Upgrade Guide

Single Node to High Availability Upgrade for DD6800, DD9300, DD9500, and DD9800

Dell EMC Data Domain

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DELL EMC

Tools and supplies needed

These tools and supplies may be helpful for the installation and setup tasks for a system.

- Null modem cable (DB-9 female to female), plus spare
- USB-to-DB-9 serial (male connector) converter cable if the laptop does not have a serial port, plus spare
- Power adapter, C13 to NEMA 5-15 (if based in North America), or a power cord for your laptop power adapter with a C13 plug, so that you can power your laptop from a rack PDU
- Antistatic wrist strap and conductive foam pad
- Screwdrivers:
  - Phillips #2 with a 12 inch or longer blade
  - Phillips #2 (standard-length blade)
  - Phillips #1
  - Flat head 3/16 inch
  - Flat head 1/4 inch
  - Torx T10
- Flashlight
- Needle nose pliers
- Diagonal wire cutters (for cutting tie wraps)
- 2 GB USB flash memory drive
- Tie wraps (4 inch and 8 inch)
- (recