN instructions

Manual setup of the 1 Gb management switch might be required only for unracked installations. If it is unracked, use the instructions that are given in the following doc link to know how to log in, change the switch password, and configure the management VLANs. If the customer has their own switch (for example, Cisco), they are responsible for configuring the switch to the IBM Elastic Storage System VLAN specifications.

There are dedicated ports configured on the management switch that have a role in both the service and management VLANs. They are trunk ports. It is important to carefully review the network document for more information. For more information about instructions on switch VLAN configuration, see Appendix B, "Switch VLAN configuration instructions," on page 97.

Hardware installation tasks performed by an IBM SSR

A POWER9 (5105-22E) node is required to manage an ESS 3200, ESS 5000, and/or ESS 3500 system. If you are adding additional ESS building-blocks, it is assumed that there is already a POWER9 EMS managing the ESS environment. One EMS is allowed per ESS storage cluster.

The required EMS (POWER9) network connections and the associated VLANs are as follows:

- C11-T1 Management VLAN (Yellow)
- C11-T2 FSP VLAN (Blue)
- C11-T3 campus connection (mandatory to deploy the container during install time)
- HMC1 port FSP VLAN (Blue)
- HMC2 port campus connection (optional)

Each POWER server has an HMC2 port on the rear. It is highly recommended the customer connect this port to the campus network. The customer can use this connection to access a console and execute power control functions if the EMS is not available (will not boot).

To install the IBM Elastic Storage System hardware, an IBM SSR must complete the following tasks (Example of ESS 3500 given below):

Important: You must complete the planning tasks and provide completed worksheets to the IBM SSR before they can proceed with installing and initializing your system.

1. An IBM SSR unpacks and installs the 5141-FN2 system in the rack.

2. If the system comes unracked, the IBM SSR completes the cabling (power, networking) within the rack. For information on the networking requirements for the EMS (POWER9) and the IBM Elastic Storage System 3500, see Planning worksheets (customer task).

Installation procedure performed by an IBM SSR

After the hardware is installed, an IBM SSR connects the laptop point-to-point (through USB-A to Ethernet adapter (P/N: 00VJ994) to each IBM Elastic Storage System 3500 (5141-FN2) canister to perform hardware checkout and configure IP addresses using ESS Code 20 App (acting as the **essserv1** user ID). If it is a new ESS environment, the SSR would then connect (via Ethernet cable (C11-T4 port)) to the POWER9 EMS to ensure the server is healthy, IP addresses are configured and tested. If the customer ordered POWER9 Protocol nodes, they would be checked and IP addresses configured same as the EMS. The same procedure is used to check an ESS 5000 nodes by attaching a point-to-point Ethernet cable from your laptop to C11-T4.

Perform SSR tasks listed in the SSR panel within the ESS Code 20 App tool. The tool will also prompt the user to configure IP address of the management interface, BMC/FSP interface, set the VLAN tag (ESS 3500 only), and test connectivity. Depending on whether the node is being set up for the first time or not, a connectivity test will be executed (i.e., has target nodes configured already to test ping).

Procedure to follow when mixing IBM Elastic Storage System 3500 and Elastic Storage System 5000

Here is the sequence of steps that SSRs must follow when you install multiple solutions at one time (for example, consider a new order that includes a p9 EMS and optionally one or more p9 protocol nodes).

Note: Consider racking the ESS POWER nodes first at the bottom and then the x86 (3500) at the top of the frame.

1. Refer to the instructions given at Worldwide Customized Installation Instructions (WCII) as per the configuration you are working on. The table in the WCII shows the steps to be followed for racked and unracked orders. It also shows how to rack any POWER® nodes.
2. Use the *IBM Elastic Storage System 5000 Hardware Guide* in the IBM Documentation to do the following steps:
   a. Complete the installation on POWER9 nodes (including EMS and protocol nodes), and then perform the installation procedure on the ESS 5000 nodes.
   b. After the racking is complete, start with the building block at the bottom, run the ESS Code 20 App tool on each node. Continue for each additional building-block.
   c. Check and configure the POWER9 protocol nodes (if applicable) and the EMS using the same method as the I/O nodes. The EMS and Protocol nodes can be used to test connectivity against each other (ping each other's IP addresses).
3. Use the IBM Elastic Storage System 3500 Hardware Guide on the IBM Documentation website to do the following steps:
   a. Complete the installation procedure of the ESS nodes.
   b. After the racking is complete, start with the building-block at the bottom,
   c. Run the ESS Code 20 App tool point-to-point against each node (starting with canister A on top, then B on bottom).
   d. If you are prompted to provide ping test targets, use the management/service IPs that are configured previously in the rack.
   e. Repeat the above steps for each additional building-block.

If you are adding an ESS 3500 (or ESS 5000) to an existing environment, you should run the ESS Code 20 App against all additional nodes and attempt to ping test against the existing EMS in the environment.

SSR considerations before arriving customer site

This document is intended to be used by SSRs at the customer site to complete installation. The purpose of this document is to instruct the SSR on how to perform Install Complete on one or more IBM Elastic Storage System 3500 building-block(s) (ESS 3500 or ESS 5000). A POWER9 EMS is also required if you are a new ESS customer. Optionally, one or more POWER9 Protocol node(s) can be included in the order.

This section describes the following prerequisites to be considered by SSR before traveling to customer data center.

- Cables required to execute Install Complete.
- Alternative options (B/C/D/E) if there are issues with the primary Install Complete process.

Note:

- Ping tests are performed in this flow to verify that the following are successfully configured:
  - FSP/BMC IP address
  - Canister interlink (IBM Elastic Storage System 3500)
  - Management IP address
- You can ping the EMS at the end of the flow to verify these addresses. If the EMS is unavailable to test you can ping between the canisters (assuming you have access to top-of-rack management switch). The automated Install Complete procedure will help to run ping tests on given target nodes in the environment, as well as the other essential checks on a node, automatically.

Following items may be required for connecting and upgrading code on the server (depending on node type). It is highly recommended to secure and carry all possible cables just in case additional Install Complete methods are required. Refer Appendix G, “Cables/Adapters for SSR activities,” on page 129 for full list of cables and adapters.

Note: At the customer's location, a RJ45 to serial cable (for the management switch) and a serial to USB-A cable are required for node troubleshooting and VLAN modification.

- USB-A to Ethernet adapter (P/N: 0VJ994)

  Note: Any USB-A to Ethernet adapter can be used for this task. This adapter will come in every ESS 3500 order (1 per order). Once Install Complete is done, secure the adapter to frame for possible future service visits.
- To connect to the ESS 3500 server over Ethernet from your laptop, you may need a USB to Ethernet adapter (if an Ethernet port does not exist). For ESS 5000, an Ethernet connection must be used directly between your laptop and the server's C11-T4 port.
- Ethernet cable
- Micro USB to VGA/HDMI adapter

  Note: The adapter enables KVM access if needed.
- Serial (USB mini-B) to USB cable

  Note: The cable allows to connect to the server through serial if Ethernet is not available.
- Optional: USB extension cable helps to increase the length of the USB to serial cable if required.
- Customer has completed TDA worksheet.
  - You can use default IP addresses if the worksheet has not been completed and the customer has confirmed that it does not cause a network conflict.
- On-site configuration of the management switch.
  - For each canister, there must be one free green port and one free yellow port. If additional space is needed, the VLANs must be adjusted or an additional switch should be added. If changes to the management VLAN are needed, this task should be completed before the SSR reaches to the site and identified by using the TDA process.

– ESS 5000 nodes (p9 EMS, p9 protocol, IO) only connect to the yellow (management) and blue (FSP) ports on the switch. The nodes do not need to connect to the green “trunk” ports though the default behavior of those ports are to route traffic to the management (yellow) VLAN.

  Note: There are no specific yellow ports on the dual 24-port switch. Green and yellow ports are shared for these.

- Download Windows or Linux ESS Code 20 App.

  Laptop Setup

  – Create CODE20 folder on your laptop. This directory should be located in the same folder as your login name.

    Windows example: PC > Windows (C:) > Users > < YOUR NAME> >CODE20.

  – ESS Code 20 App (Linux): Box folder

  – ESS Code 20 App (Windows): Box folder

- Download the latest version of ESS Code 20 App update tarball to your laptop (for example, `SSR_CODE20_109.tar.gz`). You can find a direct download link from the ESS Code 20 App (**Help** > **Online resources**) or using the link to box folder.
- Download the latest GA Code tarball to your laptop (for example, `INTERNAL_LICENSED_CODE_6.1.5.0_DME.tar.gz`). Data Access (DAE) and Data Management (DME) are the two editions available. Use the download link available at box folder.

  The installation worksheet specifies which tarball you must download, see “Installation worksheet” on page 89.

Starting ESS Code 20 App Installation process (Common procedure: ESS 3500/POWER9 EMS/ POWER9 Protocol/ ESS 5000)

1. Plug in the power cords (if not done already) to the nodes and boot the operating system.
   a. EMS/Protocol node/ESS 5000: Press the flashing white button in front of the server.
   b. ESS 3500: The node is powered on if the green indicator light on the rear of the server is solid. Press the top grey (small) button to the side of the USB ports if the green indicator light on the back of the server is flashing green. When the light turns solid, the node is powered on.
2. Wait for 5 minutes for the nodes to start up (especially applicable for the node to be checked first). It can take considerably longer for P9 nodes to boot. For visual confirmation that the boot sequence is complete, look at the front LED panel (Power nodes only).
3. Connect the USB-A to Ethernet adapter to the bottom USB port on server canister A/1 (left canister).
   - If you want to check the POWER nodes first, connect an Ethernet cable to the C11-T4 port (no adapter required) and start with the lowest node in the frame.
4. Connect a USB-A or USB-C to Ethernet adapter if your laptop does not contain an Ethernet port.
5. Connect the laptop's Ethernet cable to the canister.
6. Navigate to the folder where ESS Code 20 App is downloaded from the box folder.

   Double-click the executable file.

   Note: If you are using Windows laptop, you may need to disable Windows Defender warnings.

   - Start the ESS Code 20 App front-end application saved on your laptop. Make sure that you have downloaded the latest version of application for your operating system and accept any security warnings that may appear.

   Run the application as administrator. For windows, you may need to disable Windows defender and click **Run anyway**.

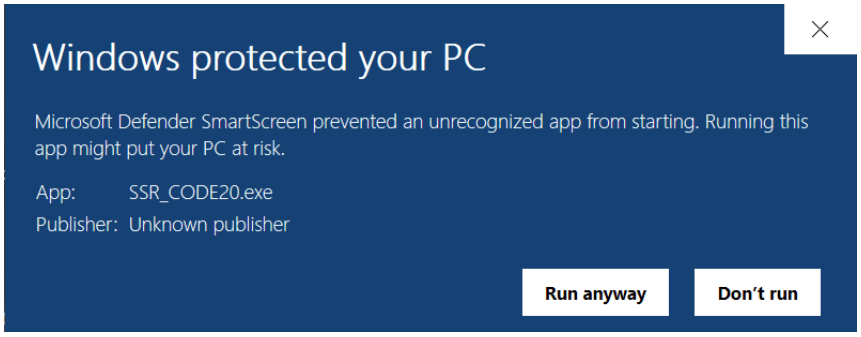
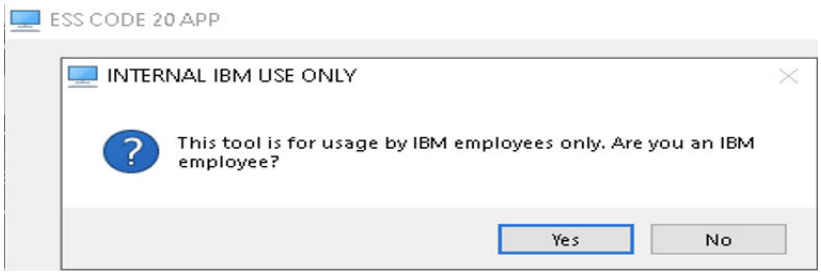


Figure 15. Windows defender screen

- To proceed, a reminder is set that you need the TDA worksheet and to be an IBM employee.



Note: If you confirm that you are not an IBM employee, contact IBM for setup message shown in Figure 17 on page 45.

Figure 16. Confirming IBM employee

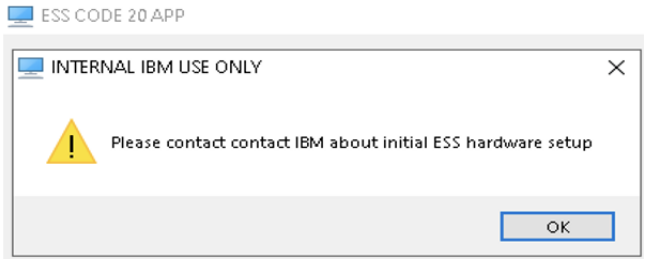
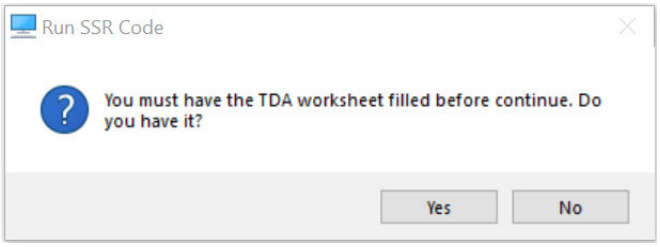


Figure 17. Contacting IBM for setup

- Click **Yes** if you have filled in TDA worksheet.



Note: At this point, if you do not have a valid worksheet, you should stop and consult the customer.

Figure 18. TDA worksheet message

7. On the main screen, verify connection to the server.

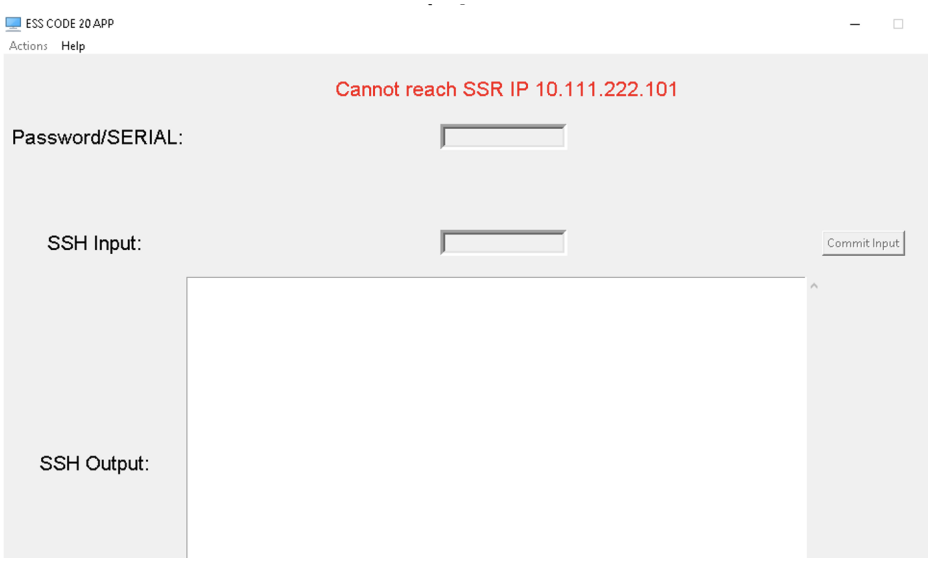


Figure 19. Verifying connection

Note: This check may take a few minutes to complete.

- A proper connection to the SSR port cannot be validated if the IP address at the top remains red.
  a. Confirm that your IP address is set on the USB interface via DHCP to 10.111.222.102, netmask 255.255.255.252.
  b. If the IP is not set, set it manually (should see a USB Ethernet interface). The following example is for a MAC OS.

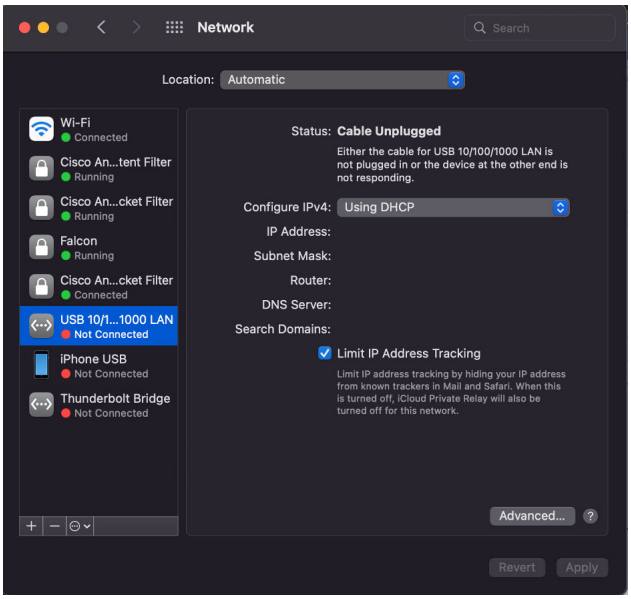


Figure 20. Mac OS USB Ethernet interface

  c. Wait a few minutes to see if the application turns green, otherwise refer Chapter 6, “Troubleshooting (SSR tasks),” on page 79.

- If the IP address at the top turns green, connection to the SSR port is successful.

Figure 21. Valid connection to SSR port

8. If you have not downloaded the required update files, you can navigate to the box folder from the application menu (you must have an Internet connection and valid w3 ID).

a. Click **Help** > **Online resources**. You can view the box folder to download the required files.

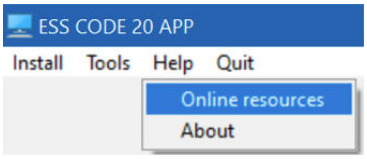


Figure 22. Retrieving required update files

b. Download the latest .tgz files (w3 connection is mandatory).

Example:

- SSR_CODE20_109.tar.gz (for example, SSR code update package)
- INTERNAL_LICENSED_CODE_6.1.5.0_DME.tar.gz (GA code package)

9. Type the **essserv1** password.

Figure 23. Typing essserv1 password

The password is the server serial number + A or B based on left or right canister (rear view). The password for POWER9 nodes is just the serial number (no need to add A or B).

Example: 78E4005A (left canister with serial number 78E4005), 78E4005B (right canister)

10. Copy the updated code on the node.

a. Click **Install** > **Upload SSR CODE 20 file**.

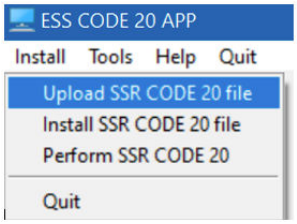


Figure 24. Uploading SSR code20 file

b. Locate the downloaded .tgz file and double-click it to open.

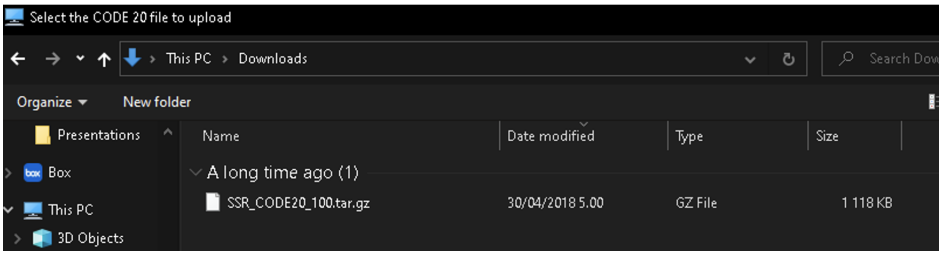


Figure 25. Downloading SSR code20 file

c. The upload progress and messages are displayed.

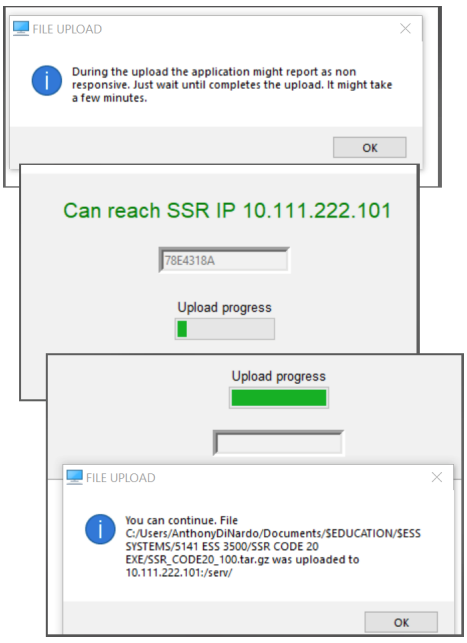


Figure 26. Uploading progress and messages

d. Click **Install** > **Install SSR CODE 20 file**.

Note: Before proceeding, make sure the root password has been set. Otherwise, you will get the following error (The root password does not need to be set by you as the SSR, but if you see the error, log in to the command line as root and set the root password):

```
Last login: Wed May  4 13:34:33 2022 from 10.111.222.102
sudo /opt/ibm/ess/tools/bin/ess_ssr_setup
[essservl@localhost ~]$ sudo /opt/ibm/ess/tools/bin/ess_ssr_setup
ERROR: Cannot do passwordless sudo
[essservl@localhost ~]$
```

Figure 27. Root password error

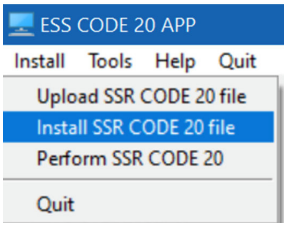


Figure 28. Installing SSR code20 file

Note: This may take a few minutes to update, reboot, and re-establish a connection.

Note: If you see the error above when using Putty, login to the server as root and set a password (use ibmesscluster). Once complete, return to the application and click **Install SSR CODE 20 file** again.

11. Copy the GA Code tarball to the server. An example file name of the GA code tarball is `INTERNAL_LICENSED_CODE_6.1.5.0_DME.tar.gz`

Note: This step should be completed only on one node in the order. If you are deploying only ESS 3500 building-blocks, perform this step on a single canister on the first building-block. If the order includes a POWER9 EMS, perform this step only on POWER9 EMS.

a. Navigate to **Tools** > **Upload licensed internal code**.

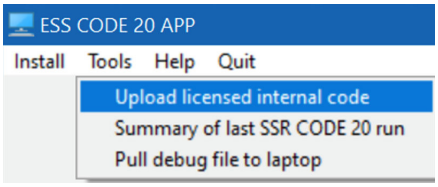


Figure 29. Upload licensed internal code option

b. Proceed with the next steps once the indicator confirms the copy is complete.

12. Run the required automated tasks to execute Install Complete on this node.

    Note: The front-end application assists the SSR in entering worksheet elements (IP addresses and VLAN tags) and allows the SSR to log into the system without having to log in directly (via Putty). The front-end application (recommended) displays the command-line script's SSH output, so either can be utilized.

    Run the following steps on ESS Code 20 App:

    a. Navigate to **Install** > **Perform SSR CODE 20**.

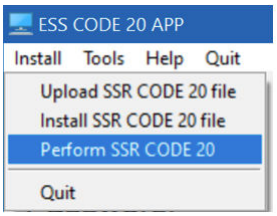


Figure 30. Performing SSR code20

    The back-end script executes automatically, prompts you to give worksheet inputs based on the node type detected (i.e. ESS 3500, POWER9 EMS, POWER9 protocol, ESS 5000).

    b. In the **SSH Input** section, provide script's input (IP addresses).

    c. Click **Command Input** to transfer information from the **SSH Input** to the back-end script.

    The script's output is displayed in the **SSH Output** section.

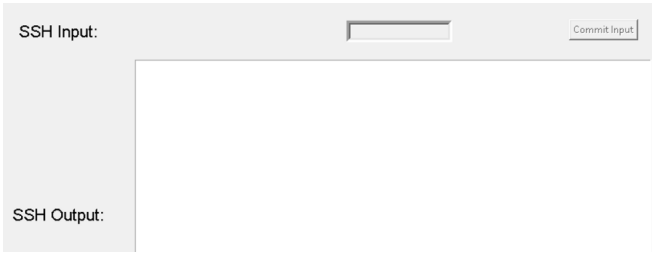


Figure 31. Executing command-line script's SSH output

13. Now, the script will execute all of the required checks automatically. If there are any errors, it will stop, and the SSR should take necessary service action to resolve the issue. Once the issue is resolved SSR should re-run the automated check using **Install** > **Perform SSR CODE 20** option.

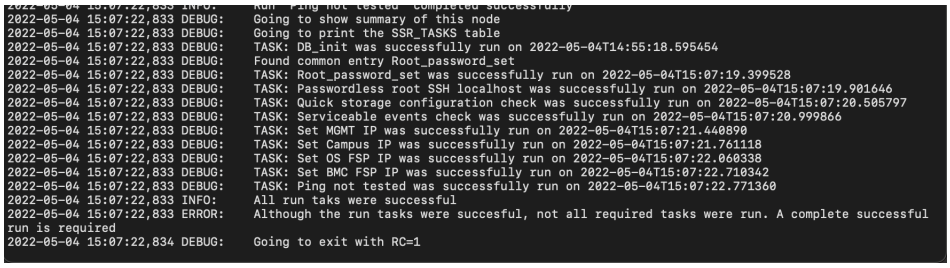


Figure 32. Code20 execution sample output

After completing successful run SSR should disconnect from the current node and repeat the steps for the next node.

- For ESS 3500, go to right server canister and if there are additional building-blocks continue the same steps on the next node.
- For ESS 5000, go to node 2(top) and if there are additional building-blocks continue the steps on the next node.
- If additional POWER9 Protocol nodes move to the next node (above the current node).
- POWER nodes are typically checked first, starting at the bottom of the frame and working up to any x86 nodes (ESS 3500).

Prerequisites for installation completion by SSR

Customers must fill the Installation worksheet for the SSR to start installation. This process must be done by using the Technical Delivery Assessment (TDA) process. The worksheet describes the IP addresses and VLAN tag that the SSR sets on each canister. If the worksheet is not completed, the SSR might confirm with the personnel at the data center and use default IP addresses listed.

Racked or rackless installation:

Note: It is recommended to install IBM Elastic Storage System 3500 in the middle of the rack, not at the bottom. Otherwise, due to its location in the rack and a longer JBOD drawer just above it, servicing IBM Elastic Storage System 3500 becomes very difficult.

- If the system did not come racked, the SSR would rack the necessary components before the installation starts.
- IBM Elastic Storage System 3500 needs to be placed in the rack location provided by the user. For example, EIA 1-2 and 3-4.
  - Each additional IBM Elastic Storage System 3500 unit needs 2U space in the rack.
- The EMS node needs to be racked into the frame.
  - One EMS node is required per IBM Elastic Storage System cluster (3500 and/or 5000).
- Management switch

  IBM Elastic Storage System 3500 has one management and one BMC port per server canister to serve both deployment (operating system level) and service (BMC/BIOS/Power control) functions. The BMC port is also shared for inter-platform communication between canisters.
  - A 1 Gb switch is required.
  - There must be a dedicated switch/subnet for ESS or shared switch with isolated VLANs for ESS.
  - It is recommended to procure this switch from IBM, but customer-provided switch can also be used.

    If the management switch was purchased from IBM and was racked along with the ESS system, setup for VLAN has been done correctly and no further configuration would be required. However, if it did not come racked, the switch would require to be setup with the correct VLAN configuration. For more information about instructions on switch VLAN configuration, see Appendix B, “Switch VLAN configuration instructions,” on page 97 and Appendix C, “Dual 24 port (48 ports) MGMT switch ESS configuration,” on page 105.

    If the switch was not purchased from IBM, there must be two isolated VLANS for ESS management. Do note that the customer provided switch might not be supported by IBM.

    Note: ESS 3500 requires certain ports to be "trunk" ports. On an IBM-sold switch (48 port variety) there are ports 1-12. These ports, when combined with the vlag tag set at the BMC, would route VLAN101 traffic to the BMC vlan. If the switch is a customer-provided, they would need to create these trunk ports and make sure that the proper VLAN tag is set on each canister BMC port.
  - The switch must be placed in the rack, cabled, powered on, and properly VLAN'd for the SSR to start.
- High-speed switch

Note: The switch is not required for SSR to execute Install Complete. The customer is responsible for installing cables.

- 200 Gb Ethernet or 200 Gb InfiniBand is supported (from IBM or customer provided).
- A 40 Gb Ethernet switch can be used with the proper connectors.
- A 40 Gb Ethernet switch can be used with the proper connectors.

Supported connectors per network type:

- EDR cables: QSFP28
- 100 Gb cables: QFSP28 (but different from the EDR cables)
- 40 Gb cables: QSFP+

Note: It is recommended to use IBM branded connectors, especially for the adapter side. When using your own switch, ensure that the connectors are compatible with the switch.

- Ethernet cables (4) run from the 1 Gb or 10 Gb management switch to the POWER9 EMS.

  POWER9 EMS node/Protocol/IO node:

  - Slot C11, Port T1 - EMS management
  - Slot C11, Port T2 - FSP / Service VLAN connection (EMS only)
  - HMC1 port (FSP VLAN connection)
  - C11-T3 campus connection (mandatory to deploy the container during installation - EMS only)
  - HMC2 port campus connection (optional - typically, EMS)
- Ethernet cables (4) run from the 1 GbE management switch to the IBM Elastic Storage System 3500 units (2 per server canister to Ethernet port 1 and 2). Make sure that the IBM Elastic Storage System 3500 connections are cabled to the dedicated ESS 3500 "Trunk" ports that allow traffic to get routed to the proper VLAN. The Port 2 (Bottom) connections run to the "Trunk" (green) ports and the Port 1 (Top) connections run to the Management (Yellow) ports.

Figure 33. Port(s) connections to trunk ports color representation

  - Plug the cable and set the IP address based on the customer specification.

Power

- All the switches have power applied.
- The ESS 5000 node(s) have power applied but in a standby state (flashing light).
- ESS 3500 canisters have power cables that are inserted should boot the node to the O/S. If the canister is in a standby state press the small button on the back (small button on the top, next to the USB ports) to power on the canister.

The SSR must have a laptop with PuTTY version 0.74 or higher installed. The laptop must be able to connect to the RJ45 Ethernet cable by using an Ethernet port or a USB to Ethernet adapter. In addition, the SSR should have the latest front-end executable downloaded to their laptop and the latest updated package.

- An Ethernet cable is required to connect to the EMS, the protocol nodes, and the server canisters.

- The SSR must access each server point-to-point to run hardware and software health checks and set the management and the BMC/FSP IP addresses. For ESS 3500 canisters, the VLAN tag must also be set accordingly.

Detailed installation steps (SSR task)

This section is intended for IBM authorized service personnel only. IBM service support representatives can access service installation information through the links in the following topics.

Note: An IBM intranet connection is required.

ESS system view

Components required to set up EMS

For information on the components required to set up EMS, see Before Installation (Sections 1 through 8) on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

ESS system network connection diagram

For information on the ESS system network connection diagram, see Section 2.3.1 - ESS network connection diagrams on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

Management Server description and feature table

For information on the Management Server description and feature table, see Section 2.3.2 - 5105-22E Management Server description and feature table on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

Technical and Delivery Assessments (TDAs)

For information on the Technical and Delivery Assessments (TDAs), see Section 3.1 - ESS - Technical and Delivery Assessments (TDAs) on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

Rack details

Prepare the rack for installation work

For information on preparing the rack for installation work, see Section 10.2 - Prepare the rack for installation work on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

Verify the position and installation of new system racks

For information on verifying the position and installation of new system racks, see Section 10.3 - Verify the position and installation of new system racks on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

Installing the EMS server in a rack

For information about the instructions to install an EMS server on a rack, see Installing, removing and replacing customer-installable parts.

Unpacking IBM Elastic Storage System 3500 (IBM SSR task)

Before you unpack IBM Elastic Storage System 3500, ensure that you have reviewed and followed all the related instructions.

The IBM Elastic Storage System 3500 system and related parts are shipped preinstalled in the enclosure:

- The IBM Elastic Storage System 3500 system comes preinstalled with the following components:
  - Two server canisters with adapters and memory feature codes
  - Two power modules
  - Six 60 mm single impeller fans
  - 12 or 24 disks
  - Network adapters (Depends on order)
  - Interface cables (if ordered)
- Rail kit that includes:
  - One left adjustable rack mounting rail
  - One right adjustable rack mounting rail
  - Four M4 x 4 Philips screws
  - Eight #10 32 X 14.5 round hole rack screws
  - Two M5 X 9 Philips shipping screws
- Left and right bezel ear caps
- Cable Management Assembly (CMA)

Note: You might need a box knife to unpack the IBM Elastic Storage System 3500 system.

CAUTION: To lift the assembled enclosure, two persons are required unless a suitable lifting equipment is available or the enclosure is unpacked and dismantled as described in the procedure.

Perform the following steps to unpack the IBM Elastic Storage System 3500 system:

1. Cut the box tape and open the lid of the shipping carton.
2. Remove the rail kit box and set them aside in a safe location.
3. Remove the cable management assembly kit box and set them aside in a safe location.
4. Lift the bezel kit box and set them aside in a safe location.
5. Lift the front and rear foam packing pieces from the carton.
6. Remove the four corner reinforcement pieces from the carton.
7. Using the box knife, carefully cut the four corners of the carton from top to bottom.
8. Fold the sides and back of the carton down to uncover the rear of the IBM Elastic Storage System 3500 system.

   If necessary, carefully cut along the lower fold line of the sides and remove them.
9. Carefully cut the raised section of the foam packing away from the rear of the enclosure.
10. Carefully cut open the bag covering the rear of the enclosure.
11. Remove the left power module from the enclosure.
12. Record the last six digits of the serial number on the back of the power supply, and then set the power supply aside.
13. Remove the right power module, record its serial number, and set it aside.
14. Remove the left server canister from the enclosure.
15. Record the serial number (on the side of the canister) and the BMC Mac address (on the release handle), then set the canister aside.
16. Remove the right server canister, record its serial number (on the side of the canister) and the BMC Mac address (on the release handle), and then set it aside.

17. Lift the enclosure from the shipping carton.

Installing support rails for the IBM Elastic Storage System 3500 system (IBM SSR task)

Before you install the IBM Elastic Storage System 3500 system, you must first install the support rails for it.

To install the support rails for the IBM Elastic Storage System 3500 system, complete the following steps:

1. Locate the IBM Elastic Storage System 3500 system rails.

   The rail assembly consists of two rails that must be installed in the rack cabinet.

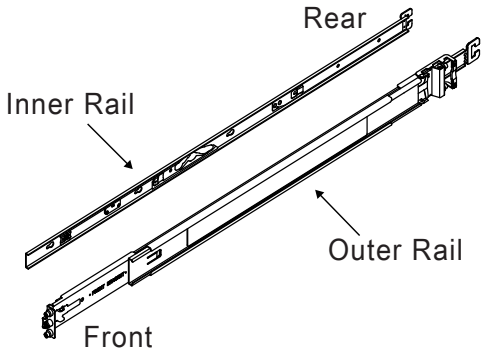


   Figure 34. Rail assembly

   Note: The rail kit accommodates racks with square or round rack post holes. Preparation for each type is nearly identical to the exception that round post holes would require different set of screws. No changes are necessary for racks with square rack post holes.

2. For racks with round post holes, remove the eight preinstalled screws (used for racks with square post holes) from the front and rear ends of the two rails as shown in the following figure.

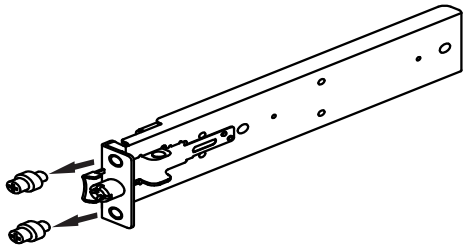


   Figure 35. Removal of square post screw

3. Install the eight screws (used for racks with round post holes) on the front and rear ends of the two rails as shown in the following figure.

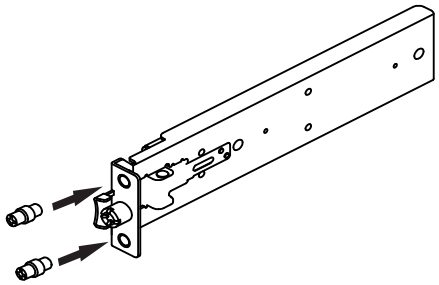


   Figure 36. Installation of round post screw

   Note: Before the rail kit is installed, the inner chassis member rails must be separated from the outer cabinet member rail.

4. Remove the inner rail from the left outer rail as follows:

   a) Slide the inner rail out from the left outer rail until you hear an audible click.

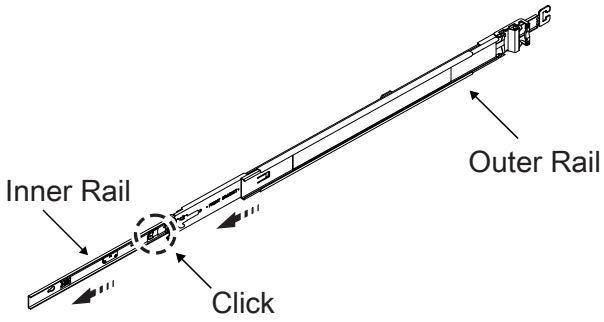


Figure 37. Removal of the inner rail

b) Pull the release tab on the inner rail forward as shown in the following figure.

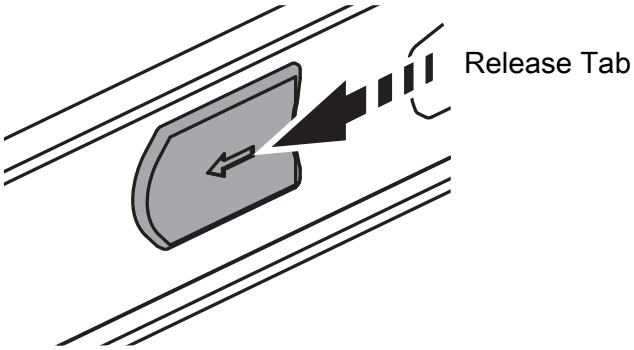


Figure 38. Release tab

c) Remove the inner rail from the left outer rail and set aside.

5. Repeat the removal steps of inner rail from left outer rail to remove the other inner rail from the right outer rail.
6. Install the left outer rail on the rack post as follows:
   a) Align the left rear bracket mounting screws with the appropriate rear rack post holes as shown in the following figure.

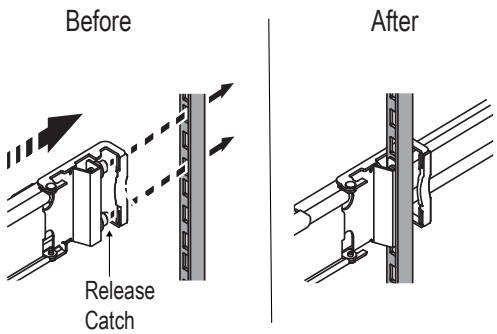


Figure 39. Installation of left rear bracket

   b) Press and hold the release catch and push the bracket into place so that the mounting screws can be installed securely into the rack post holes.
   c) Release the catch to secure the rail to the post once the screws are fully inserted.
   d) Align the left front bracket mounting screws with the appropriate rack post holes in the front left rack post. Ensure that the rail is level before you continue.

e) Secure the rear end of the left outer rail to the rack using the M5 shipping screw that comes with the supplier rail kit.

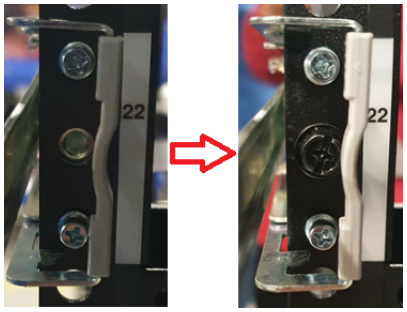


Figure 40. Securing the rear end of the left outer rail

f) Remove the middle screw (as shown in the following figure) from the front end of the left outer rail using a flat tip screwdriver.

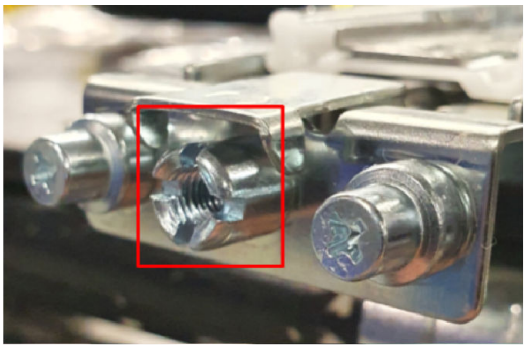


Figure 41. Removal of the middle screw

g) Push and hold the release catch outward and insert the left front bracket mounting screws into the left front rack post holes. Verify that the rail is level.

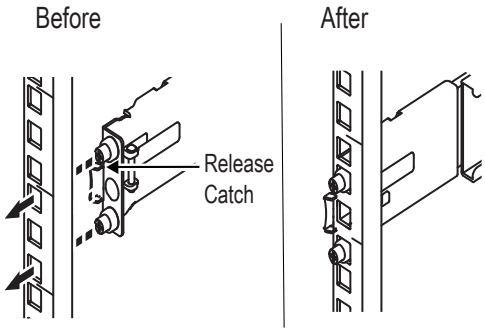


Figure 42. Installation of the front bracket

h) Once the mounting screws are fully inserted into the rack post holes, release the catch to secure the rail to the post.

i) Install the middle screw on the front end of the left outer rail as shown in the following figure.

Figure 43. Securing the front of the rails

7. Repeat the installation steps of left outer rail to install the right outer rail on the rack post.
8. Install the inner rail on the right side of the enclosure as follows:
   a) Align the large section of the keyholes on the right inner rail with the standoffs on the right side of the chassis. See the following figure.

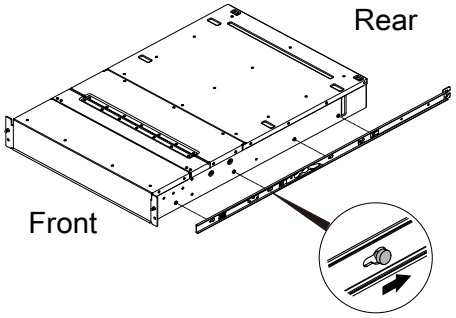


Figure 44. Standoffs aligned with the keyholes

   b) Slide the rail toward the back of the enclosure to secure the standoff on the smaller section of the keyhole to lock the rail in place, which is accompanied by an audible click. See the following figure.

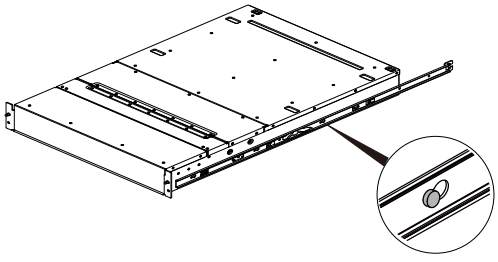


Figure 45. Standoffs secured over the keyholes

   c) Secure the rail in place by using one of the M4 screws in the hole just behind the release tab. See the following figure.

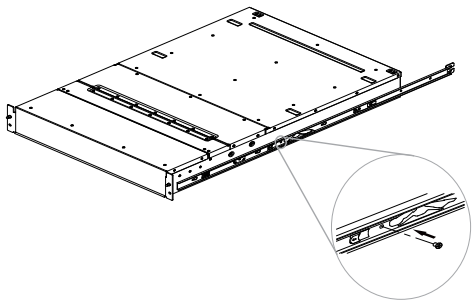


Figure 46. Securing the rail

d) Repeat the installation steps of inner rail on right side of the enclosure to secure the other inner rail on left side of the enclosure.

Installing enclosures (IBM SSR task)

Following your enclosure location plan, install the IBM Elastic Storage System 3500 system.

CAUTION:

- To lift an IBM Elastic Storage System 3500 system requires at least two people. To reduce the enclosure weight to permit one person to safely lift the enclosure, you must temporarily remove the server canisters, power modules, and all drives from the enclosure.
- Install an IBM Elastic Storage System 3500 system only onto the IBM Elastic Storage System 3500 system rails supplied with the enclosure.
- Load the rack from the bottom up to ensure rack stability. Empty the rack from the top down.

To install an enclosure, complete the following steps:

1. Align the enclosure both horizontally and square to the rails, while facing the front of the IBM Elastic Storage System 3500 as shown in the following figure.

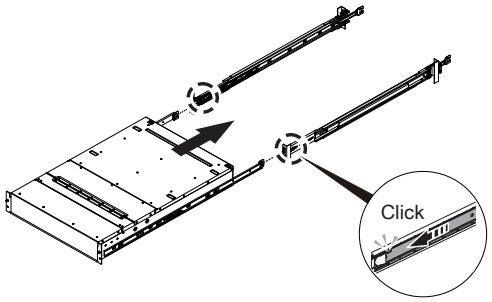


Figure 47. Alignment of the enclosure

2. Ensure that the ball bearing retainers are at the front of the left and right cabinet member rails. This is followed by an audible click.
3. Insert each inner rail into the rack cabinet as shown in the following figure.

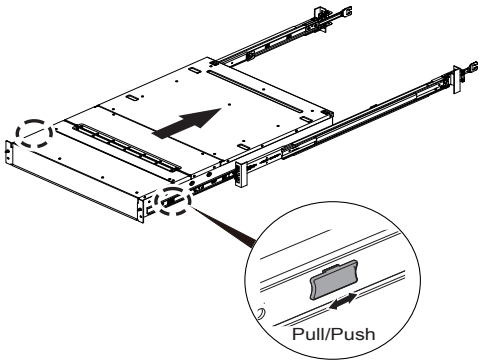


Figure 48. Inserting the enclosure

4. Install the two bezel ear caps on the enclosure as follows:
   a) Place the left bezel ear cap on the left side of the enclosure and align the mounting holes as shown in the following figure.

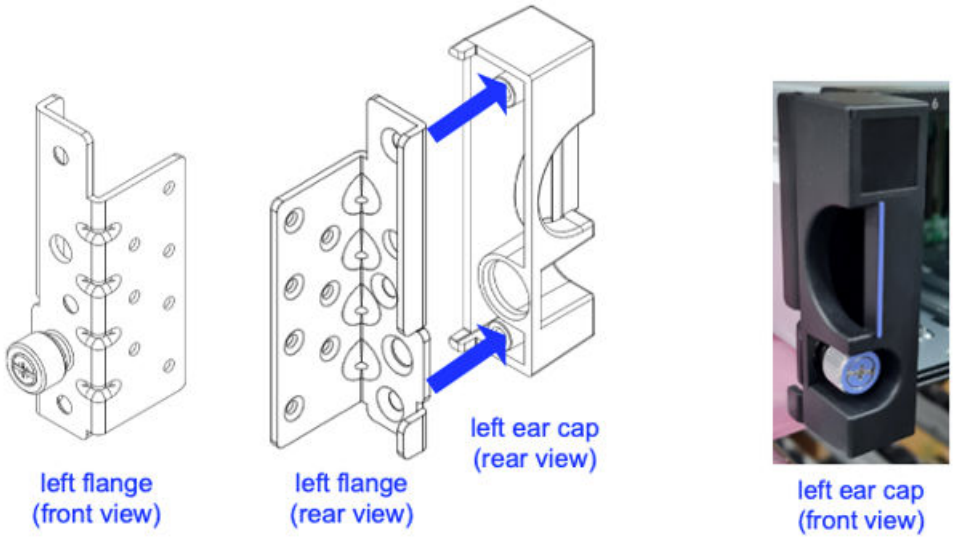


Figure 49. Replacing left ear cap

   b) Install the two screws on the rear side of the left bezel ear cap as shown in the following figure.

Figure 50. Displaying left ear cap front view

   c) Repeat the above steps to install the right bezel ear cap on the right side of the enclosure.

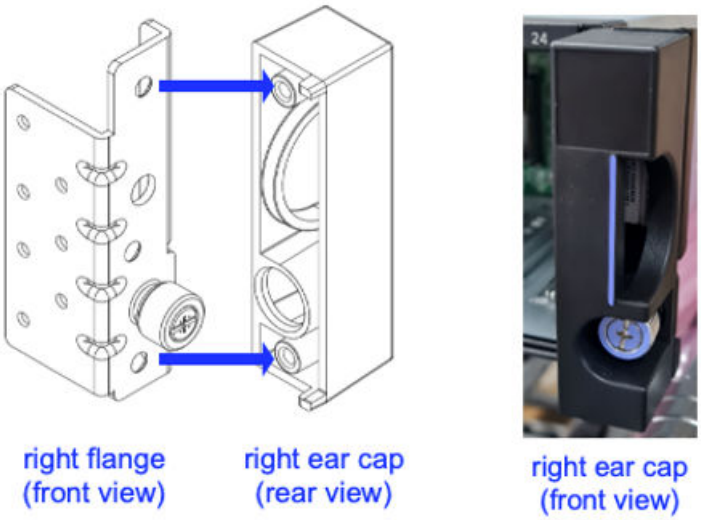


Figure 51. Replacing right ear cap

5. Push the enclosure into the rack while pulling the outer rail until the outer and the inner rails lock into the serviceable position. This is accompanied by an audible click.
6. Press the release tab and push the enclosure fully into the rack.

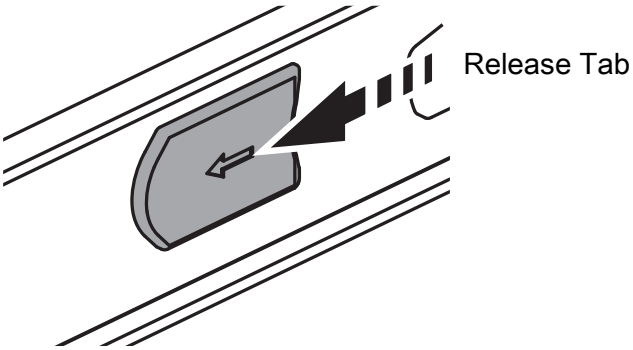


Figure 52. Release tab

7. Secure the enclosure on the left and right front of the enclosure to the left and right front rack posts by using the two M5 X 9 shipping screws as shown in the following figure.

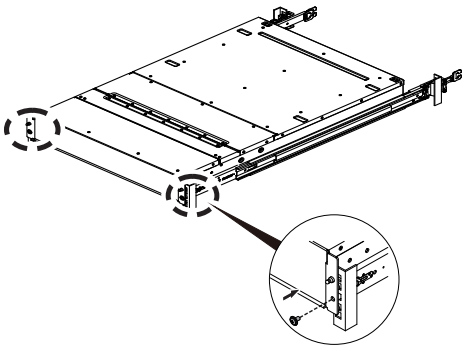


Figure 53. Securing the enclosure

At this point, the rails and IBM Elastic Storage System 3500 enclosure are installed. The enclosure is mounted on the rail with all the components that were removed, reinserted into the slots.

Installing cable management assembly (IBM SSR task)

The cable management assembly (CMA) aids in better routing and securing of the system's cabling. The CMA enables the storage enclosure easily slid in and out of the rack for drive installation or replacement without disconnecting the cables from the power modules or server canisters. A properly installed CMA prevents cable tangling and interference with other components in the rack, allowing for smooth operation of the rails.

Note: If the CMA is preinstalled, the CMA would be secured by a strap to the cross bar during transportation to avoid damage. This strap must be removed before installation.

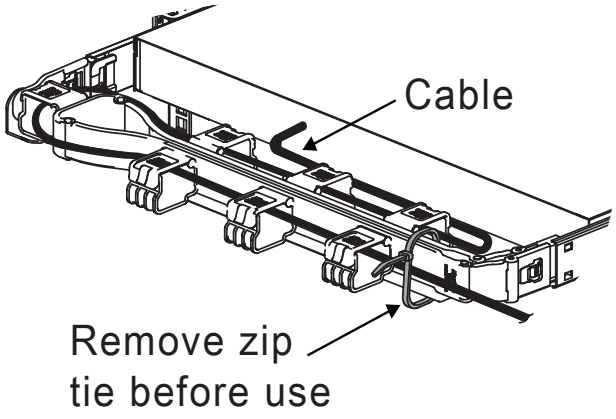
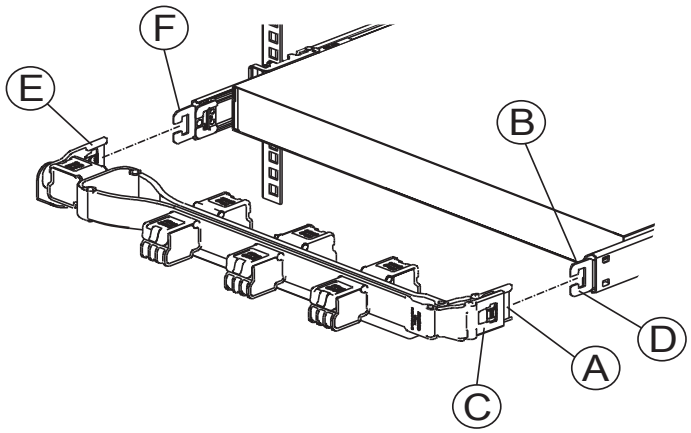


Figure 54. Cable management assembly

1. Verify the direction of the CMA arm as shown in the following figure.



A - Inner CMA arm connector

B - Inner rail connector

C - Outer CMA arm connector

D - Outer rail connector

E - CMA body connector

F - CMA body rail connector

Figure 55. Cable management assembly installation

2. To change the direction of the arm for use on the opposite side of the enclosure, press the release buttons on the outside of the CMA elbow and rotate the arm 180 degrees.

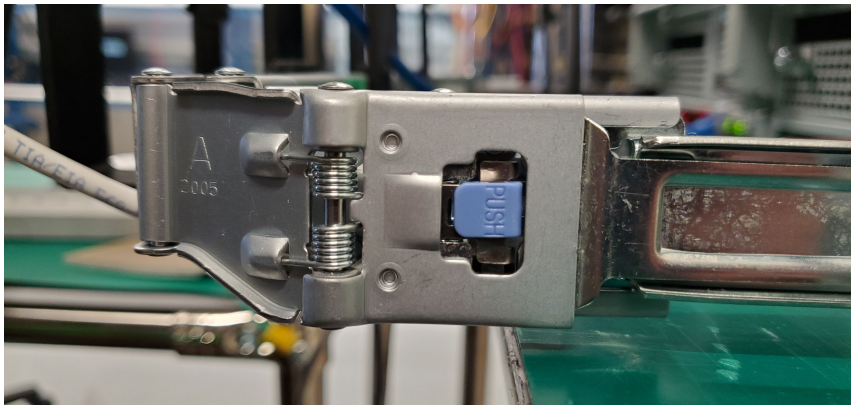


Figure 56. CMA release buttons

3. Slide the inner CMA arm connector (A) onto the lower right inner rail connector (B) as shown in the following figure.

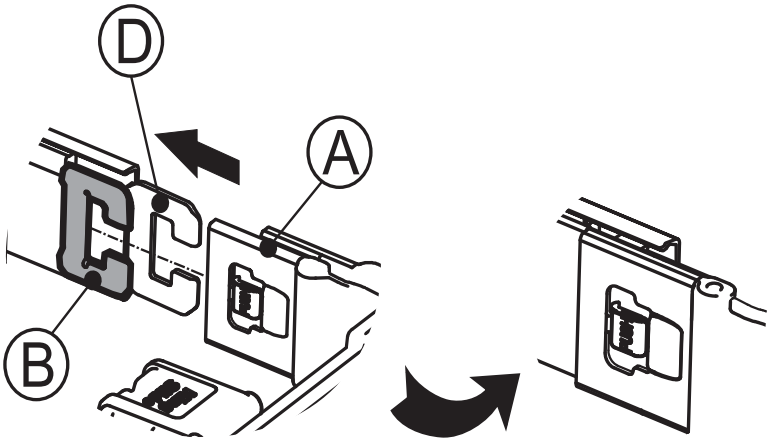


Figure 57. Installing inner CMA arm connector on inner rail connector

4. Slide the outer CMA arm connector (C) onto the lower right outer rail connector (D) as shown in the following figure.

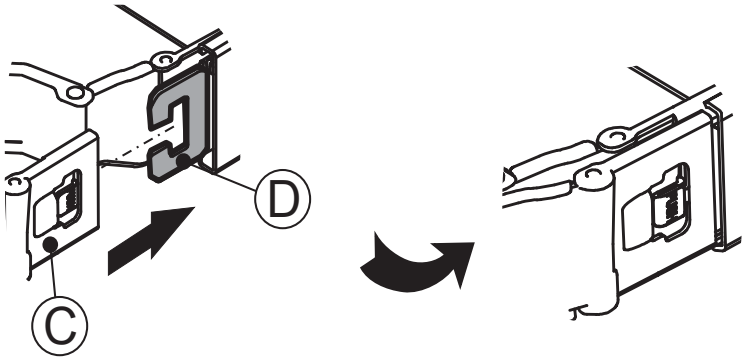


Figure 58. Installing outer CMA arm connector on outer rail connector

5. Slide the CMA body connector (E) onto the lower left CMA body rail (F) as shown in the following figure.

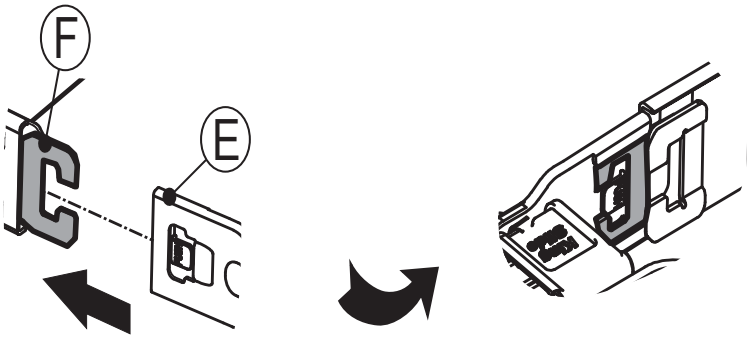


Figure 59. Installing CMA body connector (E) on the left CMA body rail

6. Connect the cables to the appropriate ports on the server canister operator panels and the jacks for the power modules. Do not connect the power cords to a power module now.
7. Starting with the thickest gauge cable first, run each cable through the loops on the CMA.
8. Test the CMA to ensure smooth operation. Ensure that the cables do not have pinching or bindings.

   Note: When you pull the enclosure from the rack, the rails lock in the serviceable position. To release the rails from the serviceable position, press the release tab on each inner member rail and simultaneously push the enclosure into the rack.

Connecting the components (IBM SSR task)

After installing rails and the IBM Elastic Storage System 3500 enclosure in the rack, the next step is to connect to the power and network.

Connecting Ethernet cables to the server canisters

To provide the system management connectivity for your system, you must connect the Ethernet cables to Ethernet port of each server canister in IBM Elastic Storage System 3500.

Connect Ethernet port of each server canister in the system to the IP network that will provide the connection to the system management interfaces, as shown in the following figure.

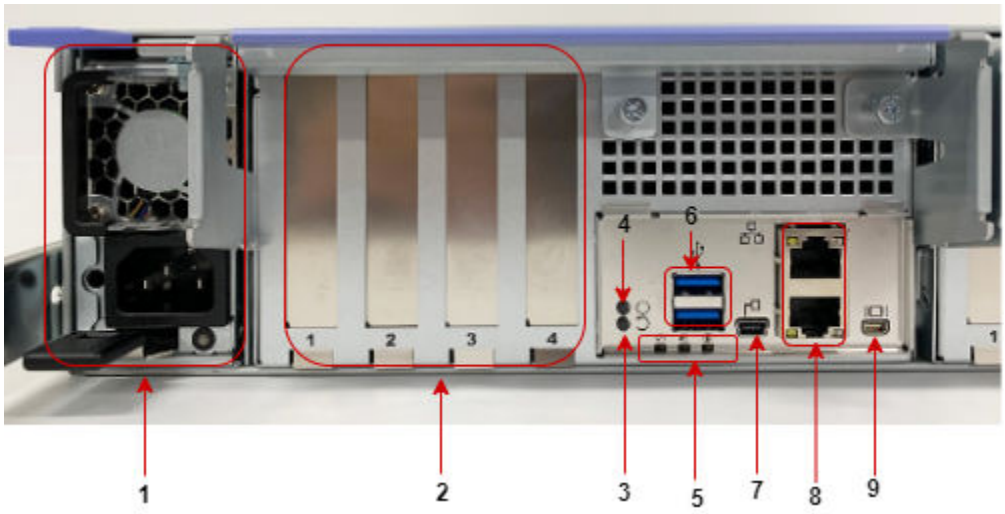


Figure 60. Orientation of ports on IBM Elastic Storage System 3500

The following table explains the connection options.

Table 19. Ports on ESS 3500

Item number	**Feature**	**Description**
1	Power module	Provides power supply to the system. One per canister
2	PCIe Gen 4 Add-in Card Slot	Provide slots up to four x16 PCIe Gen 4 card(s) per server canister.
3	CPU reset	Allows operator to reset CPU. If CPU is reset, canister reboots.
4	Power button	Provides power on/off option.
5	Server canister panel LEDs	Provides status of server canister.

Table 19. Ports on ESS 3500 (continued)		
Item number	**Feature**	**Description**
6	USB 3.1 Gen 1 type A Access Port for USB to Ethernet adapter	Provides two USB 3.1 Gen 1 type A ports for high-speed data transfer rates. The lower port is used for SSR port. It provides the SSR access to the operating system for system setup and configuration. Fixed IP address from factory gets assigned when SSR cables are inserted for service and hardware configuration. Use the following credentials to access canisters: **User ID: essserv1** User ID will be same for both canisters. **Password: <{Enclosure serial number}A|B>** For example, if the enclosure serial number is 01YM312, the password for the left canister will be 01YM312A or 01YM312B for the right canister. Serial number of the enclosure can be obtained from the front tag located at the left side of the enclosure.
7	USB Mini-B Console Port	Provides a serial console connection to BMC. **User ID: sysadmin** **Password: <{Enclosure serial number}A|B>**
8	1 GbE RJ45 Port	Provides two 1 GbE RJ45 ports. The top port is management port and the bottom port is BMC port.
9	BMC Micro HDMI Display Port	Provides for a micro HDMI video connection to the BMC.

Powering on the system

After you install all the hardware components, you must power on the system and check its status.

Attention: Do not power on the system with any open bays or slots. Open bays or slots disrupt the internal air flow, causing the drives to receive insufficient cooling.

- Every unused drive bay must be occupied by a filler panel.

- Filler panels must be installed in all empty host interface adapter slots.

Use the supplied power cords mentioned in Table 4 on page 26 to connect both power modules of the enclosure to their power sources.

If the power sources have circuit breakers or switches, ensure that they are turned on. The enclosure does not have power switches.

Note:

- Each enclosure has two power modules. To provide power failure redundancy, connect the two power cords to separate power circuits.
- Ensure that each power cable is secured to each power module on the back of the enclosure.

Next, you can connect Ethernet to USB adapter to the bottom USB-A port on the canister and checkout the hardware.

Connecting an Ethernet to USB adapter to the SSR access port (IBM SSR task)

Before you check the system, you must connect an Ethernet to USB adapter to the SSR access port on the IBM Elastic Storage System 3500.

1. Locate the SSR access ports on IBM Elastic Storage System 3500, as shown in the following figure.

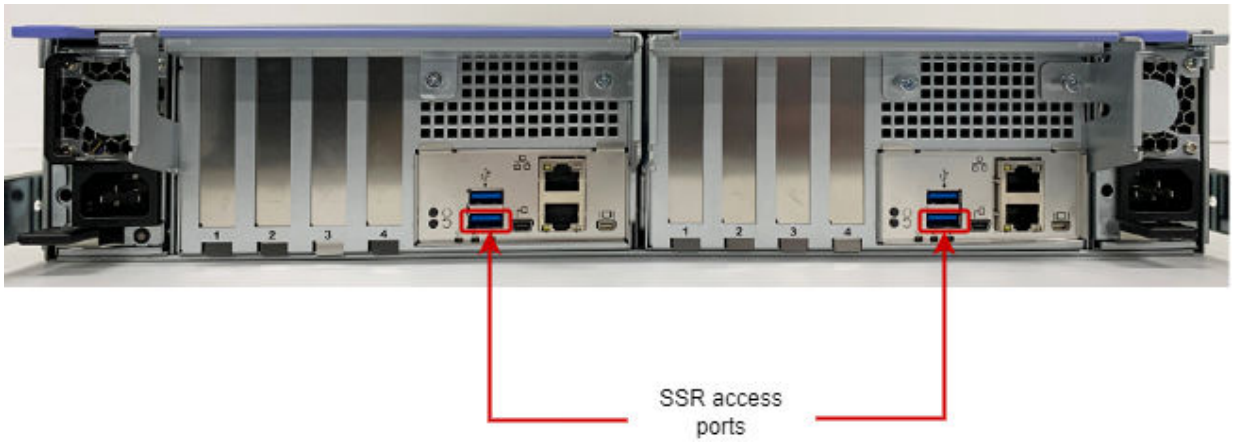


Figure 61. SSR access port

2. Connect an Ethernet cable into the Ethernet port of the USB to Ethernet cable. The cable must be long enough to easily connect to a Notebook computer. The USB-A connection is inserted into the bottom USB port on the canister (SSR access port).

Figure 62. USB to Ethernet cable

3. The other end of the Ethernet cable is plugged into your laptop. If you are using Mac and it does not have the Ethernet port, use a USB-C to Ethernet adapter.

Figure 63. USB-C to USB-A adapter

4. Complete the steps outlined in the "SSR considerations before arriving customer site" on page 43.

Install and connect management server 5105-22E

For information about installing the management server, see Install and connect Management Server 5105-22E on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

Connect power cords to rack PDUs

For information, see Connect power cords to rack PDUs on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

ESS 5000 SCx/SLx network cabling

In case your configuration includes ESS 5000 with SCx or SLx network cabling, see the following links:

- For information about 5147-SCx networking cabling, see ESS SCx network cabling on the *IBM Worldwide Customized Installation Instructions (WCII)* website.
- For information about 5147-SLx networking cabling, see ESS SLx network cabling on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

Connect AC (wall) power to the rack PDUs

For information, see Connect AC (wall) power to the rack PDUs on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

Power On switches, storage enclosures, and servers

For information, see Power On switches, storage enclosures, and servers on the *IBM Worldwide Customized Installation Instructions (WCII)* website.

Check servers with ESS Code 20 App tool

You can check servers using ESS Code 20 App tool.

The latest ESS Code 20 App (Windows/MAC/Linux) is available at box folder.

Best practices for network configuration (Customer reference task)

Use this section for best practices and guidance when you fill out the Installation worksheet.

Using these best practices, the customer is aided to select IP addresses for the management interfaces and fill out the Installation worksheet. This information from the customer is required for the SSR to pre-set the required IP addresses needed for successful storage deployment. Once the SSR is finished,

the hardware and management networking is ready for the next phase of the install (Quick deployment guide), see the *Quick Deployment guide* in the IBM Elastic Storage System 3500 Documentation website.

The SSR takes the input from the worksheet and implements the requested IP addresses. The information below is general guidance and is purely for example reasons. If the SSR does not receive desired IP addresses at time of hardware installation, they would set default IP addresses on the server canister (Check with the customer first to confirm that the addresses do not cause a network conflict).

Management server best practices (EMS)

Ensure that each IP in the worksheet is on the same subnet. Recommended subnet is /24 (255.255.255.0).

Management Network IPs:
Subnet: 192.168.45.0/24
IP address: 192.168.45.20
Netmask: 255.255.255.0

FSP Network IPs:
Subnet: 10.0.0.0/24
IP address: 10.0.0.1 (C11-T2)
IP address: 10.0.0.100 (HMC1)
Netmask: 255.255.255.0

POWER9 EMS

Table 20. EMS management connections

Physical interface	**Logical interface**
Port C11-T1	mgmt
Port C11-T2	fsp
Port C11-T3	campus
Port C11-T4	ssr

Left canister best practices

Ensure that each IP in the worksheet is on the same subnet. Recommended subnet is /24 (255.255.255.0).

Management Network IPs:
Subnet: 192.168.45.0/24
IP address: 192.168.45.30
Netmask: 255.255.255.0

- Logical interface: mgmt
- Physical interface: Port 1 (Top port)

BMC Network IPs:
Subnet: 10.0.0.0/24
IP address: 10.0.0.121(BMC)
Netmask: 255.255.255.0
VLAN tag: 101
Assigned Interlink IP: 169.254.1.3/29

- Logical interface: interlink
- Physical interface: Port 0 (Bottom port)

Right canister best practices

Ensure that each IP in the worksheet is on the same subnet. Recommended subnet is /24 (255.255.255.0).

Management Network IPs:
Subnet: 192.168.45.0/24
IP address: 192.168.45.31
Netmask: 255.255.255.0

- Logical interface: mgmt
- Physical interface: Port 1 (Top port)

BMC Network IPs:
Subnet: 10.0.0.0/24
IP address: 10.0.0.122 (BMC)
Netmask: 255.255.255.0
VLAN tag: 101
Assigned interlink IP: 169.254.1.4/29

- Logical interface: interlink
- Physical interface: Port 0 (Bottom port)

ESS 3500 Solution configurations

IBM Elastic Storage System 5141 - FN2 Server Enclosure supports three solution configurations: Performance, Capacity, and Hybrid.

Performance Configuration

A single IBM Elastic Storage System 5141 - FN2 Server Enclosure with 12 or 24 NVMe-attached SSD drives serves as the data storage component of the performance configuration.

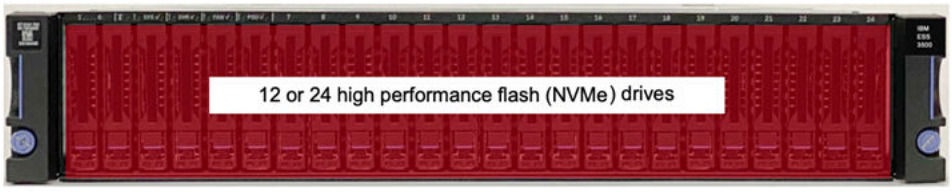


Figure 64. Performance configuration

For more information, see *Capacity and Hybrid configurations* of the *Overview* chapter in *ESS 5147 - 102 Hardware Planning and Installation Guide*.

Chapter 5. Monitoring the system using LEDs

The section provides information about LED based monitoring of IBM Elastic Storage System 3500. The chapter guides customers to use LEDs for monitoring and maintenance of the system.

The following components of IBM Elastic Storage System 3500 support LED-based monitoring:

- System status
- Drive carrier assembly
- Fan module
- Power module
- Server canister

System status LEDs

System status LEDs provide status of IBM Elastic Storage System 3500.

Ten status LEDs are available along the upper-left edge on the front of the enclosure, just above the drive bays as shown in Figure 65 on page 71. From left of the enclosure, the first three LEDs provide status of FRUs that are not visible from the cold aisle—the fans, server canisters, and power modules.

The next six LEDs provide status of FRU groups and direct the user to the appropriate FRU for further investigation when there is a fault. The last LED on the enclosure is not in use.

The following figure shows system status LEDs on an IBM Elastic Storage System 3500 enclosure:

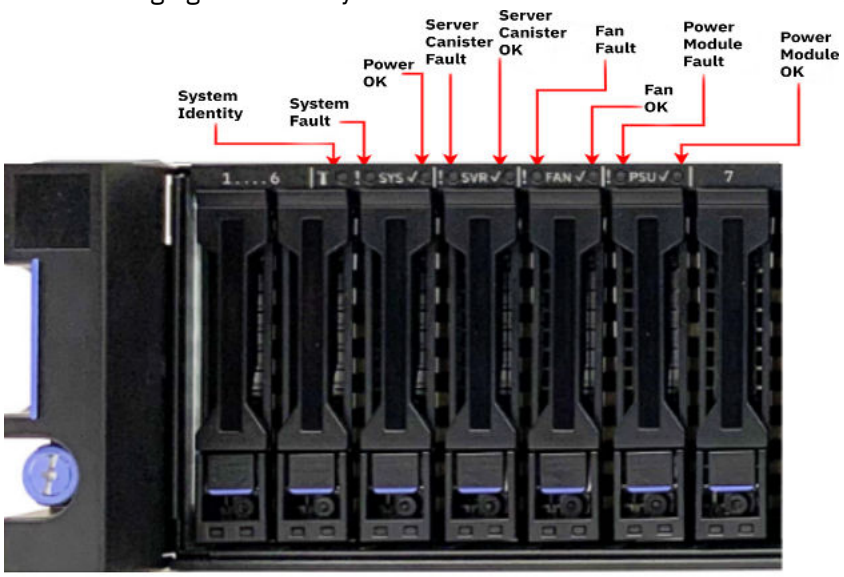


Figure 65. System status LEDs on an IBM Elastic Storage System 3500 enclosure

The following figure shows the location of each LED available on an IBM Elastic Storage System 3500 enclosure from left to right:

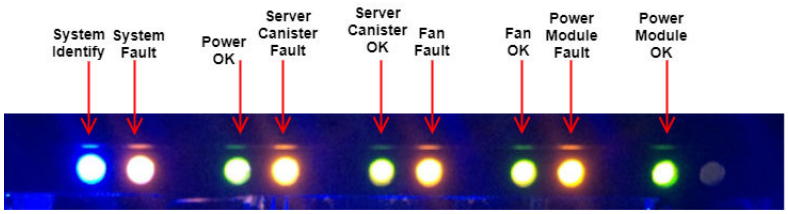


Figure 66. Displaying system status LEDs on an IBM Elastic Storage System 3500 enclosure

Table 21 on page 72 describes the behavior of system status LEDs according to their position on an enclosure from left to right as shown in Figure 66 on page 71.

Table 21. Behavior of system status LEDs

LED Type	Color	Behavior
System Identify	Blue	ON - The enclosure is receiving an identify command. OFF - The enclosure is not receiving an identify command.
System Fault	Amber	ON - One or more components within the enclosure experience a fault that requires a service action. OFF - No detectable faults are present in the enclosure.
Power OK	Green	ON - The enclosure is powered on and operating correctly. OFF - The enclosure is not powered on.
Server Canister Fault	Amber	ON - One or more server canisters experience a fault that requires a service action.
Server Canister OK	Green	ON - Both server canisters are powered on and operating correctly.
Fan Fault	Amber	ON - One or more fan modules experience a fault that requires a service action.
Fans OK	Green	ON - All fan modules are powered on and operating correctly.
Power Module Fault	Amber	ON - One or more power modules experience a fault that requires a service action.
Power Module OK	Green	ON - Both modules are powered on and operating correctly.

Drive carrier assembly LEDs

Each drive carrier assembly of IBM Elastic Storage System 3500 includes a set of LEDs that are visible from the bottom of the drive carrier. On system startup, the green LED illuminates automatically.

The drive status LEDs on a drive carrier shown in the following figure.

Figure 67. Drive status LEDs on an IBM Elastic Storage System 3500 drive carrier

The following table describes the behavior of drive carrier assembly LEDs of IBM Elastic Storage System 3500.

Table 22. IBM Elastic Storage System 3500 LEDs behavior

LED Type	Color	Behavior
Identify LED	Blue	ON (Solid): The SSD has been identified (with Green LED) or in replace state. OFF: The SSD is not in Identify or Replace state.
Drive carrier (bi-color, Green/Amber) LED	Green	Solid: Refers drive power. There are no detectable faults. Flash: The drive LED flashes green for an activity.
	Amber	ON: The drive is in Failing state.
	OFF	The SSD does not have any power.

Fan module LEDs

The IBM Elastic Storage System 3500 includes three LEDs with each of the six fan modules. The available LEDs are of blue, amber, and green color. These LEDs are used to monitor fan modules.

Note: To get access to the fan, requires the removal of the fan cover screw.

On system startup, the green LED illuminates automatically until the system is initialized completely. The following figure shows fan module LEDs.

Figure 68. IBM Elastic Storage System 3500 fan LEDs

The following table describes the behavior of IBM Elastic Storage System 3500 fan LEDs.

Table 23. IBM Elastic Storage System 3500 fan LEDs

Blue	**Amber**	**Green**	**Behavior**
OFF	OFF	ON	The fan module is functioning properly.
OFF	ON	OFF	A fan module fault is detected.
ON	OFF	ON	An identify command is being issued to the fan.

Power module LEDs

These LEDs are used to monitor power modules of the IBM Elastic Storage System 3500.

The power module status LEDs are visible from the rear of the enclosure. The following figure provides a close view of the power module status LED.

Figure 69. IBM Elastic Storage System 3500 power module status LED

The following table describes bi-color power module status LED behavior.

Table 24. IBM Elastic Storage System 3500 power module status LED		
Green Color	**Amber Color**	**Behavior**
ON	OFF	Power module ON and OK.
OFF	OFF	No AC power to all power modules.
OFF	ON	A power module critical event is causing shutdown. Also, indicates the AC power cord is unplugged.
OFF	Flashing 0.5 Hz	Indicates high temperature, hot spot temperature, slow fan, high current, or high-power warning in power module. In this condition, power module continues to operate.
Flashing 0.5 Hz	OFF	Power module is in standby state. AC present, 12 V standby ON/PSU OFF. PSU is in smart redundant state.
Flashing 2.0 Hz	OFF	Indicates that the firmware is in update mode.

Server canister LEDs

The IBM Elastic Storage System 3500 server canister consists three status LEDs on the bottom of the server canister operator panel. In addition, two Ethernet port LEDs per Ethernet port (four LEDs) are located to the right of the server canister status LEDs. These LEDs are used to monitor the status of server canister and Ethernet ports.

The following figure shows server canister LEDs.

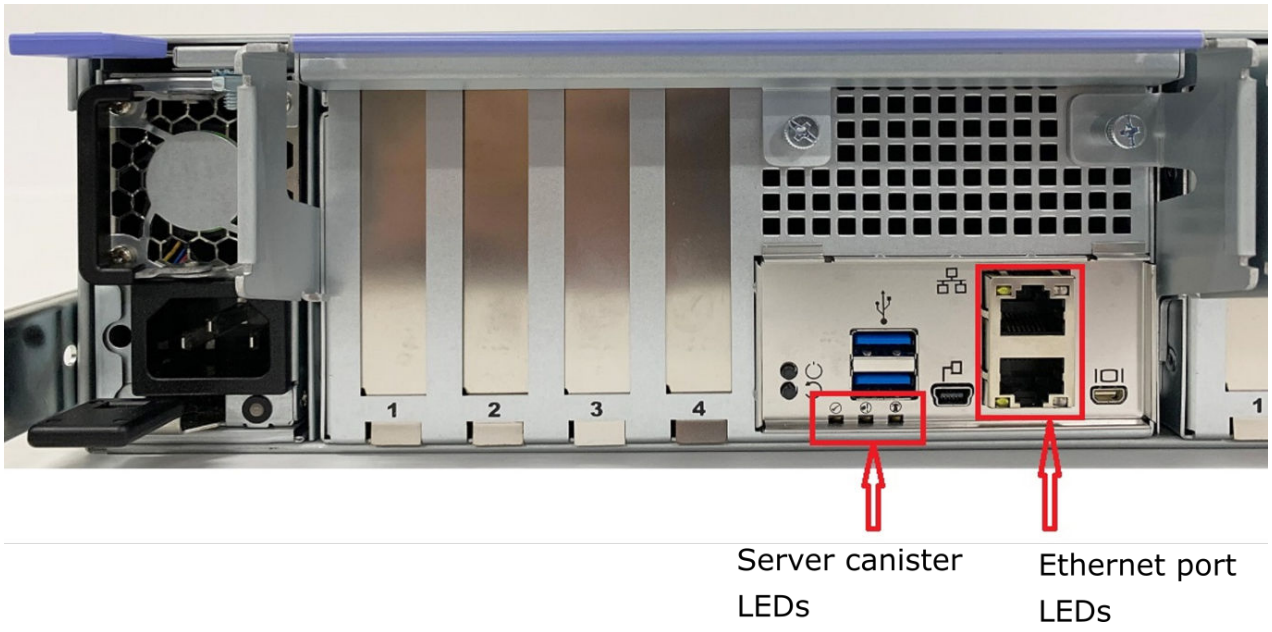


Figure 70. IBM Elastic Storage System 3500 server canister

The following figure shows a close-up view of server canister LEDs.

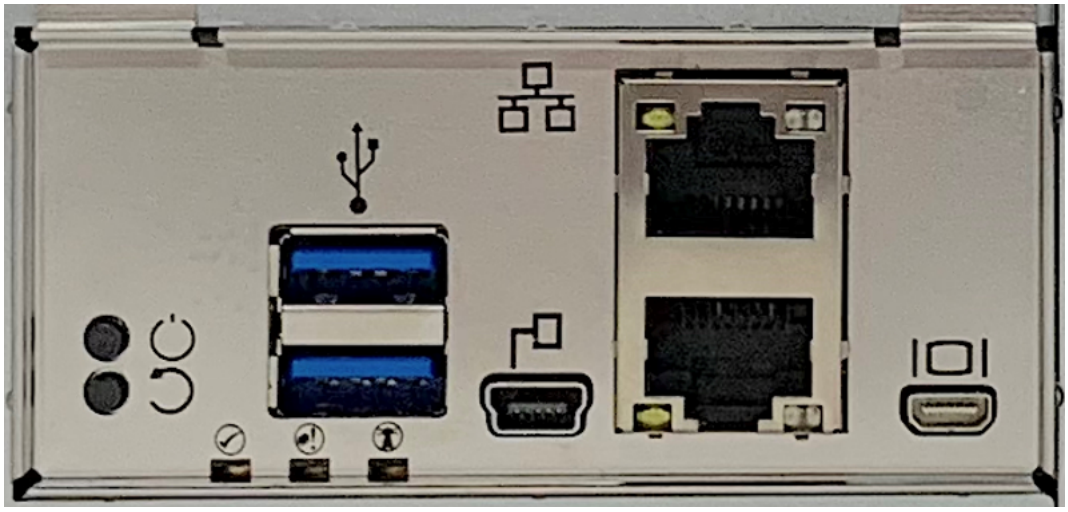


Figure 71. Close-up view of server canister LEDs

Ethernet port LEDs

The Ethernet port on the rear of server canister is a standard RJ45-style connector. These LEDs indicate speed and link activity as described in Table 25 on page 76.

A close up view of Ethernet port LEDs is shown in the following figure.

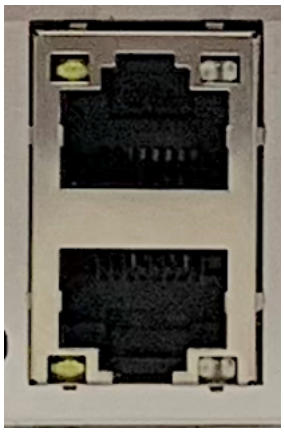


Figure 72. Close up view of IBM Elastic Storage System 3500 Ethernet port LEDs

The following table describes the behavior of Ethernet port LEDs.

Table 25. IBM Elastic Storage System 3500 Ethernet port status LEDs

Left LED	**Right LED**	**Behavior**
OFF	OFF	Indicates no link.
Amber	Green	Indicates link at 1000 Mb.
Green	Green	Indicates link at 10000 Mb.
Flashing	Flashing	Indicates Ethernet link activity.

Server canister status LEDs

The following table describes the possible behavior of server canister status LEDs.

Table 26. Behavior of IBM Elastic Storage System 3500 server canister status LEDs

Canister status OK (Green)	Canister identify (Blue)	Canister fault (Amber)	Behavior
ON	OFF	OFF	The server canister boots and operates normally.
ON or OFF	OFF	ON	A server canister fault is detected.
ON or Flashing	ON	OFF	The server canister is being sent an identify command.
Flashing ~1 Hz	ON or OFF	ON or OFF	BMC is powered ON. Canister is powered OFF. A service action is allowed.
Slow Flashing	ON	ON	BMC is powered ON.
Rapid Flashing	OFF	ON or OFF	BMC is powering ON.

Chapter 6. Troubleshooting (SSR tasks)

This section explains troubleshoot issues faced while configuring the POWER9 nodes and/or IBM Elastic Storage System 3500.

Note: Ensure that you have gone through the "Prerequisites for installation completion by SSR" on page 50 topic and also followed the steps given in the "SSR considerations before arriving customer site" on page 43 topic.

Table describes on-site SSR options in executing Install Complete. If option A is not working try option B, and then C/D/E/F.

Table 27. On-site SSR options to execute Install Complete

Plan	Action	Cables/Items required	Why
A	1. Use new ESS Code 20 App (Windows/ Linux) connected through USB to Ethernet adapter. 2. Update SSR code through application. 3. Copy GA tarball to single node. 4. Run automated code 20 (ess_ssr_setup). 5. Optional: Collect debug data/evidence from server.	• Laptop and ESS Code 20 App • Update tarball • GA tarball • USB-A to Ethernet adapter • Ethernet cable • Optional: USB-C to Ethernet adapter	Main approach (good path)
B	1. Connect laptop via USB to Ethernet adapter. 2. Copy update tarball to /derv using FileZilla. 3. Copy GA tarball to / derv using FileZilla. 4. Login to the node using Putty (essserv1). 5. Run batch application (ess_ssr_setup). 6. Update server with latest SSR code. 7. Optional: Collect debug data/evidence from server.	• Putty • FileZilla • Update tarball • GA tarball • USB-A to Ethernet adapter • Ethernet cable • Optional: USB-C to Ethernet adapter	If unable to use front-end application, obtain DHCP IP address directly from server to laptop using adapter.

Table 27. On-site SSR options to execute Install Complete (continued)			
Plan	**Action**	**Cables/Items required**	**Why**
C	Set IP address on laptop. If successful run steps in Plan B otherwise go to Plan D. Use Plan A, if you can run front-end application (Swap Putty and FileZilla with SSR laptop application and update tarball.	• Putty • FileZilla • Update tarball • GA tarball • USB-A to Ethernet adapter • Ethernet cable • Optional: USB-C to Ethernet adapter	Assuming the front-end application is unavailable for some reason and unable to obtain DHCP address.
D	1. Connect laptop through USB to Ethernet adapter. 2. Copy GA tarball to /derv using FileZilla. 3. Login to the node using Putty(essserv1). 4. Run legacy essutils.	• Putty • GA tarball • USB-A to Ethernet adapter • Ethernet cable • Optional: USB-C to Ethernet adapter	If ess_ssr_setup does not run but able to login via Ethernet.
E	1. Connect laptop to serial port of each node. 2. Login to BMC and enable re-direction. Two options: 1. Set IP address by hand on the server and test ping. If works, go back to plan A or B. 2. Use essutils via serial	Serial to USB cable (or RJ45)	If you are not able to login via Ethernet.
F	1. Connect crash cart/KVM to the node. 2. Boot OS and set IP address. If works, go to Plan A or B. Otherwise, call IBM service.	Micro USB to VGA/HDMI cable (3500)	All else fails.

The figure shows Plan A workflow to execute Install Complete.

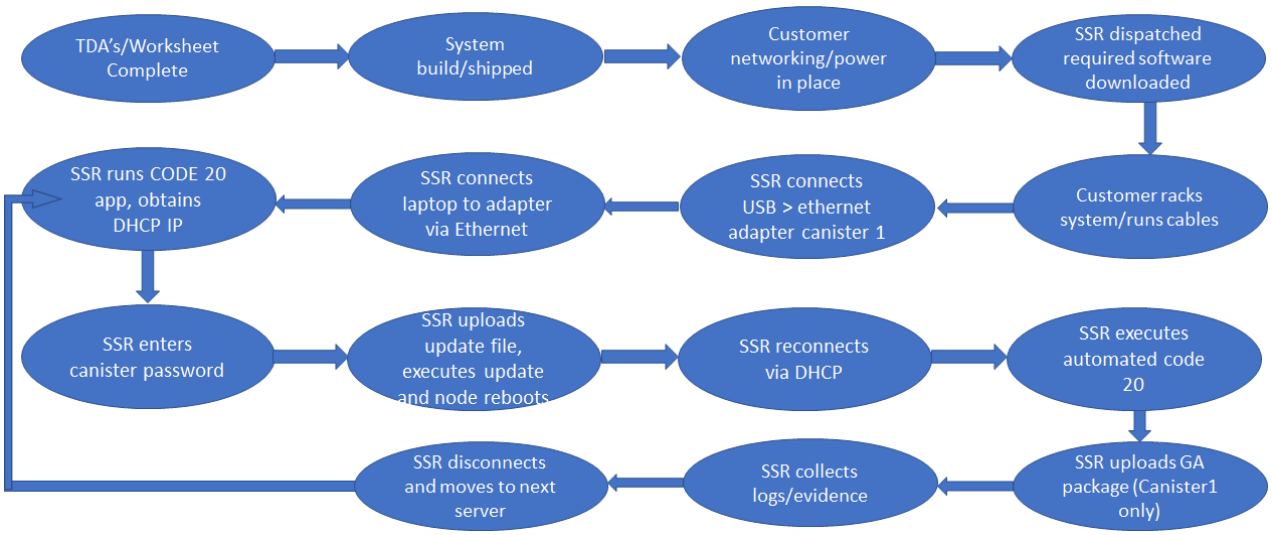


Figure 73. Plan A workflow

POWER9 EMS/POWER9 protocol issues

POWER9 protocol/EMS node boot issues

When booting up the node, if you face any issue while pinging the FSP interface (C11-T4 IP 110.111.222.101) 5 minutes after pressing the white button, perform the following checks (The new ESS Code 20 App indicates whether a valid connection has been made by flashing green or red):

- Verify if the Ethernet cable on both the ends has a solid green light.
- Check if your laptop is set to IP 10.111.222.102 and netmask 255.255.255.252.
- Verify that you are plugged into the correct port – C11-T4 on the EMS.

If the issues still persist, shut down the node (hold the white button until flashing again) and perform the following steps:

1. Connect the laptop point-to-point over serial connection, connecting the USB to RJ45 console cable between the auxiliary laptop and the serial port of the server with active ASMI session from the previous section.

   Note:

   - The USB to RJ45 console cable shown in the following figure works for Linux and Windows laptops.
   - Identify the right console cable when using an Apple laptop.

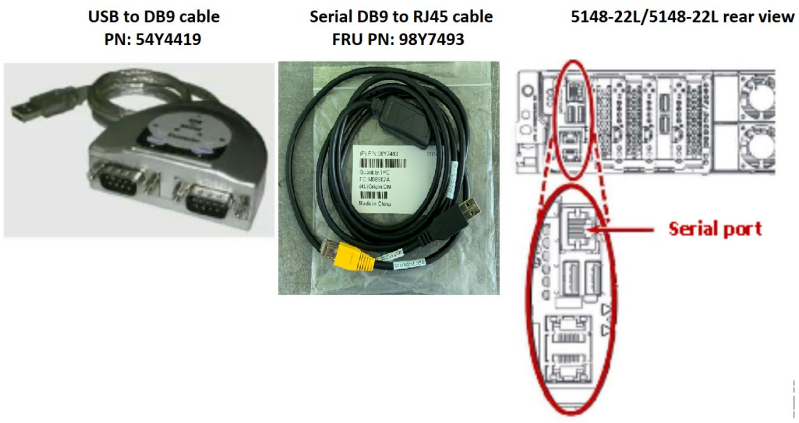


Figure 74. Connecting a laptop to the serial port in the EMS node

2. Open a terminal emulator program such as PuTTY or minicom. Set the following settings for communications using the serial connection:

```
19200 baud rate
Data bits of 8
Parity of None
Stop bits of 1
```

3. For the serial terminal to show an FSP login screen, press any key on the keyboard. Log in using the ASMI credentials:
   - username: **admin**
   - password: **Serial number of server**

   Note: It happens only when the POWER node is in standby mode (OS is not turned on).
4. Manually power on the server by pressing the power button on the front.
   - After powering on the server, the terminal emulator (for example, PuTTY) will display messages during the system boot.

     If there is no output, press the **Up Arrow** key and the **Down Arrow** key a few times to make the terminal respond.
   - After the terminal starts showing output as the system boots, pay close attention to detect when the system reaches the **petitboot** menu (it takes a few minutes before it discovers the disks):
     – System pauses the boot process for a few seconds when it gets the **petitboot** menu.
     – Immediately press the **Up Arrow** key and/or the **Down Arrow** key a few times while in the **petitboot** menu.
     – Boot process stops indefinitely and the user will be able to interact with the **petitboot** menu and choose a boot option.
5. In the **petitboot** menu, press the **Up Arrow** key and/or the **Down Arrow** key to select the **redhat** boot option:
   - Do not select the `Rescue` option.
   - If several **redhat** boot options (besides the **Rescue** option) are shown, select the newest available. The server should boot the latest kernel automatically.
   - Press **Enter** and the server will start to boot the OS. You should see the output going across the screen and come to a login.
6. Log in to the operating system using SSR credentials:
   - username: **essserv1**
   - password: **<serial number of server>**

   Note: You must set the terminal variable correctly before attempting to run any commands. Within PuTTY do the following:

```
export TERM=xterm
```

Continue with the rest of the flow (using essutils) to perform Install Complete.

To run essutils manually, perform the following steps:

- Set `stty` appropriately (run both of the following commands and press **Enter** after each command.
- `stty rows 40 cols 50`
- `stty erase '^?'`
- Run essutils

```
sudo /opt/ibm/ess/tools/bin/essutils
```

If there is an issue with the boot process, you will need to call the technical support.

POWER9 EMS / Protocol node login issues

Note: The default password is `ibmesscluster` and must be changed after the first login. Customers should be advised to change the password once the SSR task is complete.

If you face issues logging in with username: **essserv1** and password: **<serial number of server>**, perform the following steps:

- Log in as a root user:
  - username: **root**
  - password: **ibmesscluster**

  Note: You should only login as root when you cannot login as **essserv1** and it is an emergency. The root password is set to expire so you will be prompted to change immediately. Work with the customer to change the root password again after the installation is complete.
- Run essutils tool manually by typing essutils and press the **Enter** key.

IBM Elastic Storage System 3500 issues

IBM Elastic Storage System 3500 Login issues

Note: The default password is `ibmesscluster` and must be changed after the first login. Customers should be advised to change the password once the SSR task is complete.

If you face issues with logging in with username: **essserv1** and password: **<serial number of server>A** or **<serial number of server>B** (depending on Canister), perform the following steps:

Log in as a root user:

- username: **root**
- password: **ibmesscluster**

Note: You should only login as root when you cannot login as **essserv1** and it is an emergency. The root password is set to expire so you will be prompted to change immediately. Work with the customer to change the root password again after the installation is complete.

To run the ESS Code 20 App tool manually (via Ethernet), execute the following command:

```
sudo /opt/ibm/ess/tools/bin/ess_ssr_setup
```

To run the essutils manually (via serial), execute the following steps:

```
stty rows 40 cols 160
stty erase '^?'
```

Now, run essutils

```
sudo /opt/ibm/ess/tools/bin/essutils
```

Issues logging in to IBM Elastic Storage System 3500 BMC

Putty serial configuration settings

Configure PuTTY to use as follows:

1. Baud rate - 115200
2. Parity - none
3. Stop bits - 1
4. Data bits - 8
5. Flow control - none

You need to log in to the BMC if you don't have access to Ethernet.

To login to the BMC, complete the following steps:

1. Log in to the BMC by using the following credentials:
   - User ID: **sysadmin**
   - Password: **<{Enclosure serial number}A>**

   Note: Change A with B for right canister.
2. Power on IBM Elastic Storage System 3500 canister 1 (left). You must press the power button to boot the system up (see Figure 14 on page 38). The system begins to boot and directs to a login prompt.

   Note: If you are greeted with the BMC login prompt vs the OS login prompt, login to the BMC with the following credentials:

   ```
   AMI00093D06DB61 login: sysadmin
   Password:
   ```

   - User ID: **sysadmin**
   - Password: **<{Enclosure serial number}A|B>**

   If you cannot log in to the BMC, either the canister might be FRU replacement or there might be an issue in manufacturing. Log in by using the default manufacturing password, that is, **superuser**.

   Once logged in, run the following command to fix the console redirection:

   ```
   ipmitool -H 127.0.0.1 -U admin -P <{Enclosure serial number}A|B> raw 0x3c 0xcc 0x0
   ```

   You should immediately be greeted with the O/S login prompt. If not you need to power cycle the canister.

   If you do not see the O/S login prompt immediately, the canister might not be powered on. Run the following command to confirm the chassis power status:

   ```
   ipmitool -H 127.0.0.1 -U admin -P <{Enclosure serial number}A|B> chassis power state
   ```

   If the chassis power state is off, run the following command to boot the canister:

   ```
   ipmitool -H 127.0.0.1 -U admin -P <{Enclosure serial number}A|B> chassis power on
   ```

   Approximately in 5 minutes, the node is booted with an O/S login prompt.

   Log in only as **sysadmin** to fix the serial redirection issue if needed. If the system boots to the OS login prompt, skip this step.

   If you cannot log in to the BMC with either password, you must contact IBM service. IBM service might recommend to replace a canister or to run a procedure to reset the password. It is also possible that the default **ipmitool** password was set. So try **admin** as the password.
3. Log in by using the following SSR credentials and press the **Enter** key.

   ```
   uid: essserv1
   ```

   ```
   pw:<{Enclosure serial number}A|B>
   ```

   Add ‘A’ at the end of the enclosure serial number for the left canister for password (use 'B' for right canister). For example, if the enclosure serial number is 78E00TF, the password for the left canister will be 78E00TFA.

Once you login, you can change the password by using the following command.

```
passwd
```

You will be prompted to set a passed. Enter **<{Enclosure serial number}A>**.

Note: Change A with B for right canister.

Network switch issues

If you have any issues that are related to the management or high-speed switches, see Appendix B, “Switch VLAN configuration instructions,” on page 97 and Appendix C, “Dual 24 port (48 ports) MGMT switch ESS configuration,” on page 105.

Assigning the management IP address manually

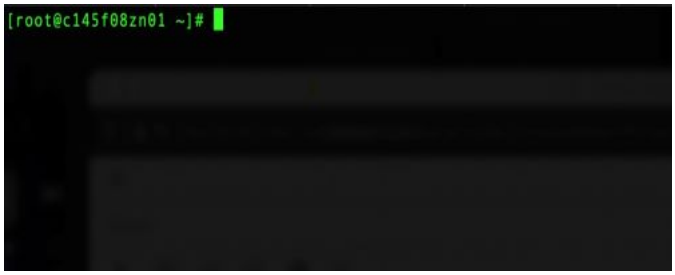
This section covers the issues that are faced while you set the management IP address by using the ESS Code 20 App tool. This task requires knowledge of the Linux command line and the vi editor.

When you see an *interface name*, the interface name is **mgmt** for IBM Elastic Storage System 3500. For POWER9 EMS you may need to modify mgmt, campus, or the fsp connection. For the POWER9 protocol or ESS 5000 you need to modify **enP1p8s0f0** which represents the management interface.

1. Log in the IBM Elastic Storage System 3500 or the EMS/Protocol node as a root user.

   The default password is **ibmesscluster**. You can be prompted to set the expired password. If you are prompted, set the password to **ibmesscluster** again. (You will be asked to enter the password two times and then press Enter.)

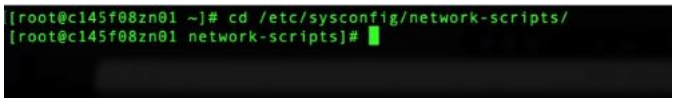
   After the login, you are greeted with a prompt.

2. Go to the networks scripts directory and press Enter.

   ```
   # cd /etc/sysconfig/network-scripts
   ```

   Example:

3. Open the `ifcfg-` file and press Enter.

   ```
   # vi ifcfg-interface name
   ```

   A sample output is as follows:

```
[root@ess3200a3 network-scripts]# cat ifcfg-mgmt
DEVICE=mgmt
IPADDR=192.168.21.102
NETMASK=255.255.255.0
BOOTPROTO=static
ONBOOT=yes
HWADDR=00:09:3D:06:B2:C5
TYPE=Ethernet
NAME=mgmt
PROXY_METHOD=none
BROWSER_ONLY=no
PREFIX=24
DEFROUTE=yes
IPV4_FAILURE_FATAL=no
IPV6INIT=no
UUID=5fb06bd0-0bb0-7ffb-45f1-d6edd65f3e03
[root@ess3200a3 network-scripts]#
```

4. Edit the `ifcfg-` file.

   Press 'i' on the keyboard to enter the insert mode. You can see **Insert** at bottom of the screen.

5. Modify the IP address and netmask.

   a. Based on the “Installation worksheet” on page 89 information, ensure that you add or modify the **IPADDR** and **NETMASK** lines with the correct information.

   b. Use the keyboard arrows to navigate the file and add the necessary information.

      Example:

```
IPADDR=IP ADDRESS
NETMASK=NETMASK
```

      It does not matter where you add these lines in this file.

6. Save the file.
7. Press escape on the keyboard and type **:wq!**.

   Example:

8. Bring down and up the interface.

```
# ifdown interface name
# ifup interface name
```

   Example:

   `ifdown` **mgmt down**

   `ifup` **mgmt up**

9. Check that the IP address was set.

```
# ifconfig interface name
```

Example:

```
ifconfig mgmt
```

Deleting characters in essutils

When you modify characters (for example, deleting IP addresses) in essutils, you might find it is not working. One way to delete characters is with Ctrl + H. We designed the ability for **backspace** key to be used normally, but if that fails to use Ctrl + H you can also modify the terminal settings to interpret the **backspace/delete** key properly.

When you edit commands in essutils (for example: when you change the IP address with 'c' and save with Ctrl+G) it is possible to make a mistake that you feel cannot be corrected.

Remember: Any options changed are not permanent. Simply exit essutils completely and re-start. This will reset all options back to defaults.

Appendix A. Planning worksheets (customer task)

Customers are responsible for completing the system planning worksheets.

The customer then provides the worksheets to the IBM SSR when they install and configure the system.

Installation worksheet

This worksheet is intended for customers as part of the TDA process to outline the items that are required to be implemented by the SSR during setup.

Important: Click here to download the blank worksheet.

Customer task

Customer fills out the desired IP addresses.

SSR task

The SSR uses this information to properly set the desired IP addresses on each canister and the EMS (if applicable).

Note: The management IP addresses must be on the same subnet as the EMS bridge interface. If you already have an existing EMS, set IP addresses on the same subnet (all must be reachable).

Note: This document does not describe about the high-speed network. Customers must have that in place and ready to fill in (or update) the `/etc/hosts` file on the EMS node during the software installation. For reference, see Chapter 4, “Installing,” on page 41 and *IBM Elastic Storage System 3500 Quick Deployment Guide*. The high-speed interfaces are on a separate switch and must be defined on a different subnet.

- For instance, if your management interfaces are all 192.168.21.X/24, your high-speed hosts should be any other network. For instance, 172.16.0.0/24. You should use /24 (255.255.255.0), if possible.

Prerequisite (for SSR)

You must be connected to the SSR access port of the target canister (left or right). See the “SSR considerations before arriving customer site” on page 43 for steps required to check the hardware and set the desired IP addresses that are outlined in this worksheet by the customer.

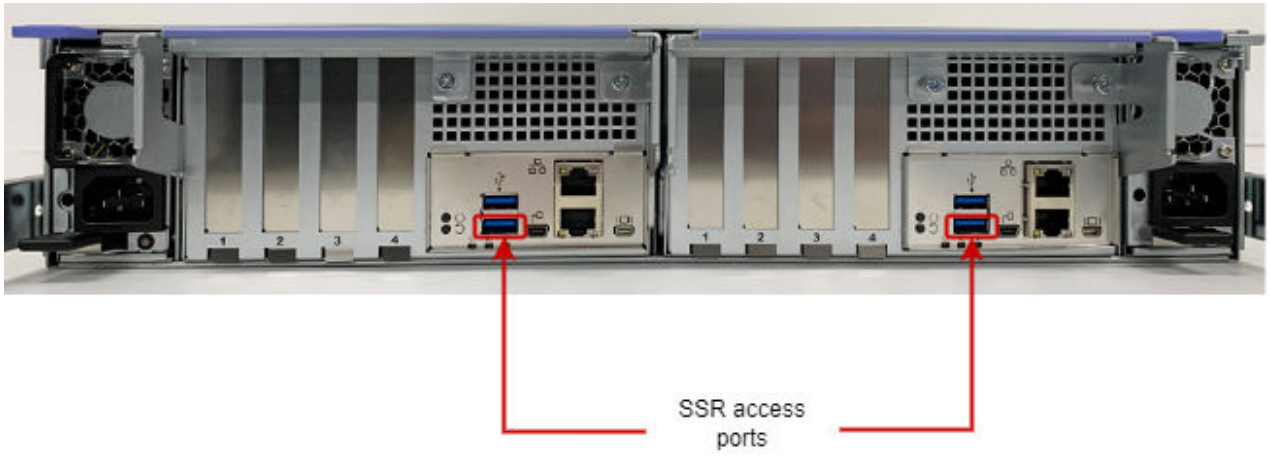


Figure 75. SSR access port

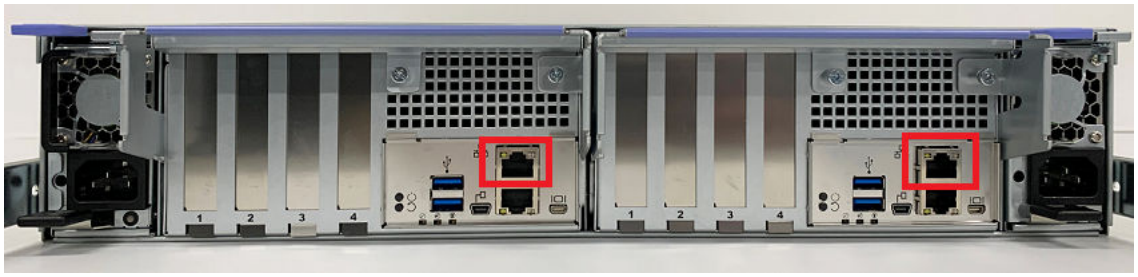


Figure 76. Management ports of each canister

The following figure shows the EMS server P2P cabling.

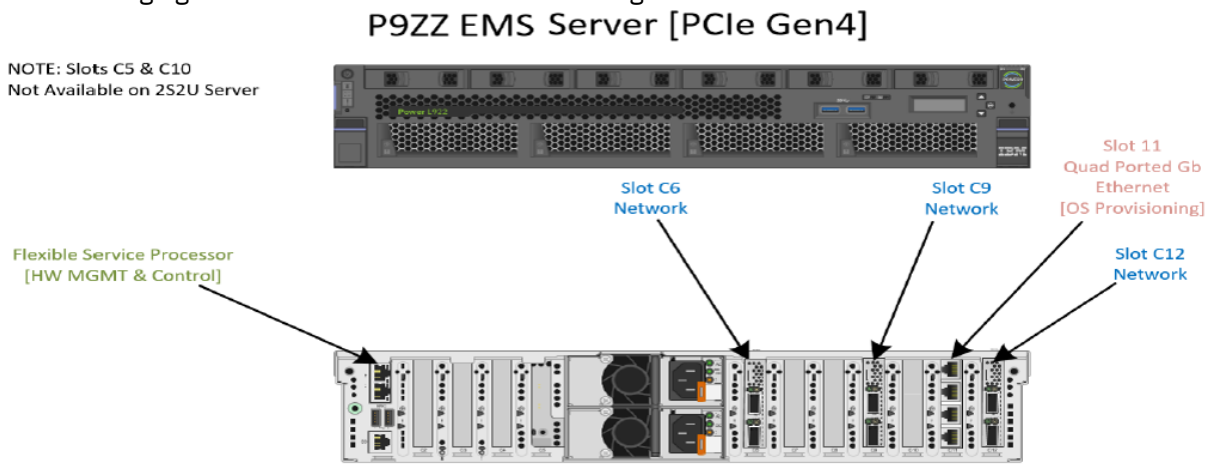


Figure 77. EMS server P2P cabling

SSR / Customer:

- Ensure that the management switch is in the rack and powered on.
- Ensure that there is one Ethernet cable from the management switch (if there are VLANs, connect from the management VLAN) to port (management port) on each canister as shown in Figure 76 on page 90.
- If an EMS node is received with IBM Elastic Storage System 3500, connect two Ethernet cables from the management switch (if there are VLANs, connect from the management VLAN) to port C11-T1 (top port) and to port C11-T2 (second from top).

SSR: General guidance

- For each IBM Elastic Storage System 3500 canister in the flow (see Chapter 4, “Installing,” on page 41), connect your laptop point-to-point to the SSR port as shown in the SSR access port. You need to use this port to access each canister, perform hardware checks, and set the management IP address.
- For the ESS 5000/POWER9 EMS/POWER9 protocol, connect your laptop point-to-point to C11-T4 and use the instructions in the “SSR considerations before arriving customer site” on page 43 to log in, perform the hardware checks, and set the management IP address.

Reference:

- SSR user ID is **essserv1**
- SSR default password for POWER nodes is the server serial number
- SSR default password is the IBM Elastic Storage System 3500 serial number
  - Add ‘A’ for left canister
  - Add ‘B’ for right canister
- Other than the SSR access port, there are no default IP addresses set on any canister
- All management interfaces should be connected to the same VLAN switch

- Default physical POWER9 Protocol or ESS 5000 I/O node ports
  - C11-T1 = Management Interface (set by the SSR), Logical port: enP1p8s0f0
- Default physical POWER9 EMS ports
  - C11-T1 = Management Interface (set by the SSR) - Logical port: mgmt
  - C11-T2 = FSP (BMC) interface (set by the SSR) - Logical port: mgmt
- Default physical IBM Elastic Storage System 3500 ports (per canister)
  - Port 1 – Management port (set by the SSR) - Logical port: mgmt
  - The SSR connects a laptop to the SSR port when performing the IBM Elastic Storage System 3500 tasks. You need to move the cable when you work on a different canister (two per ESS 3500 unit).

Note: The worksheet has default IP addresses filled out in case they were not provided by the customer during the TDA process. Before setting any default IP addresses have the customer confirm that they are not currently in use by the associated networks.

Customers must fill in the following values so that the SSR is able to perform the required networking tasks. If there are more than one building-block per system type being installed, you might need to add the corresponding rows.

Recommendations:

- Keep all management interfaces on 192.168.x.x/24 (netmask 255.255.255.0).
- Keep all BMC/FSP (HMC1) interfaces on 10.0.0.x/24 (netmask 255.255.255.0).

Note: The EMS has an additional FSP connection at C11-T2, which is visible to the operating system.

Important: All IP addresses must on the same subnet. For example,

- All management interfaces on 192.168.x.x/24
- All FSP interfaces on 10.0.0.x/24

ESS 3200/3500 notes:

The ESS 3200 has a single interface for both the BMC and Management interfaces. When mixed with an ESS 5000, you must apply changes to your switch, which would configure a set of ports specific to ESS 3200.

The ESS 3500 has dedicated management (f1) and BMC (f0) interfaces. The management interfaces are connected to the yellow network, while the BMC interfaces are connected to the green trunk ports.

In both ESS 3200 and ESS 3500 proper switch configuration and VLAN tag should be set to route traffic from the BMC to the blue service/FSP network.

ESS 3000 notes:

The ESS 3000 has a single interface per canister used for the management network only (yellow network). There is no BMC connection in ESS 3000.

Campus or remote connection notes:

A POWER9 EMS campus connection must be set prior to deployment (C11-T3). This allows remote access to the EMS and ensures you will not lose a connection when starting the container. Optionally, space is also allocated to set a campus connection on the HMC2 port. This will allow remote access to the FSP which aids the recovery of the node (console/power control) in case of an outage.

The SSR is provided the commands to set the campus interface (C11-T3) and HMC2 port connection to the customer campus connection. If C11-T3 (POWER9 EMS) is not in place or the IP address not provided to the SSR at time of Install Complete may still, consider the task complete. It will be up to the customer/LBS to set this connection before deployment can begin.

ESS 3500 Building-Block 1 (lowest position in frame)

Note: ESS 3500 only applies to ESS 6130 and later.

	IP address	Netmask
ESS 3500 canister 1 management interface (left)	192.168.45.30	255.255.255.0
ESS 3500 canister 1 BMC interface (left)	10.0.0.121	255.255.255.0
ESS 3500 canister 2 management interface (right)	192.168.45.31	255.255.255.0
ESS 3500 canister 2 BMC interface (right)	10.0.0.122	255.255.255.0

ESS 3500 Building-Block 2 (higher position in frame)

Note: ESS 3500 only applies to ESS 6130 and later.

	IP address	Netmask
ESS 3500 canister 1 management interface (left)	192.168.45.32	255.255.255.0
ESS 3500 canister 1 BMC interface (left)	10.0.0.123	255.255.255.0
ESS 3500 canister 2 management interface (right)	192.168.45.33	255.255.255.0
ESS 3500 canister 2 BMC interface (right)	10.0.0.124	255.255.255.0

The VLAN tag is required to route traffic on the BMC interface to the service network. This interface is connected to the **green** trunk ports on the switch. This is required only on ESS 3200 and ESS 3500. The default is 101.

ESS 3200/3500 VLAN Tag	VLAN TAG	101

ESS 3200 Building-Block 1 (lowest position in frame)

	IP address	Netmask
ESS 3200 canister 1 management interface (left)	192.168.45.40	255.255.255.0
ESS 3200 canister 1 BMC interface (left)	10.0.0.131	255.255.255.0
ESS 3200 canister 2 management interface (right)	192.168.45.41	255.255.255.0
ESS 3200 canister 2 BMC interface (right)	10.0.0.132	255.255.255.0

ESS 3200 Building-Block 2 (higher position in frame)

	IP address	Netmask
ESS 3200 canister 1 management interface (left)	192.168.45.42	255.255.255.0
ESS 3200 canister 1 BMC interface (left)	10.0.0.133	255.255.255.0

	IP address	Netmask
ESS 3200 canister 2 management interface (right)	192.168.45.43	255.255.255.0
ESS 3200 canister 2 BMC interface (right)	10.0.0.134	255.255.255.0

The VLAN tag is required to route traffic on the BMC interface to the service network. This interface is connected to the **green** trunk ports on the switch. This is required only on ESS 3200 and ESS 3500. The default is 101.

ESS 3200/3500 VLAN Tag	VLAN TAG	101

ESS 5000 Building-Block 1 (lowest position in frame)

	IP address	Netmask
IO node 1 management Interface (bottom node in building-block)	192.168.45.21	255.255.255.0
IO node 1 FSP (HMC1 port) interface (bottom node in building-block)	10.0.0.101	255.255.255.0
IO node 2 management Interface (top node in building-block)	192.168.45.22	255.255.255.0
IO node 2 FSP (HMC1 port) interface (top node in building-block)	10.0.0.102	255.255.255.0

ESS 5000 Building-Block 2 (upper position in frame)

	IP address	Netmask
IO node 1 management interface (bottom node in building-block)	192.168.45.23	255.255.255.0
IO node 1 FSP (HMC1 port) interface (bottom node in building-block)	10.0.0.103	255.255.255.0
IO node 2 management interface (top node in building-block)	192.168.45.24	255.255.255.0
IO node 2 FSP (HMC1 port) interface (top node in building-block)	10.0.0.104	255.255.255.0

ESS 3000 Building-Block 1 (lower position in frame)

	IP address	Netmask
ESS 3000 Canister 1 management Interface (left)	192.168.45.60	255.255.255.0
ESS 3000 Canister 2 management Interface (right)	192.168.45.61	255.255.255.0

ESS 3000 Building-Block 2 (higher position in frame)

	IP address	Netmask
ESS 3000 Canister 1 management Interface (left)	192.168.45.62	255.255.255.0
ESS 3000 Canister 2 management Interface (right)	192.168.45.63	255.255.255.0

ESS 5000 POWER9 protocol nodes

	IP address	Netmask
Protocol node 1 management interface (bottom-most)	192.168.45.50	255.255.255.0
POWER9 protocol node 1 FSP (HMC1 port) interface (bottom-most)	10.0.0.110	255.255.255.0
Protocol node 2 management interface (top)	192.168.45.51	255.255.255.0
POWER9 protocol node 2 FSP (HMC1 port) interface (top)	10.0.0.111	255.255.255.0

Note: If there are additional building-blocks or POWER9 Protocol nodes, please add more tables.

POWER9 EMS (should be only one)

	IP address	Netmask
EMS management interface	192.168.45.20	255.255.255.0
EMS FSP (HMC1 port) interface	10.0.0.100	255.255.255.0
EMS FSP (C11-T2) interface	10.0.0.1	255.255.255.0
EMS External/Gateway IP (C11-T3)		

Recommended HMC2 port campus connection. Consider cabling this port to a public network and setting a campus IP. This will allow remote recovery/debug of the EMS in case of an outage. The gateway may be needed to for this IP address to work properly.

EMS HMC2 port IP	
EMS HMC2 port IP gateway	

Additional notes for customer / LBS:

The root password should be set for the **essserv1** SSR ID to execute commands. When prompted set the password.

Account type	Account ID	Password
Linux OS	root	ibmesscluster

Customer has purchased a scale license. The options are Data Access Edition (DAE) or Data Management Edition (DME). When deciding which edition to download and copy to the /serv directory you will need this information.

The Scale license field is only need for ESS 6130 or later.

Scale license	DAE or DME	

Note: Write down any vital information that should be shared with the customer / LBS that you encountered during execution of Install Complete.

Appendix B. Switch VLAN configuration instructions

This topic describes the instructions that are needed to configure an IBM Cumulus switch VLAN.

The IBM Cumulus switch would be preconfigured from manufacturing with proper VLAN that includes the following:

- Service/FSP/BMC VLAN
  - Blue network - Bottom ports
  - VLAN 101
- Management/Provisioning VLAN
  - Yellow network - Top ports
  - VLAN 102
- IBM Elastic Storage System 3500 special ports
  - Ports 1 - 12
  - Trunk ports
  - Default routes traffic to management VLAN
  - Packets with VLAN tag 101 routed to service network.

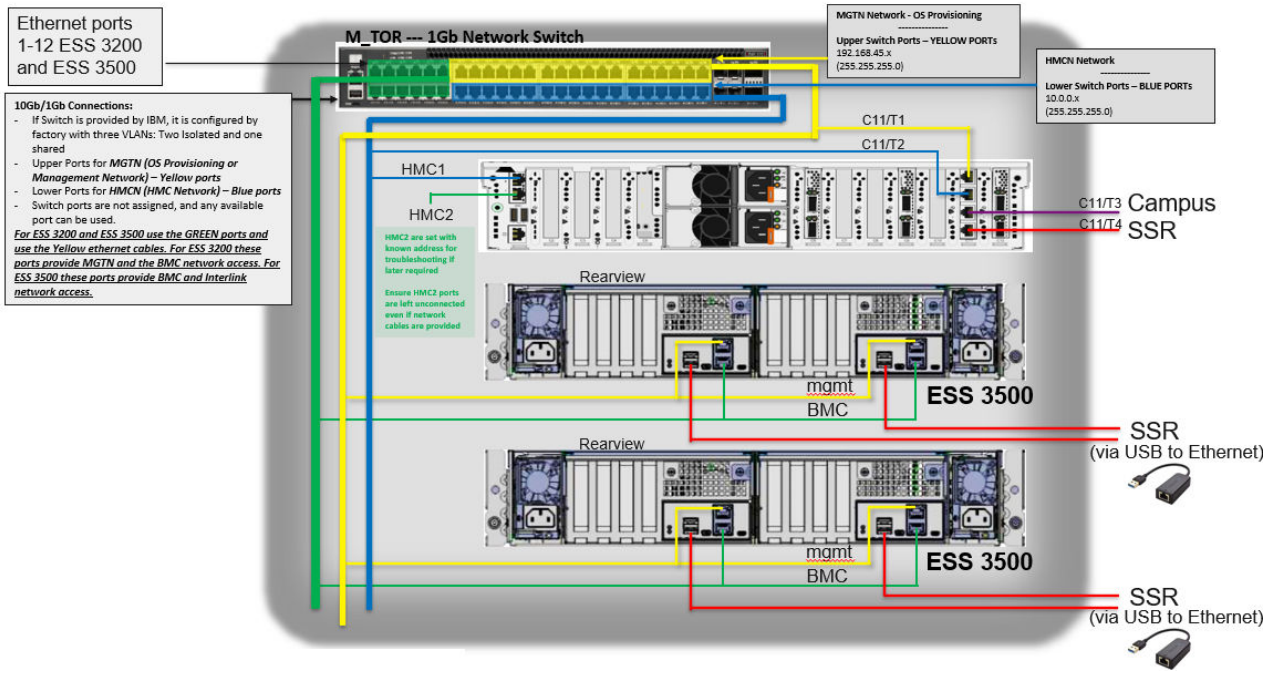


Figure 78. 1 Gb network switch

The management switch is configured with three VLANs from factory.

A: MGTN (Management and OS Provisioning Network)

- Upper Switch Ports are marked Yellow (A) in the figure.
- It is used for host management and OS provisioning for ESS 3500 and ESS 5000.
- Default network: 192.168.45.0/24

B: HMCN (HMC Network)

- Lower Switch Ports are marked Blue (B) in the figure.

- It is used for HMC connection of EMS, ESS 5000 I/O Server and Protocol nodes.
- Default network: 10.0.0.0/24

C: ESS 3200 BMC, ESS 3500 BMC, and interlink network

- Ports are marked Green © in the figure.
- For ESS 3200, these ports provide MGTN (untagged) and the BMC (VLAN tagged) network access.
- For ESS 3500, these ports provide BMC (VLAN tagged) network access and enclosure canister interlink (untagged) communications.

Procedure to change switch default password

Use the following steps to change switch default password.

1. Verify the 11S label at the back of the switch as shown in the following figure.

Figure 79. 11S label

Note: The required software update is cumulus-3.7.12a.

2. Log in to the switch by using the following default credentials and press the Enter key.
   - User ID: cumulus
   - Password: CumulusLinux!

   If the CumulusLinux1 default password does not work, to reset the password see the Password Recovery section in the NVIDIA documentation.
3. Use the following command to display the 11S serial number.

```
cumulus@1Gsw:~$ decode-syseeprom | grep Serial | awk '{print $5}'| cut --complement -c -3
```

   The system displays the 11S serial number similar to the following:

```
01FT690YA50YD7BGABX
```

4. Change the default password to the 11S password by using the following command:

```
cumulus@accton-1gb-mgmt:~$ passwd
```

```
current UNIX password: CumulusLinux!
Enter new UNIX password: <<<Copy and paste the output provided in the 11S serial number
display step.
Retype new UNIX password: <<<Copy and paste the output provided in the 11S serial number
display step.
passwd: password updated successfully.
```

5. Log in through SSH or console and log in with the new 11S password to validate the changes.

   Note: The default password must be set to the 11S serial number **01FT690YA50YD7BGABX**. If not, the password must be **CumulusLinux!**.

Connect the PC to the switch console port

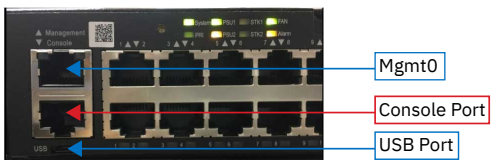


Figure 80. Switch port and switch markings

Connect the PC to the switch console port as follows:

- Connect to the switch by using RJ45 to serial cable.

Figure 81. RJ45 to serial cable and USB to serial cable

- Connect the serial end to the serial to USB adapter.
- Connect the USB adapter to the PC.

Figure 82. USB adapter

Configure the host PC

Configure the host PC as follows:

1. Ensure that the driver for USB to serial cable is connected on the PC.
2. Open the device manager to verify that the COM port is used by the USB to serial cable.
3. Open `putty.exe` and use the COM port to connect to the switch.
4. Configure PuTTY to use as follows:
   a. Baud rate - 115200
   b. Parity - none
   c. Stop bits - 1
   d. Data bits - 8
   e. Flow control - none
5. Power on the switch and wait for the login prompt to show up.
6. Log in by using the following default credentials and press the Enter key.
   - User ID: **cumulus**
   - Password: **<11S serial number>**

   Note: If the switch has default Mellanox user ID and password, then proceed as follows:
   - User ID: **cumulus**
   - Password: **CumulusLinux!**
7. Download the VLAN configuration file `H48712_interfaces.rtf` from box folder.

   Note: If you do not have access to the above link, see “Full output of the interface file” on page 101.
8. Gain sudo rights by using the following command:

   ```
   sudo su -
   ```
9. Copy the contents of the interface file to the file name `/etc/network/interfaces` and save the file.

   Note: You can use **`vi`** or modify this file.
10. Reload the interfaces by using the following command:

```
root@cumulus:/etc/network# ifreload -a
root@cumulus:/etc/network# ifquery -a
```

11. Check VLAN setup.

```
net show interface all
```

12. If required, set switch network. It is recommended to set a static IP to log remotely on the switch. For example, 192.168.45.0/24 network IP switch 192.168.45.60, gateway 192.168.45.1.
    - net add interface eth0 IP address 192.168.45.60/24
    - net add interface eth0 IP gateway 192.168.45.1
    - net pending
    - net commit
13. Set the VLAN tag on each server canister. If this document is used, the tag must be 101.

```
# Set tag
/bin/ipmitool lan set 1 vlan id 101
# Confirm tag
/bin/ipmitool lan print 1 | grep -i 'VLAN ID'
```

Non-IBM Cumulus switches

If you have a non-IBM Cumulus switch, use the information above as a general reference on how to modify the switch. The key is to have a designated IBM Elastic Storage System 3500 trunk ports that are apart of both VLANs.

Modifying existing Cumulus switches

If you are converting a switch that has already non-ESS 3500 using the switch on any port in the range 1 - 12, you need to evacuate one by one those ports. If you are not using ports in the range 1 - 12, you need to apply the above process.

That means to move the cables on the upper ports in the range 1 - 12 to any free upper port that is not in the range ports 1 - 12. Equally any lower cable plugged to any port in the range 1 - 12 needs to be moved to any lower port not in the range of ports 1 - 12.

You must move one cable at the time and wait until the link LED on the destination port comes up. Once all ports in the range 1-12 are no longer cabled, you can apply the following procedure.

If an existing Cumulus switch must be modified to support IBM Elastic Storage System 3500, the general guidance are as follows:

1. Free up at least two ports (1 IBM Elastic Storage System 3500) on the existing switch. It is better if you can free up a block. Ideally, the current configuration is not scattered where it is easy to convert free ports for IBM Elastic Storage System 3500 usage.
2. Take the existing interfaces file from the switch and modify it for the chosen IBM Elastic Storage System 3500 ports.
3. Make the modifications to the interfaces file.

```
auto swp10
iface swp10
bridge-pvid 102
bridge-vids 101
```

   Any ports that you designate as IBM Elastic Storage System 3500 ports need to have this configuration. Consult the default IBM Elastic Storage System 3500 interfaces file for more information.
4. Copy the new interfaces file to the switch.
5. Reload and verify the interfaces.

6. Set the VLAN tags on the IBM Elastic Storage System 3500 canisters.

Full output of the interface file

H48712_interfaces.rtf:

```
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).
source /etc/network/interfaces.d/*.intf
# The loopback network interface
auto lo
iface lo inet loopback
# The primary network interface
auto eth0
iface eth0
    address 192.168.45.60/24
    gateway 192.168.45.1
# EVEN Ports/Lower ports PVID 101 for FSP network
auto swp14
iface swp14
bridge-access 101
auto swp16
iface swp16
bridge-access 101
auto swp18
iface swp18
bridge-access 101
auto swp20
iface swp20
bridge-access 101
auto swp22
iface swp22
bridge-access 101
auto swp24
iface swp24
bridge-access 101
auto swp26
iface swp26
bridge-access 101
auto swp28
iface swp28
bridge-access 101
auto swp30
iface swp30
bridge-access 101
auto swp32
iface swp32
bridge-access 101
auto swp34
iface swp34
bridge-access 101
auto swp36
iface swp36
bridge-access 101
auto swp38
iface swp38
bridge-access 101
auto swp40
iface swp40
bridge-access 101
auto swp42
iface swp42
bridge-access 101
auto swp44
iface swp44
bridge-access 101
auto swp46
iface swp46
bridge-access 101
auto swp48
iface swp48
bridge-access 101


# ODD Ports/Upper ports PVID 102 for management network
auto swp13
iface swp13
bridge-access 102
auto swp15
```

```
iface swp15
bridge-access 102
auto swp17
iface swp17
bridge-access 102
auto swp19
iface swp19
bridge-access 102
auto swp21
iface swp21
bridge-access 102
auto swp23
iface swp23
bridge-access 102
auto swp25
iface swp25
bridge-access 102
auto swp27
iface swp27
bridge-access 102
auto swp29
iface swp29
bridge-access 102
auto swp31
iface swp31
bridge-access 102
auto swp33
iface swp33
bridge-access 102
auto swp35
iface swp35
bridge-access 102
auto swp37
iface swp37
bridge-access 102
auto swp39
iface swp39
bridge-access 102
auto swp41
iface swp41
bridge-access 102
auto swp43
iface swp43
bridge-access 102
auto swp45
iface swp45
bridge-access 102
auto swp47
iface swp47
bridge-access 102


# ESS 3200 ports (1 to 12) FSP + OS on single physical port
auto swp1
iface swp1
bridge-pvid 102
bridge-vids 101
auto swp2
iface swp2
bridge-pvid 102
bridge-vids 101
auto swp3
iface swp3
bridge-pvid 102
bridge-vids 101
auto swp4
iface swp4
bridge-pvid 102
bridge-vids 101
auto swp5
iface swp5
bridge-pvid 102
bridge-vids 101
auto swp6
iface swp6
bridge-pvid 102
bridge-vids 101
auto swp7
iface swp7
bridge-pvid 102
bridge-vids 101
auto swp8
```

```
iface swp8
bridge-pvid 102
bridge-vids 101
auto swp9
iface swp9
bridge-pvid 102
bridge-vids 101
auto swp10
iface swp10
bridge-pvid 102
bridge-vids 101
auto swp11
iface swp11
bridge-pvid 102
bridge-vids 101
auto swp12
iface swp12
bridge-pvid 102
bridge-vids 101


# Bridge setup
auto bridge
iface bridge
bridge-vlan-aware yes
bridge-ports glob swp1-48
bridge-pvid 101
bridge-pvid 102
bridge-stp off
```

Adding additional management switches

If the customer is out of ports on a single management switch, then a second one can be used to extend VLANs.

Connect the existing switch (Switch 1) port 45 to the new switch (Switch 2) port 47, and Switch 1 port 46 to Switch 2 port 48. It extends both the management and service VLANs ports to the new switch.

Appendix C. Dual 24 port (48 ports) MGMT switch ESS configuration

This topic describes how to configure a pair of ECS4100-28T to be the ESS top of the rack (TOR) switches.

For more information about the port, see ECS4100-28T.

This is intended for IBM manufacturing but can be also used by field engineers if needed.

When the management TOR is part of an order, IBM will deliver two of these switches as part of that order. The reason to deliver two instead of one is to keep similar number of ports available as with the 48 ports switch option.

Logical overview

From a logical perspective, the switches would look like the following figure:

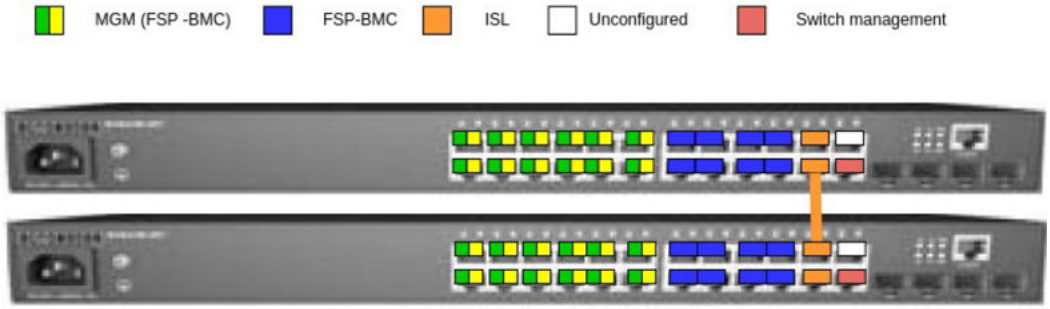


Figure 83. Logical view of two switches

The orange-colored cable shown in the figure must be connected between port 22 of the upper switch and 21 of the lower switch as a part of the configuration. That cable works as inter-switch link (ISL) between the two switches.

Ports definitions

The following are the ports definitions:

- Ports 1 through 12, named as MGM (FSP-BMC) in the green and yellow colors, are to be used for management connections to EMS and I/O nodes. These ports are used for all ESS models, regardless they have dual MAC ports (ESS 3200 and 3500) or not (ESS 5000). This is different from the previous IBM provided TOR rack where each logical color network had dedicated ports. Green and yellow ports share the same physical ports (1 through 12).
- Ports 13 through 20, named as FSP-BMC in the blue color, are to be used for systems that have dedicated FSPBMC connections. These are POWER9 EMS (both C11-T2 and HMC1 ports) and ESS 5000 I/O nodes HMC1 ports.
- Ports 21 and 22, named as ISL in the orange color, are to be used for ISL between switches only. IBM allows to extend this setup to more than two switches on a line topology, meaning the first and last switch can only have one ISL connection to the following/previous switch. The switches that are not on the edge of that line topology have both ISL ports used to their previous and following switch on the line.
- Port 23, named as Unconfigured in the white color, is not used and is shut down. This port might be used in the future.
- Port 24, named as Switch management in the red color, is to be used to access the management functions of the switch. It is intended for customer switch management network and it is set up to get an IP address via the DHCP protocol.

– The Switch management port is set as VLAN 1305 access port by default. It should work on any setup that provides an access port connected to it. If the field setup requires a different VLAN ID, change the following line:

```
VLAN 1305 name CUSTOMER media ethernet
```

– For the VLAN ID required. Match the VLAN ID with the ID in the following block:

```
interface vlan 1305
ip address dhcp
exit
```

– If you need to set a static IP address on the Switch management, replace the DHCP in the following block:

```
interface vlan 1305
ip address dhcp
exit
```

– For the IP and netmask required. In the following example, the IP address is set to 192.168.44.22 and the netmask is set to 255.255.255.0.

```
interface vlan 1305
ip address 192.168.44.22 255.255.255.0
exit
```

Personalization of the switch

To each switch, the following customization must be done. In this section, only one switch is customized but this customization must be repeated to the second and any other subsequent switch from any order.

It is assumed that the “Switch management” port is not used and the serial connection will be used. For this, you need the RJ-45 to DB-9 cable that comes with the switch. You might need extra adapters and/or converters to connect to your computer if you do not have a DB-9 connection on it.

The serial port RJ-45 is located on the top right of the switch, the serial configuration settings are 115200 bps, 8 characters, no parity, one stop bit and no flow control.

Note: The factory user is “admin” and the factory password is “admin”, if the switch is personalized already at manufacturing.

For more information, see *Quick Start Guide* in the https://www.edge-core.com/_upload/images/ECS4100_series_models_QSG_R03_20180418.pdf.

Once logged in, apply the switch configuration information to both switches.

- Copy and paste the following configuration to the switch and press Enter .
- Or, copy the contents of the file in the box (https://ibm.box.com/s/x3kzg5ykkfsu2t6536um5p0pmbg64xrl) to the switch and press Enter.
- Highlight all information and copy and paste to the switch command line after the login.

```
ip ssh crypto host-key generate
configure
ip ssh server
vlan database
VLAN 100 name ESS_MNG media ethernet
VLAN 101 name ESS_BMC media ethernet
VLAN 1305 name CUSTOMER media ethernet
exit
loopback-detection action none
no loopback-detection

interface ethernet 1/1-12
 switchport mode hybrid
 switchport native vlan 100
 switchport allowed vlan add 100 untagged
 switchport allowed vlan add 101 tagged
 switchport allowed vlan remove 1
```

```
 no spanning-tree loopback-detection
 no shutdown
 exit

interface ethernet 1/13-20
 switchport mode access
 switchport allowed vlan add 101 untagged
 switchport native vlan 101
 switchport allowed vlan remove 1
 no shutdown
 exit

interface ethernet 1/21-22
 switchport mode hybrid
 switchport native vlan 100
 switchport allowed vlan add 100 untagged
 switchport allowed vlan add 101 tagged
 spanning-tree spanning-disabled
 switchport allowed vlan remove 1
 no shutdown
 exit

interface ethernet 1/23
 shutdown
 no loopback-detection
 spanning-tree spanning-disabled
 exit

interface ethernet 1/24
 switchport allowed vlan add 1305 untagged
 switchport mode access
 switchport native vlan 1305
 switchport allowed vlan remove 1
 no shutdown
 exit

interface vlan 1305
 ip address dhcp
 exit

exit
copy running-config startup-config
```

Up to this point the configuration is always the same for every switch, the following lines are different for each switch. You need to know the serial number of the switch to continue. To get the serial, run show version command as shown in the following example:

```
Vty-1#show version
Unit 1
 Serial Number : EC2028001435
 Hardware Version : R02A
 Number of Ports : 28
 Main Power Status : Up
 Role : Master
 Loader Version : 1.0.1.9
 Linux Kernel Version : 2.6.19-g496f2361-di
 Operation Code Version : 1.2.71.203
```

In this example, the serial number EC2028001435 is used. You need to use the serial number of each switch on the commands.

```
configure
username guest password 0 EC2028001435
username admin password 0 EC2028001435
exit
copy running-config startup-config
exit
```

At this point, you are disconnected from the switch and the switch is personalized for ESS usage.

Appendix D. Executing Install Complete using essutils

This topic describes an alternative procedure to execute Install Complete using essutils.

The topic does not have instructions for following new methods to execute Install Complete.

- Front-End application (SSR_CODE20)
- Updates to the node/canister software via (SSR_CODE20_xxx.tgz)
- Install Complete automation via ess_ssr_setup

Note: Use a serial cable to execute essutils if you cannot connect to the node via Ethernet. For more information, see Troubleshooting (SSR tasks).

Note: The ESS 3500 example is explained below:

The p9 EMS, p9 Protocol, or ESS 5000 node all operate according to the same procedure. The only difference is the initial connection between your laptop to each server (adapter to ESS 3500 USB port or directly to C11-T4 (power nodes)).

For each node type, find the corresponding panel in essutils and walk through all the options. Keep the worksheet handy for IP address assignment and ping tests.

1. Perform the following steps to configure server canister A/1 (left):
    a. Connect the laptop to the SSR access port of the server canister A/1 (left) by using an Ethernet cable and Ethernet to USB-A adapter. The USB adapter is connected the bottom USB-A port. The following figure shows the SSR access ports.

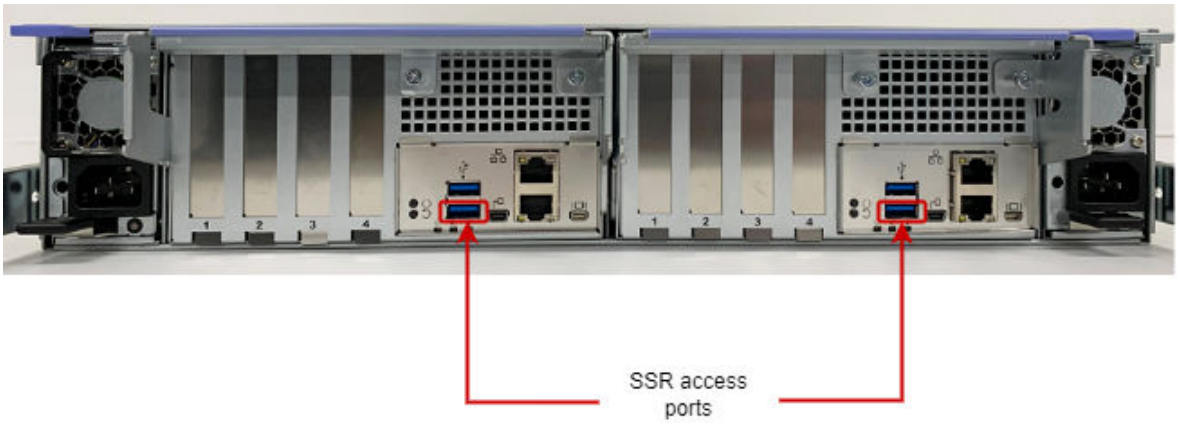


Figure 84. SSR access port

Connect the laptop to the USB-A to Ethernet adapter on the canister using an Ethernet cable. If the USB-A port is not found on your laptop, plug in the Ethernet to USB adapter to connect the cable to the laptop.

b. Power on IBM Elastic Storage System 3500 server canister A/1 (left) (if not already ON). You must press and hold the power button (small button on the top left of the USB ports) for 1-3 seconds to boot the system up (see Orientation of ports). The system begins to boot and directs to a login prompt. Wait for 5 minutes, the Power LED flashes until the canister is powering On and becomes solid once the power is On.

Note: At this stage, it is best to power on both the canisters as some of the tests (**Interlink ping test**) require it. Press the power button on the alternative canister though you are physically connected to only one at this point.

Note: Holding the power button for more than 3 seconds will power off the canister.

c. The canister will try to automatically assign (via DHCP) an IP address to your laptop of 10.111.222.102/30.

d. Ping 10.111.222.101. If successful, ssh via putty to 10.111.222.102.

e. If ping is not successful, verify your laptop has an IP address set. Otherwise, manually set a static IP address of 10.111.222.102 netmask 255.255.255.252.

f. Before you log in, increase the size of the putty window and the putty text.

g. SSH login (to 10.111.222.101) by using the following credentials:

```
uid:essserv1
```

```
pw:<{Enclosure serial number}A|B>
```

Add 'A' at the end of the enclosure serial number for the left canister for password. For example, if the enclosure serial number is 01YM312, the password for the left canister will be 01YM312A or 01YM312B for the right canister.

To access the utility, log into the canister and type **essutils**.

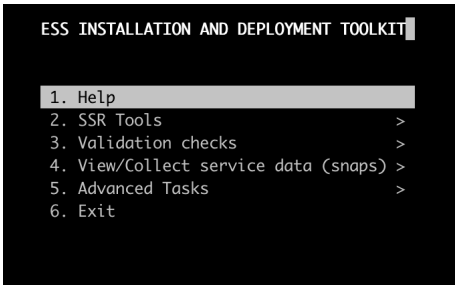


Figure 85. Accessing Utility

h. Perform the following steps to set the root password and open the ESS 3500 tools menu.

i) Highlight the **Advanced Tasks** menu and press the **Enter** key.

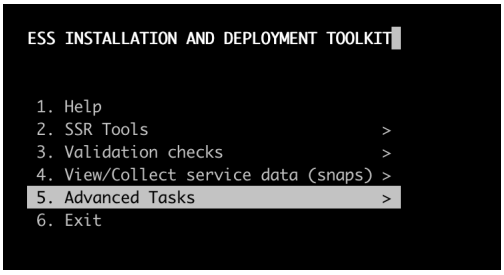


Figure 86. Advanced Tasks menu

ii) Highlight the **Command Prompt** menu and press the **Enter** key.

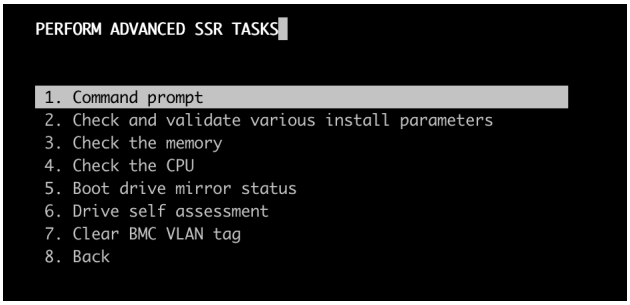


Figure 87. Command Prompt menu

iii) Type **passwd** and press **Enter**.

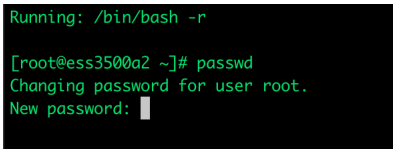


Figure 88. Setting Root Password

You will be prompted to set the root password and confirm it. It is recommended to set to **ibmesscluster**.

iv) Type **Exit** and press the **Enter** key to re-enter **essutils**.

v) Highlight **Back** and press **Enter**. Highlight **SSR Tools** and press the **Enter** key.

vi) Highlight the **ESS 3500 SSR checks** menu and press the **Enter** key.

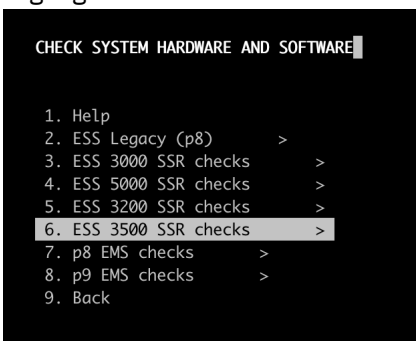


Figure 89. ESS 3500 SSR checks menu

vii) Now, the full IBM Elastic Storage System 3500 tools menu opens.

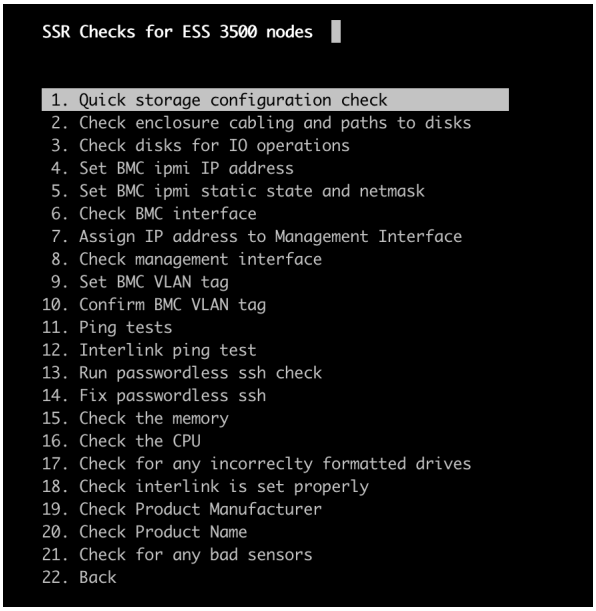


Figure 90. IBM Elastic Storage System 3500 tools menu

i. Highlight the **Quick storage configuration check** menu and press the **Enter** key.

This option checks the valid status of the drive type/placement, adapter type/placement, and canister model.

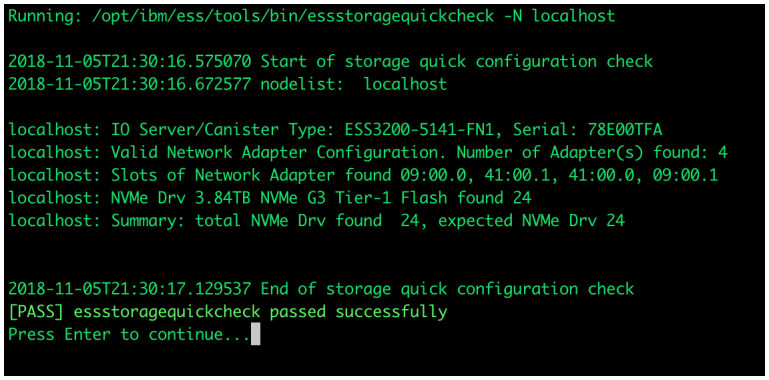


Figure 91. Quick storage configuration check window

The output displays with a **PASS** or **ERROR** message. If the step fails with an error message, debug the issue and try again.

Press the **Enter** key to continue.

j. Highlight the **Check enclosure cabling and paths to disks** menu and press the **Enter** key.

This option checks the valid status of all paths to the NVMe drives.

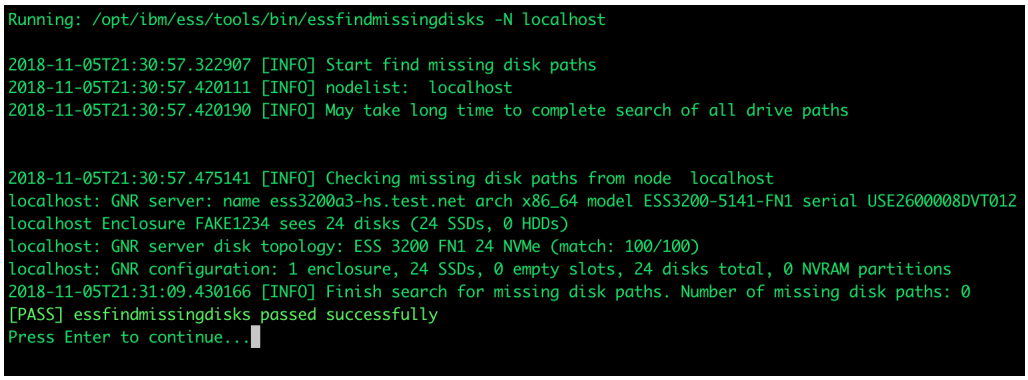


Figure 92. Checking enclosure cabling and paths to disks

The output displays with a **PASS** or **ERROR** message. If the step fails with an error message, debug the issue and try again.

Press the **Enter** key to continue.

k. Highlight the **Check disks for IO operations** menu and press the **Enter** key.

This option checks the health status of all the drives by performing a simple read/write test to each drive. This check takes around 5 seconds for each drive.

You would be asked to confirm by typing **Yes** and press the **Enter** key as shown in the following figure.

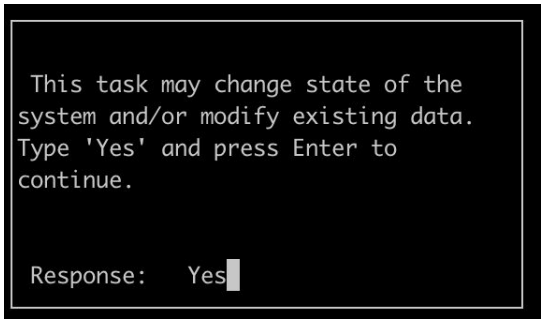


Figure 93. Checking disks for I/O operations

Warning: Run this command only on a new system. If any warnings related to existing recovery group are detected, exist immediately.

```
Running: ESSENV=INSTALL /opt/ibm/ess/tools/bin/esscheckdisks --enclosure-list all --iotest a --write-enable --duration 5

2018-11-05T21:33:24.416450 Start running check disks
2018-11-05T21:33:24.485539 Disk check will be performed for host: ess3200a3
Recovery group descriptor found. Write test will destroy data in the targeted disks. Enter 'yes' to continue.
>>>
```

Figure 94. Recovery group descriptor

```
2018-11-05T21:33:46.752134 System architecture is x86_64
2018-11-05T21:33:46.752204 By default Path 0 will be taken for x86_64 types of node.
2018-11-05T21:33:46.752223 Path Lists: 0
2018-11-05T21:33:46.756943 Taking inventory of nvme disks
2018-11-05T21:33:53.077236 Using IO Engine: gpfsperf
2018-11-05T21:33:53.081362 Starting r test for 24 of 24 disks. Path: 0, duration 5 secs
2018-11-05T21:34:03.120476 Check disk analysis for r test Complete
2018-11-05T21:34:03.120573 Using IO Engine: gpfsperf
2018-11-05T21:34:03.121320 Starting w test for 24 of 24 disks. Path: 0, duration 5 secs
2018-11-05T21:34:13.164164 Check disk analysis for w test Complete
2018-11-05T21:34:13.164259 Using IO Engine: gpfsperf
2018-11-05T21:34:13.165344 Starting R test for 24 of 24 disks. Path: 0, duration 5 secs
2018-11-05T21:34:23.208541 Check disk analysis for R test Complete
2018-11-05T21:34:23.208637 Using IO Engine: gpfsperf
2018-11-05T21:34:23.209725 Starting W test for 24 of 24 disks. Path: 0, duration 5 secs
2018-11-05T21:34:33.252835 Check disk analysis for W test Complete
Press Enter to continue...
```

Figure 95. Recovery group check for all disks

If there is any error that is detected, you must replace or reset drives and try again.

Press the **Enter** key to continue.

l. Highlight the **Set BMC ipmi IP address** menu, press the **C** key and then press the **Enter** key.

```
                                                    3. Check disks for IO operations
                                                    4. Set BMC ipmi IP address
                                                    5. Set BMC ipmi static state and netmask
                                                    6. Check BMC interface
                                                    7. Assign IP address to Management Interface
                                                    8. Check management interface
                                                    9. Set BMC VLAN tag
                                                   10. Confirm BMC VLAN tag
                                                   11. Ping tests
                                                   12. Interlink ping test
                                                   13. Run passwordless ssh check
                                                   14. Fix passwordless ssh
                                                   15. Check the memory
                                                   16. Check the CPU
                                                   17. Check for any incorreclty formatted drives
/bin/ipmitool lan set 1 ipaddr


Change command option(s) below. Press Ctrl+G to return.
Nodelist/Group:
        Prefix:
        Suffix:
   cmd options:ipaddr 10.0.0.200
```

Figure 96. Setting BMC ipmi IP address

A new panel opens. This new panel allows the SSR to change the IP address. Press the **Ctrl + G** keys to save the changes.

Press the **Enter** key to execute. This sets the BMC IP address. For information, see Installation worksheet.

Note: You can see the updated IP address in the box at the bottom of the screen after the changes are saved.

m. Highlight the **Set BMC ipmi static state and netmask** menu and press the **Enter** key.

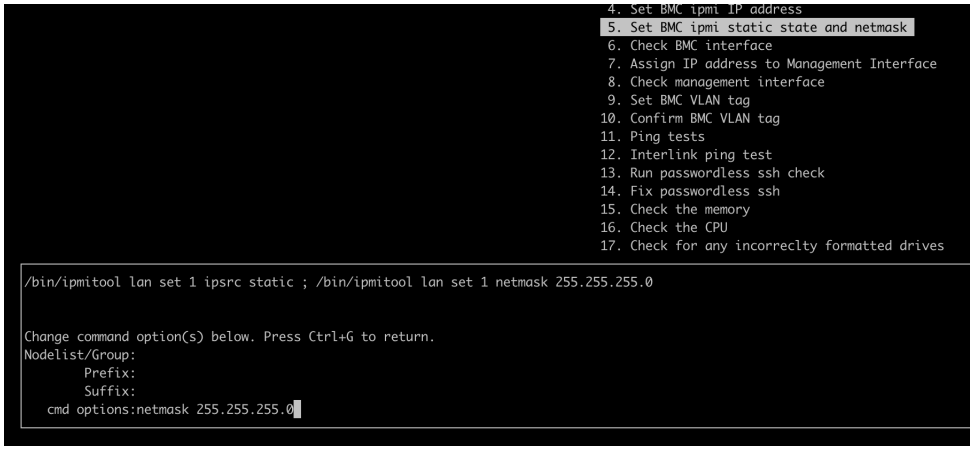


Figure 97. Setting BMC ipmi static state and netmask

You do not need to customize this option. Only reason to modify is, if the netmask is different than 255.255.255.0 (/24).

If you want to modify, highlight the option and press **C** key. Then, change the subnet and press **Ctrl + G** to save the changes.

Press the **Enter** key to execute.

n. Highlight the **Check BMC interface** menu and press the **Enter** key.

This option confirms that the BMC IP address is set correctly in the previous command.

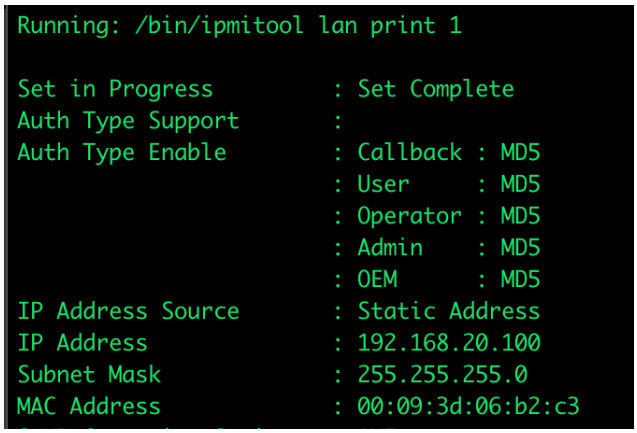


Figure 98. Checking BMC interface

Press the **Enter** key to continue.

o. Highlight the **Assign IP address to Management Interface** menu, press **C** key and then press the **Enter** key.

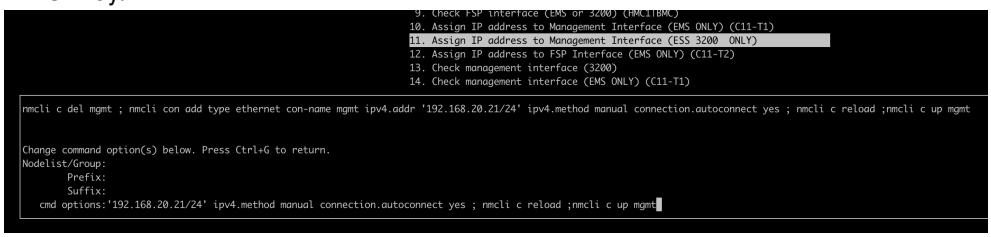


Figure 99. Assigning IP address to Management Interface

A new panel opens. This new panel allows the SSR to change the IP address. Press the **Ctrl + G** keys to save the changes.

Press the **Enter** key to execute. This sets the management IP address. For more information, see the Installation worksheet.

Note: You can see the updated IP address in the box at the bottom of the screen after the changes are saved.

Highlight the **Check management interface** menu and press the **Enter** key.

This option confirms that the management IP set is applied correctly.

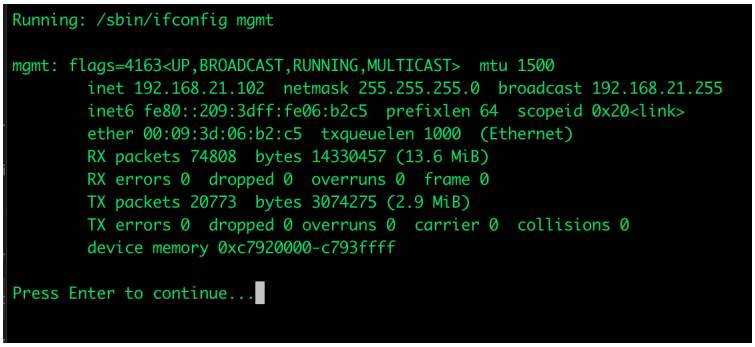


Figure 100. Checking management interface

Press the **Enter** key to continue.

p. Highlight the **Set BMC VLAN tag** menu to set the VLAN tag required so that the BMC can talk to the FSP network. By default press **Enter** to use **VLAN tag 101**. If a unique switch/VLAN tag situation is at hand modify the option with the new value.

Press the **c** key to modify the command.

Change the desired value (from 101).

Press **Control+G** to save then press **Enter** to execute.

In most situations (Especially if brand new racked system and IBM Cumulus switch), you will just press **Enter** immediately to use VLAN tag 101.

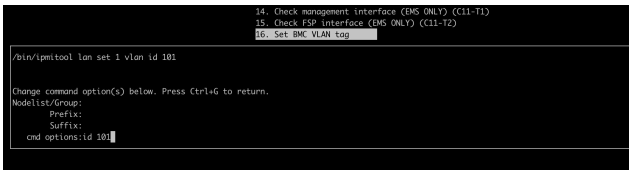


Figure 101. Configuring VLAN tag

q. Highlight the **Confirm BMC VLAN tag** menu and press **Enter**. This confirms the VLAN tag set in the previous option.

Note: The VLAN ID is **Disabled** specifies that it is not set. You should see **101**(Default) or other customized value.

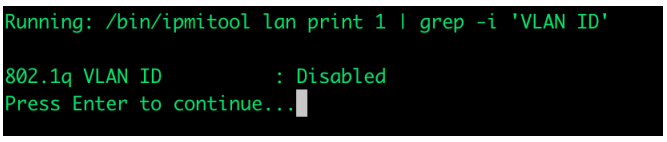


Figure 102. Confirming VLAN tag

r. Highlight **Check interlink is set properly** and press the **Enter** key.

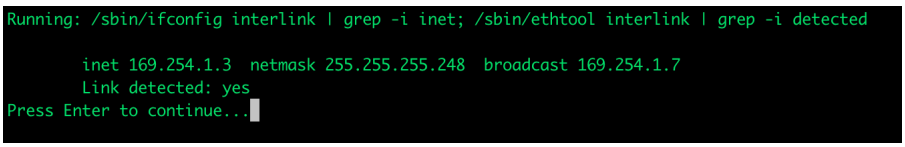


Figure 103. Checking interlink device

This test verifies that the interlink device has an IP address and link is detected.

You can see the following values:

- If you are on the left canister, the IP address must be inet: 169.254.1.3 and netmask: 255.255.255.248
- If you are on the right canister, the IP address must be inet: 169.254.1.4 and netmask :255.255.255.248
- Link Detected: Yes

s. Highlight the **Interlink ping test** menu.

Note: Make sure the other canister is powered on and booted to the OS before performing this test.

i) If you are on the left canister, press the **c** key to customize the target IP address.

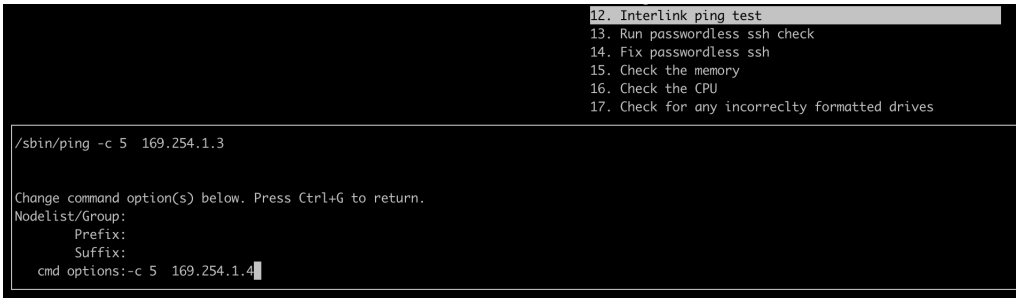


Figure 104. Interlink ping test menu

ii) Change the IP address to 169.254.1.4.

iii) Press **Control+G** to save the value, and then press **Enter** to execute.

iv) If you are on the right canister, pres the **Enter** key (No need to change the IP).

A simple ping test will be performed. If ping does not work you may need to power cycle the canister(s) or contact technical support.

t. Highlight the **Run passwordless ssh check** menu and press **Enter**. This option checks that passwordless ssh is set up correctly.

The result must be "passwordless test is PASSED".

If the test Fails, run the next option to fix.

u. Highlight the **Fix passwordless ssh** menu and press **Enter**. This fixes passwordless ssh issues that are found in the prior step.

v. Check the memory.

The result is,

```
InspectionPassed: True
```

If you do not see, debug any faulty DIMMs.

w. Check the CPUs.

The result is,

```
InspectionPassed: True
```

If you do not see, debug any faulty CPUs.

x. Highlight **Check for any incorrectly formatted drives** and press the **Enter** key.

All drives should be 4K+0B. If any are incorrectly called out, they should be replaced.

y. Highlight **Check Product Manufacturer** and press the **Enter** key.

This check ensures that the manufacturer of canister is set to IBM. Please contact IBM service if the value is different.

After the check, press the **Enter** key to continue.

```
Running: /bin/ipmitool fru list 0 | grep -i 'Product Manufacturer'

 Product Manufacturer  : IBM
Press Enter to continue...
```

Figure 105. Checking Product Manufacturer

z. Highlight **Check Product Name** and press the **Enter** key.

This check ensures that the canister MTM is set to 5141FN2. Please contact IBM service if the value is different.

After the check, press the **Enter** key to continue.

```
Running: /bin/ipmitool fru list 0 | grep -i 'Product Name'

 Product Name          : ESS 3500 : -[5141FN2]-
Press Enter to continue...
```

Figure 106. Checking Product Name

aa. Highlight **Check for any bad sensors** and press the **Enter** key.

This will check to see if the canister is reporting any bad sensor values. If any are not acceptable, take appropriate action. All the values in the column 4 must be **ok**.

After the check, press the **Enter** key to continue.

```
Running: /bin/ipmitool sensor | grep -v discrete | grep -v na

12V_MAIN_VOLT    | 12.120     | Volts      | ok    | 9.000     | 10.020    | 10.500    | 13.500    | 13.980    | 14.520
12V_AUX_VOLT     | 12.180     | Volts      | ok    | 9.000     | 10.020    | 10.500    | 13.500    | 13.980    | 14.520
12V_NV_VOLT      | 12.120     | Volts      | ok    | 9.000     | 10.020    | 10.500    | 13.500    | 13.980    | 14.520
V5P0_S5          | 5.010      | Volts      | ok    | 3.990     | 4.260     | 4.500     | 5.490     | 5.760     | 6.000
V3P3_S5          | 3.320      | Volts      | ok    | 2.800     | 2.960     | 3.100     | 3.600     | 3.760     | 3.900
V2P5_S5          | 2.480      | Volts      | ok    | 2.000     | 2.120     | 2.260     | 2.760     | 2.880     | 3.000
V1P8_S5          | 1.790      | Volts      | ok    | 1.400     | 1.500     | 1.600     | 2.000     | 2.100     | 2.200
V1P2_S5          | 1.200      | Volts      | ok    | 0.900     | 0.970     | 1.050     | 1.350     | 1.430     | 1.500
V1P15_S5         | 1.140      | Volts      | ok    | 0.860     | 0.930     | 1.000     | 1.300     | 1.370     | 1.430
VSOC_S5          | 0.910      | Volts      | ok    | 0.600     | 0.700     | 0.800     | 1.000     | 1.100     | 1.200
V3P3_S0          | 3.340      | Volts      | ok    | 2.800     | 2.960     | 3.100     | 3.600     | 3.760     | 3.900
V1P8_S0          | 1.820      | Volts      | ok    | 1.400     | 1.500     | 1.600     | 2.000     | 2.100     | 2.200
VDDQ_S3_ABCD     | 1.210      | Volts      | ok    | 0.940     | 1.020     | 1.100     | 1.280     | 1.340     | 1.400
VPP_S3_ABCD      | 2.500      | Volts      | ok    | 2.000     | 2.120     | 2.240     | 2.760     | 2.880     | 3.000
VDDQ_S3_EFGH     | 1.210      | Volts      | ok    | 0.940     | 1.020     | 1.100     | 1.280     | 1.340     | 1.400
VPP_S3_EFGH      | 2.500      | Volts      | ok    | 2.000     | 2.120     | 2.240     | 2.760     | 2.880     | 3.000
VDDCR_CPU_S0     | 1.180      | Volts      | ok    | 0.010     | 0.020     | 0.030     | 2.530     | 2.540     | 2.550
VDDCR_SOC_S0     | 0.830      | Volts      | ok    | 0.010     | 0.020     | 0.030     | 2.530     | 2.540     | 2.550
PSU1_V_OUT       | 12.100     | Volts      | ok    | 9.000     | 10.000    | 10.500    | 13.500    | 14.000    | 14.500
PSU2_V_OUT       | 12.100     | Volts      | ok    | 9.000     | 10.000    | 10.500    | 13.500    | 14.000    | 14.500
V_BAT            | 3.180      | Volts      | ok    | 2.000     | 2.260     | 2.500     | 5.060     | 5.080     | 5.100
Press Enter to continue...
```

Figure 107. Checking for bad sensors

2. Unplug the USB-A to Ethernet connection from server canister A/1 (left) to canister B/2 (right).
3. For IBM Elastic Storage System 3500 server canister B/2 (right), repeat the configuration steps of server canister A/1 (left).

   Note: Add a ‘B’ at the end of the enclosure serial number for the right canister for password. For example, if the enclosure serial number is 78E00TF, the password for the right canister would be 78E00TFB.
4. Perform ping test from server canister B/2 (right) to canister A/1 (left).

- Highlight **Ping tests**.

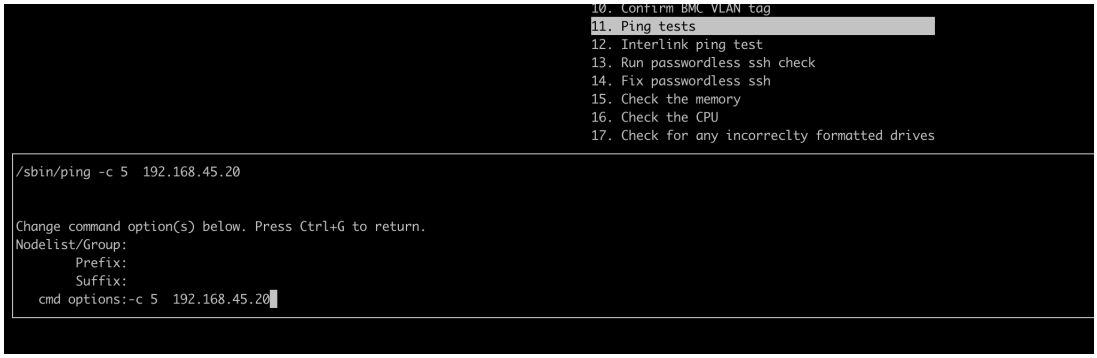


Figure 108. Performing Ping tests

- Press the **C** key to modify the target to the management IP of server canister A/1.
- Press **Ctrl+G** to save the changes.
- Press the **Enter** key to execute.

  You should get positive result (no packet drops).

5. Power cycle the building block.

   It is recommended that SSRs do a full A/C power cycle after both canisters are checked and ping tests are confirmed. Power cycling can be done after ping tests are complete.

   a. Shut down the O/S on both canisters.

   ```
   shutdown -h now
   ```

   b. Power off the A/C by removing the power cables.

   c. Wait for 5 minutes.

   d. Power on the A/C.

   e. Power on each canister by holding the small button on the top next to the USB ports on each canister.

   If you face any issues, see Troubleshooting (SSR tasks) topic.

   After you complete the above procedure for canister B/2, repeat the same procedure for each additional ESS building-blocks. Ensure that the final step before the execution of Install Complete to test that you can ping from the EMS to both the mgmt and BMC interfaces on each ESS canister. If the EMS was already set up, then proceed to do that now. If not, perform this step after the EMS is checked and configured.

Install Complete Commands

Except for upgrading the code, the SSR can execute the commands manually to perform Install Complete.

Use this section if you are not able to execute Install Complete using `essutils` or automated Code 20 tool (`ess_ssr_setup`).

ESS 3500

- Check quick storage configuration

```
sudo /opt/ibm/ess/tools/bin/essstoragequickcheck -N localhost
```

- Check cabling and paths

```
sudo /opt/ibm/ess/tools/bin/essfindmissingdisks -N localhost
```

- Check disks for I/O operations

```
sudo ESSENV=INSTALL /opt/ibm/ess/tools/bin/esscheckdisks --enclosure-list all --iotest a --
writeenable --duration 5
```

- Set BMC IP address

```
sudo /bin/ipmitool lan set 1 ipaddr <desired IP>
```

- Set BMC netmask and static

```
/bin/ipmitool lan set 1 ipsrc static ;
/bin/ipmitool lan set 1 netmask <desired netmask>
```

- Check BMC settings after setting up of BMC netmask

```
/bin/ipmitool lan print 1
```

- Management IP ping test

```
/sbin/ping -c 5  <node IP on mgmt>
```

- Assign IP address to mgmt interface

```
nmcli c del mgmt; nmcli con add type ethernet con-name mgmt ifname mgmt ipv4.addr '<IP
address/mask>' ipv4.method manual connection.autoconnect yes; nmcli c reload; nmcli c up mgmt
```

Note: Replace 192.168.20.21/24 with the desired IP and netmask.

- Check management interface info after assigning IP address

```
/sbin/ifconfig mgmt
```

- Test interlink connection

```
/sbin/ping -c 5  169.254.1.3
```

Note: Use 169.254.1.4 if you are on the right canister.

- Run `passwordless ssh test`

```
/bin/ssh -o BatchMode=yes -o ConnectTimeout=5 localhost echo 'passwordless test is PASSED'
2>/dev/null || echo
```

- Fix `Passwordless ssh` (if the above test fails)

```
echo 'You will need to enter the root password if asked' && /bin/ssh-copy-id -o
ConnectTimeout=5 localhost -f
```

- Set VLAN tag

```
/bin/ipmitool lan set 1 vlan id <tag id>
```

- Confirm VLAN tag after setting it

```
/bin/ipmitool lan print 1 | grep -i 'VLAN ID'
```

- Check memory

```
sudo /opt/ibm/ess/tools/bin/ess3kplt -t memory --local
```

- Check CPU

```
sudo /opt/ibm/ess/tools/bin/ess3kplt -t cpu --local
```

- Check for formatted drives

```
/sbin/nvme --list | grep -v "4 KiB +  0 B"
```

Note: 4 K + 0 drives are not listed.

- Check interlink is up

```
/sbin/ifconfig interlink | grep -i inet; /sbin/ethtool interlink | grep -i detected
```

- Interlink ping test

```
/sbin/ping -c 5  <partner interlink ip>
```

Note: IP address: 169.254.1.3; If on left ping 1.4, if on right ping 1.3.

- Check Product Manufacturer

```
/bin/ipmitool fru list 0 | grep -i 'Product Manufacturer'
```

Note: The Manufacturer should be IBM.

- Check Product Name

```
/bin/ipmitool fru list 0 | grep -i 'Product Name'
```

Note: The product name should be ESS 3500 : -[5141FN2]-

- Check for bad sensors

```
/bin/ipmitool sdr list | grep -v ok
```

- Ping tests

```
/sbin/ping -c 5  192.168.45.20
```

Note: To test, change the target node's IP address on the same subnet (mgmt).

P9 EMS/p9 protocol

- Check quick storage configuration

```
/opt/ibm/ess/tools/bin/essstoragequickcheck -N localhost
```

- Assign IP mgmt address (EMS)

```
nmcli c del mgmt; nmcli con add type ethernet con-name mgmt ifname mgmt ipv4.addr '<IP
address/mask>' ipv4.method manual connection.autoconnect yes; nmcli c reload; nmcli c up mgmt
```

- Check mgmt IP

```
/sbin/ifconfig mgmt
```

- Assign FSP IP (EMS)

```
nmcli c del fsp; nmcli con add type ethernet con-name fsp ifname fsp ipv4.addr '<IP address/
mask>' ipv4.method manual connection.autoconnect yes; nmcli c reload; nmcli c up fsp
```

- Check FSP IP

```
/sbin/ifconfig fsp
```

- Assign campus IP (EMS)

```
nmcli c del campus; nmcli con add type ethernet con-name campus ifname fsp ipv4.addr '<IP
address/mask>' ipv4.method manual connection.autoconnect yes; nmcli c reload; nmcli c up
campus
```

- Check campus IP

```
/sbin/ifconfig campus
```

- Assign mgmt IP (Protocol)

```
nmcli c del enP1p8s0f0; nmcli con add type ethernet con-name enP1p8s0f0 ifname fsp ipv4.addr
‘<IP address/mask>' ipv4.method manual connection.autoconnect yes; nmcli c reload; nmcli c up
enP1p8s0f0
```

- Check protocol IP

```
/sbin/ifconfig enP1p8s0f0
```

- Check serviceable events

```
/usr/sbin/opal-elog-parse -s
```

- Gather event details (if needed)

```
/usr/sbin/opal-elog-parse  -d <event ID>
```

- Erase event (if needed)

```
/usr/sbin/opal-elog-parse  -e <event ID>
```

- Set HMC1 port

```
/bin/ipmitool lan set 1 ipaddr <IP>
```

- Set static / netmask HMC1 port

```
/bin/ipmitool lan set 1 ipsrc static; /bin/ipmitool lan set 1 netmask <netmask>
```

- Confirm HMC1 port settings

```
/bin/ipmitool lan print 1
```

- Ping tests

```
/sbin/ping -c 5  <target ip>
```

- Check IPR raid status

```
/sbin/iprconfig -c show-config
```

- Optional: Set HMC2 port stuff

```
/bin/ipmitool lan set 2 ipaddr <IP>
```

```
/bin/ipmitool lan set 2 ipsrc static ; /bin/ipmitool lan set 2 netmask <netmask>
ipmitool lan set 2 defgw ipaddr 192.168.1.254
```

ESS 5000

- Check quick storage configuration

```
/opt/ibm/ess/tools/bin/essstoragequickcheck -N localhost
```

- Check cabling and paths

```
/opt/ibm/ess/tools/bin/essfindmissingdisks -N localhost
```

- Check disks for I/O operations

```
ESSENV=INSTALL /opt/ibm/ess/tools/bin/esscheckdisks --enclosure-list all --iotest a --write-
enable --duration 5
```

- Set HMC 2 port (optional)

```
/bin/ipmitool lan set 2 ipaddr <IP>
/bin/ipmitool lan set 2 ipsrc static; /bin/ipmitool lan set 2 netmask <netmask>
ipmitool lan set 2 defgw ipaddr 192.168.1.254
```

- Ping tests

```
/sbin/ping -c 5  <target ip>
```

- check IPR raid status

```
/sbin/iprconfig -c show-config
```

- Assign mg mt IP

```
nmcli c del enP1p8s0f0; nmcli con add type ethernet con-name enP1p8s0f0 ifname fsp ipv4.addr
‘<IP address/mask>' ipv4.method manual connection.autoconnect yes; nmcli c reload; nmcli c up
enP1p8s0f0
```

- Check mgmt IP

```
/sbin/ifconfig enP1p8s0f0
```

- Check serviceable events

```
/usr/sbin/opal-elog-parse -s
```

- Gather event details (if needed)

```
/usr/sbin/opal-elog-parse  -d <event ID>
```

- Erase event (if needed)

```
/usr/sbin/opal-elog-parse  -e <event ID>
```

- Set HMC1 port

```
/bin/ipmitool lan set 1 ipaddr <IP>
```

- Set static / netmask HMC 1 port

```
/bin/ipmitool lan set 1 ipsrc static ; /bin/ipmitool lan set 1 netmask <netmask>
```

- Confirm HMC 1 port settings

```
/bin/ipmitool lan print 1
```

- Check WCE

```
/opt/ibm/ess/tools/samples/ess5000_wce_check.sh 2>/dev/null && echo 'No bad drives' || echo
'Bad drives detected'
```

Appendix E. Copying Packages to /serv manually

The SSR should copy two packages to each node before running the automated ESS Code 20 App tool.

The following packages should be downloaded from the IBM Box folder (w3 access is required) and copied to each node.

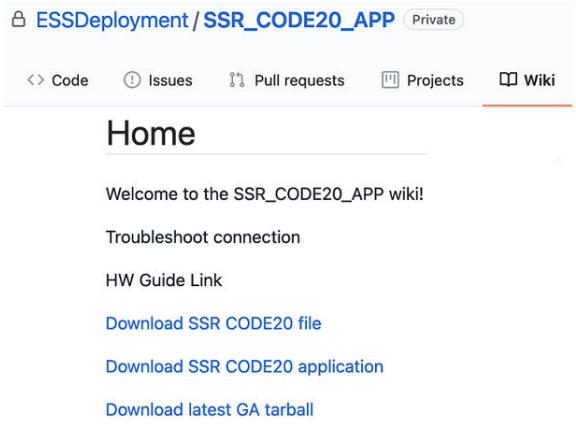


Figure 109. Packages download website

- Update tarball (for example, `SSR_CODE20_109.tar.gz`).
- Latest GA package (for example, `INTERNAL_LICENSED_CODE_6.1.5.0_DME.tar.gz`).
  - The worksheet should indicate if you need to download **dme** or **dae**.

Note: If you are using **essutils** (suggested if the other ways do not work), copy the entire GA package to the /serv. The update tarball does not need to be copied.

Perform the following steps to copy the packages:

1. Using FileZilla, connect to the node via ftp (port 22).

   IP address: 10.111.222.101

   Username: **essserv1**

   Password: **Server serial number + A (left canister) or B (right canister)**

   Example: left canister: 78E4005A; right canister: 78E4005B

   Considering you have an assigned IP address 10.111.222.102 (via DHCP or static, SFTP port - 22) and are directly connected to the server via USB A to an Ethernet adapter.
2. Copy the required packages to /serv on the node. Typically by dragging and dropping to /serv from your laptop.

   Note: Only one node in the order have the **Latest GA package** copied to it. You need to copy the file to a single canister if you are adding one or more ESS 3500s to an environment (typically the bottom-most, left canister). Always copy the package to the EMS if an EMS is in the order (no other nodes).

Appendix F. Running ess_ssr_setup manually

You have two alternatives to execute Install Complete on a node if you are not using the GUI front-end application.

Before you start, make sure you copy the relevant files to server manually. For more information, see Appendix E, “Copying Packages to /serv manually,” on page 123.

Run one of the following methods if you are not using GUI front-end application:

Note: You should set the root password before running any of the following commands:

- Login as root (password is **cluster**). The login shell confirms the root password has expired.
- Set a new password (**ibmesscluster**).
- Re-enter the password to confirm.

  Now, the password is set.

1. Login to the server canister to run the automated Install Complete script (ess_ssr_setup).

   ```
   ssh essserv1@10.111.222.101
   ```

   Password: **Server serial number + A (left canister) or B (right canister)**

   Example: left canister: 78E4005A; right canister: 78E4005B

   If the node is a POWER node (POWER9 EMS/POWER9 Protocol/ESS 5000), the password is the serial number of the server.

   Run the **ess_ssr_setup** application manually from the command line.

   The **ess_ssr_setup** application is same as the GUI front-end application, but it is only available as a command line option. After logging in using Putty via ssh, type **sudo /opt/ibm/ess/tools/bin/ess_ssr_setup** to start the automated Install Complete setup.
2. Run the legacy **essutils** program (Use if the GUI front-end application or the above method does not work).

   Until IBM Elastic Storage System 3500 6.1.3, the primary method of executing Install Complete in ESS environments is **essutils**, a GUI-like panel.

   Run the **sudo /opt/ibm/ess/tools/bin/essutils** command to start the utility. For detailed instructions, see Appendix D, “Executing Install Complete using essutils,” on page 109.

When using **ess_ssr_setup** on IBM Elastic Storage System 3500 the canister, the following steps explain the SSR experience (command line and GUI front-end are based on similar user experience).

1. Run the tool (**sudo /opt/ibm/ess/tools/bin/ess_ssr_setup**) after logged into the node.

   If the latest tarball is not available in server, displays an error message to download the latest file.

   ```
   essserv1@essio3's password:
   Last login: Thu Mar 17 21:53:13 2022 from 10.10.0.1
   [essserv1@essio3 ~]$ sudo /opt/ibm/ess/tools/bin/ess_ssr_setup
   ERROR: Please download from IBM internal repo the latest SSR CODE 20 file into this node /serv
   [essserv1@essio3 ~]$
   ```

   Figure 110. Error message to download latest tarball

   For more information about downloading latest tarball, see Appendix E, “Copying Packages to /serv manually,” on page 123.

   The following details are required from the TDA worksheet:

   - Management IP address and netmask
   - BMC IP address and netmask
   - VLAN tag (default is 101)

- Root password

2. The following figure shows the initial questions asked when starting **ess_ssr_setup**. You need to fill in the answers based on the worksheet.

```
[essserv1@essio3 ~]$  sudo /opt/ibm/ess/tools/bin/ess_ssr_setup
2022-03-17 22:15:14,027 INFO:    Welcome to IBM ESS 'code 20' helper tool
2022-03-17 22:15:14,027 INFO:    You are going to need the TDA table information to continue. If you do not have that information, you CANNOT continue.
2022-03-17 22:15:14,027 INFO:    For debug output or issues, be sure to include the debug file on /opt/ibm/ess/tools/bin/code20_debug.log

Do you want to continue? (y/n): y

Please type the management IP of this node (i.e. 192.168.10.10): 10.10.0.5
Please type the management netmask of this node (i.e. 255.255.255.0): 255.255.255.0

Please type the BMC/HMC1 FSP IP of this node (i.e. 192.168.20.10): 172.16.0.5
Please type the BMC/HMC1 FSP netmask of this node (i.e. 255.255.255.0): 255.255.255.0
2022-03-17 22:18:25,470 INFO:    Going to ask for the node password. All the nodes must have the same password for code 20
2022-03-17 22:18:25,470 INFO:    Be aware that the password will not be prompted into the screen and you will not see it on it
Password:
2022-03-17 22:18:30,202 INFO:    Please type the same password again
Password:
```

Figure 111. SSR setup initial questionnaire

The following figure shows additional questions to be filled.

```
Is this a new deploymnet or adding a block to a running cluster? (new/add): new
Is this the very first node being installed today and there is no other node already configured and cannot ping any other system yet (y/n): y
2022-03-17 22:20:50,976 WARNING:         This is a new setup and we have no peers to check with, no ping tests will happen
```

Figure 112. SSR setup additional questions

3. Confirm worksheet inputs.

   The inputs given to the command are displayed to the SSR before execution begins. If everything is correct, type **y** and press the **Enter** key.

```
Please review the entered information before continuing.
No changes in the system had been perfomed at this point.

The entered IP in CIDR format for MANAGEMENT is 10.10.0.5/24
The entered IP in CIDR format for FSP/HMC1 is 172.16.0.5/24
No ping tests to be performed.
The entered root password to set is: ibmesscluster

Do you want to continue and perform changes adn tests in this node? (y/n):
```

Figure 113. Confirming worksheet inputs

4. Sample output from **ess_ssr_setup** after confirming all the inputs.

```
2022-05-04 15:07:22,833 DEBUG:    Going to show summary of this node
2022-05-04 15:07:22,833 DEBUG:    Going to print the SSR_TASKS table
2022-05-04 15:07:22,833 DEBUG:    TASK: DB_init was successfully run on 2022-05-04T14:55:18.595454
2022-05-04 15:07:22,833 DEBUG:    Found common entry Root_password_set
2022-05-04 15:07:22,833 DEBUG:    TASK: Root_password_set was successfully run on 2022-05-04T15:07:19.399528
2022-05-04 15:07:22,833 DEBUG:    TASK: Passwordless root SSH localhost was successfully run on 2022-05-04T15:07:19.901646
2022-05-04 15:07:22,833 DEBUG:    TASK: Quick storage configuration check was successfully run on 2022-05-04T15:07:20.505797
2022-05-04 15:07:22,833 DEBUG:    TASK: Serviceable events check was successfully run on 2022-05-04T15:07:20.999866
2022-05-04 15:07:22,833 DEBUG:    TASK: Set MGMT IP was successfully run on 2022-05-04T15:07:21.440890
2022-05-04 15:07:22,833 DEBUG:    TASK: Set Campus IP was successfully run on 2022-05-04T15:07:21.761118
2022-05-04 15:07:22,833 DEBUG:    TASK: Set OS FSP IP was successfully run on 2022-05-04T15:07:22.060338
2022-05-04 15:07:22,833 DEBUG:    TASK: Set BMC FSP IP was successfully run on 2022-05-04T15:07:22.710342
2022-05-04 15:07:22,833 DEBUG:    TASK: Ping not tested was successfully run on 2022-05-04T15:07:22.771360
2022-05-04 15:07:22,833 INFO:     All run taks were successful
2022-05-04 15:07:22,833 ERROR:    Although the run tasks were succesful, not all required tasks were run. A complete successful
run is required
2022-05-04 15:07:22,834 DEBUG:    Going to exit with RC=1
```

Figure 114. Sample ess_ssr_setup output

Here is an example of the ESS 3500 menu using essutils. The POWER9 EMS/protocol, ESS 5000, and other devices have similar menus.

Figure 115. Sample output using essutils

Appendix G. Cables/Adapters for SSR activities

This section shows the cables required for installing and configuring code on the server.

Figure 116. USB-A to Ethernet adapter

Figure 117. Mini USB to VGA/HDMA adapter

Note: The figure shows mini USB (ESS 3200), micro USB is need for ESS 3500.

Figure 118. Serial (USB mini-B) to USB cable

Note: The cable shown in the figure works for ESS 3200/ESS 3500 enclosures.

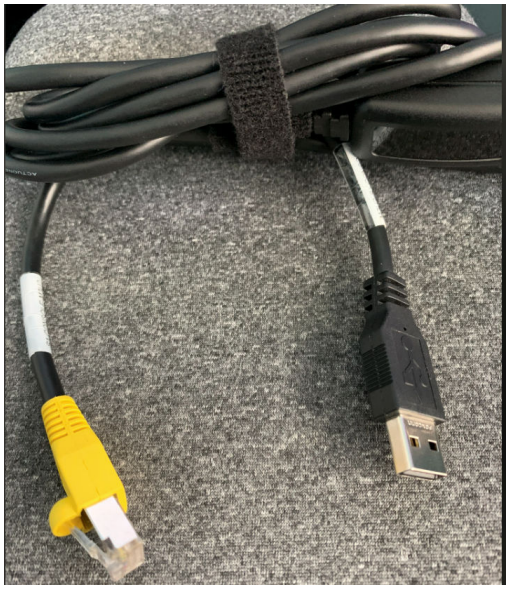


Figure 119. POWER9 EMS (serial to USB)

Figure 120. DB9 to USB cable for power nodes

Figure 121. USB extension cable

Figure 122. Adapter to access server via Ethernet

Figure 123. Adapter slot to access server via Ethernet

Appendix H. ESS 3500 - Slot placement summary

Each slot number and its usage, as well as VM usage when setup, are explained in the slot placement summary.

The following table and the illustration represents each slot and its usage.

Slot Number	Usage	VM Usage when Configured
Slot 1 – Network	Network: CX5 or CX6	CX5 or CX6– host IOMMU group
Slot 2 – Network	Network: CX5 or CX6	CX5 or CX6– host or guest IOMMU group
Slot 3 – Network	Network: CX5 or CX6	CX5 or CX6 – guest IOMMU group
Slot 4 – Network	Network: CX5 or CX6	CX5 or CX6 - host or guest IOMMU group

Figure 124. Slot placement summary

Appendix I. PCIe4 x16 2-port EDR 100 GB InfiniBand ConnectX-5 CAPI Capable adapter (FC AJP1; CCIN 2CF2)

Learn about the specifications and operating system requirements for feature code (FC) AJP1 adapter.

Overview

FC AJP1 is a low-profile adapter. PCIe4 x16 2-Port EDR 100 GB IB ConnectX-5 CAPI Capable Adapter is a PCI Express (PCIe) generation 4 (Gen4) x16 adapter. The adapter enables higher HPC performance with new Message Passing Interface (MPI) offloads, such as MPI Tag Matching and MPI AlltoAll operations, advanced dynamic routing, and new capabilities to perform various data algorithms.

Note: The Virtual Protocol Interconnect (VPI) feature is supported on this adapter. The adapter may be used as InfiniBand and/or Ethernet adapter.

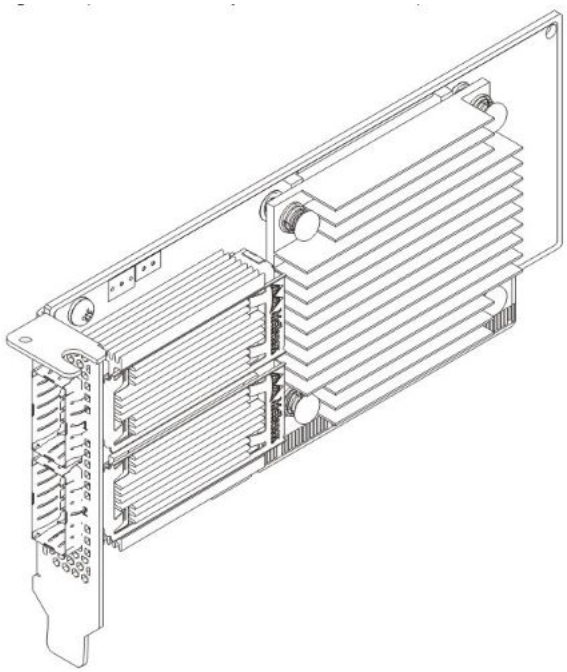


Figure 125. PCIe4 x16 2-Port EDR 100 GB IB ConnectX-5 CAPI Capable Adapter

Specifications

Item
Description

Adapter FRU number
01LL586

I/O bus architecture
PCIe4 x16

Slot requirement
For more information about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities and select the system that you are working on.

Thermal requirement
If you have a 5105-22E system, you might be required to set the thermal mode of the system to a setting other than the default setting, depending on your system, adapter, and cable type.

Voltage
3.3 V, 12 V

Form factor
Short, low-profile

Attributes provided
EDR 100 Gb/s InfiniBand per port

PCIe4 Support

IBM® CAPI v2 support

Tag Matching and Rendezvous Offloads

Hardware-based I/O virtualization

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices.

Accessibility features for the system

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

Accessibility features

The following list includes the major accessibility features in IBM Spectrum Scale RAID:

- Keyboard-only operation
- Interfaces that are commonly used by screen readers
- Keys that are discernible by touch but do not activate just by touching them
- Industry-standard devices for ports and connectors
- The attachment of alternative input and output devices

IBM Documentation, and its related publications, are accessibility-enabled.

Keyboard navigation

This product uses standard Microsoft Windows navigation keys.

IBM and accessibility

See the IBM Human Ability and Accessibility Center (www.ibm.com/able) for more information about the commitment that IBM has to accessibility.

Glossary

This glossary provides terms and definitions for the IBM Elastic Storage System solution.

The following cross-references are used in this glossary:

- *See* refers you from a non-preferred term to the preferred term or from an abbreviation to the spelled-out form.
- *See also* refers you to a related or contrasting term.

For other terms and definitions, see the IBM Terminology website (opens in new window):

http://www.ibm.com/software/globalization/terminology

B

building block
A pair of servers with shared disk enclosures attached.

BOOTP
See *Bootstrap Protocol (BOOTP)*.

Bootstrap Protocol (BOOTP)
A computer networking protocol that is used in IP networks to automatically assign an IP address to network devices from a configuration server.

C

CEC
See *central processor complex (CPC)*.

central electronic complex (CEC)
See *central processor complex (CPC)*.

central processor complex (CPC)
A physical collection of hardware that consists of channels, timers, main storage, and one or more central processors.

cluster
A loosely-coupled collection of independent systems, or *nodes*, organized into a network for the purpose of sharing resources and communicating with each other. See also *GPFS cluster*.

cluster manager
The node that monitors node status using disk leases, detects failures, drives recovery, and selects file system managers. The cluster manager is the node with the lowest node number among the quorum nodes that are operating at a particular time.

compute node
A node with a mounted GPFS file system that is used specifically to run a customer job. ESS disks are not directly visible from and are not managed by this type of node.

CPC
See *central processor complex (CPC)*.

D

DA
See *declustered array (DA)*.

datagram
A basic transfer unit associated with a packet-switched network.

DCM
See *drawer control module (DCM)*.

declustered array (DA)
A disjoint subset of the pdisks in a recovery group.

dependent fileset
A fileset that shares the inode space of an existing independent fileset.

DFM
See *direct FSP management (DFM)*.

DHCP
See *Dynamic Host Configuration Protocol (DHCP)*.

drawer control module (DCM)
Essentially, a SAS expander on a storage enclosure drawer.

Dynamic Host Configuration Protocol (DHCP)
A standardized network protocol that is used on IP networks to dynamically distribute such network configuration parameters as IP addresses for interfaces and services.

E

Elastic Storage System (ESS)
A high-performance, GPFS NSD solution made up of one or more building blocks. The ESS software runs on ESS nodes - management server nodes and I/O server nodes.

encryption key
A mathematical value that allows components to verify that they are in communication with the expected server. Encryption keys are based on a public or private key pair that is created during the installation process. See also *file encryption key (FEK)*, *master encryption key (MEK)*.

ESS
See *Elastic Storage System (ESS)*.

environmental service module (ESM)
Essentially, a SAS expander that attaches to the storage enclosure drives. In the case of multiple drawers in a storage enclosure, the ESM attaches to drawer control modules.

ESM
See *environmental service module (ESM)*.

F

failback
Cluster recovery from failover following repair. See also *failover*.

failover
(1) The assumption of file system duties by another node when a node fails. (2) The process of transferring all control of the ESS to a single cluster in the ESS when the other clusters in the ESS fails. See also *cluster*. (3) The routing of all transactions to a second controller when the first controller fails. See also *cluster*.

failure group
A collection of disks that share common access paths or adapter connection, and could all become unavailable through a single hardware failure.

FEK
See *file encryption key (FEK)*.

file encryption key (FEK)
A key used to encrypt sectors of an individual file. See also *encryption key*.

file system
The methods and data structures used to control how data is stored and retrieved.

file system descriptor
A data structure containing key information about a file system. This information includes the disks assigned to the file system (*stripe group*), the current state of the file system, and pointers to key files such as quota files and log files.

file system descriptor quorum
The number of disks needed in order to write the file system descriptor correctly.

file system manager
The provider of services for all the nodes using a single file system. A file system manager processes changes to the state or description of the file system, controls the regions of disks that are allocated to each node, and controls token management and quota management.

fileset
A hierarchical grouping of files managed as a unit for balancing workload across a cluster. See also *dependent fileset*, *independent fileset*.

fileset snapshot
A snapshot of an independent fileset plus all dependent filesets.

flexible service processor (FSP)
Firmware that provides diagnosis, initialization, configuration, runtime error detection, and correction. Connects to the HMC.

FQDN
See *fully-qualified domain name (FQDN)*.

FSP
See *flexible service processor (FSP)*.

fully-qualified domain name (FQDN)
The complete domain name for a specific computer, or host, on the Internet. The FQDN consists of two parts: the hostname and the domain name.

G

GPFS cluster
A cluster of nodes defined as being available for use by GPFS file systems.

GPFS portability layer
The interface module that each installation must build for its specific hardware platform and Linux distribution.

GPFS Storage Server (GSS)
A high-performance, GPFS NSD solution made up of one or more building blocks that runs on System x servers.

GSS
See *GPFS Storage Server (GSS)*.

H

Hardware Management Console (HMC)
Standard interface for configuring and operating partitioned (LPAR) and SMP systems.

HMC
See *Hardware Management Console (HMC)*.

I

IBM Security Key Lifecycle Manager (ISKLM)
For GPFS encryption, the ISKLM is used as an RKM server to store MEKs.

independent fileset
A fileset that has its own inode space.

indirect block
A block that contains pointers to other blocks.

inode
The internal structure that describes the individual files in the file system. There is one inode for each file.

inode space
A collection of inode number ranges reserved for an independent fileset, which enables more efficient per-fileset functions.

Internet Protocol (IP)
The primary communication protocol for relaying datagrams across network boundaries. Its routing function enables internetworking and essentially establishes the Internet.

I/O server node
An ESS node that is attached to the ESS storage enclosures. It is the NSD server for the GPFS cluster.

IP
See *Internet Protocol (IP)*.

IP over InfiniBand (IPoIB)
Provides an IP network emulation layer on top of InfiniBand RDMA networks, which allows existing applications to run over InfiniBand networks unmodified.

IPoIB
See *IP over InfiniBand (IPoIB)*.

ISKLM
See *IBM Security Key Lifecycle Manager (ISKLM)*.

J

JBOD array
The total collection of disks and enclosures over which a recovery group pair is defined.

K

kernel
The part of an operating system that contains programs for such tasks as input/output, management and control of hardware, and the scheduling of user tasks.

L

LACP
See *Link Aggregation Control Protocol (LACP)*.

Link Aggregation Control Protocol (LACP)
Provides a way to control the bundling of several physical ports together to form a single logical channel.

logical partition (LPAR)
A subset of a server's hardware resources virtualized as a separate computer, each with its own operating system. See also *node*.

LPAR
See *logical partition (LPAR)*.

M

management network
A network that is primarily responsible for booting and installing the designated server and compute nodes from the management server.

management server (MS)
An ESS node that hosts the ESS GUI and is not connected to storage. It must be part of a GPFS cluster. From a system management perspective, it is the central coordinator of the cluster. It also serves as a client node in an ESS building block.

master encryption key (MEK)
A key that is used to encrypt other keys. See also *encryption key*.

maximum transmission unit (MTU)
The largest packet or frame, specified in octets (eight-bit bytes), that can be sent in a packet- or frame-based network, such as the Internet. The TCP uses the MTU to determine the maximum size of each packet in any transmission.

MEK
See *master encryption key (MEK)*.

metadata
A data structure that contains access information about file data. Such structures include inodes, indirect blocks, and directories. These data structures are not accessible to user applications.

MS
See *management server (MS)*.

MTU
See *maximum transmission unit (MTU)*.

N

Network File System (NFS)
A protocol (developed by Sun Microsystems, Incorporated) that allows any host in a network to gain access to another host or netgroup and their file directories.

Network Shared Disk (NSD)
A component for cluster-wide disk naming and access.

NSD volume ID
A unique 16-digit hexadecimal number that is used to identify and access all NSDs.

node
An individual operating-system image within a cluster. Depending on the way in which the computer system is partitioned, it can contain one or more nodes. In a Power Systems environment, synonymous with *logical partition*.

node descriptor
A definition that indicates how ESS uses a node. Possible functions include: manager node, client node, quorum node, and non-quorum node.

node number
A number that is generated and maintained by ESS as the cluster is created, and as nodes are added to or deleted from the cluster.

node quorum
The minimum number of nodes that must be running in order for the daemon to start.

node quorum with tiebreaker disks
A form of quorum that allows ESS to run with as little as one quorum node available, as long as there is access to a majority of the quorum disks.

non-quorum node
A node in a cluster that is not counted for the purposes of quorum determination.

O

OFED
See *OpenFabrics Enterprise Distribution (OFED)*.

OpenFabrics Enterprise Distribution (OFED)
An open-source software stack includes software drivers, core kernel code, middleware, and user-level interfaces.

P

pdisk
A physical disk.

PortFast
A Cisco network function that can be configured to resolve any problems that could be caused by the amount of time STP takes to transition ports to the Forwarding state.

R

RAID
See *redundant array of independent disks (RAID)*.

RDMA
See *remote direct memory access (RDMA)*.

redundant array of independent disks (RAID)
A collection of two or more disk physical drives that present to the host an image of one or more logical disk drives. In the event of a single physical device failure, the data can be read or regenerated from the other disk drives in the array due to data redundancy.

recovery
The process of restoring access to file system data when a failure has occurred. Recovery can involve reconstructing data or providing alternative routing through a different server.

recovery group (RG)
A collection of disks that is set up by ESS, in which each disk is connected physically to two servers: a primary server and a backup server.

remote direct memory access (RDMA)
A direct memory access from the memory of one computer into that of another without involving either one's operating system. This permits high-throughput, low-latency networking, which is especially useful in massively-parallel computer clusters.

RGD
See *recovery group data (RGD)*.

remote key management server (RKM server)
A server that is used to store master encryption keys.

RG
See *recovery group (RG)*.

recovery group data (RGD)
Data that is associated with a recovery group.

RKM server
See *remote key management server (RKM server)*.

S

SAS
See *Serial Attached SCSI (SAS)*.

secure shell (SSH)
A cryptographic (encrypted) network protocol for initiating text-based shell sessions securely on remote computers.

Serial Attached SCSI (SAS)
A point-to-point serial protocol that moves data to and from such computer storage devices as hard drives and tape drives.

service network
A private network that is dedicated to managing POWER8 servers. Provides Ethernet-based connectivity among the FSP, CPC, HMC, and management server.

SMP
See *symmetric multiprocessing (SMP)*.

Spanning Tree Protocol (STP)
A network protocol that ensures a loop-free topology for any bridged Ethernet local-area network. The basic function of STP is to prevent bridge loops and the broadcast radiation that results from them.

SSH
See *secure shell (SSH)*.

STP
See *Spanning Tree Protocol (STP)*.

symmetric multiprocessing (SMP)
A computer architecture that provides fast performance by making multiple processors available to complete individual processes simultaneously.

T

TCP
See *Transmission Control Protocol (TCP)*.

Transmission Control Protocol (TCP)
A core protocol of the Internet Protocol Suite that provides reliable, ordered, and error-checked delivery of a stream of octets between applications running on hosts communicating over an IP network.

V

VCD
See *vdisk configuration data (VCD)*.

vdisk
A virtual disk.

vdisk configuration data (VCD)
Configuration data that is associated with a virtual disk.

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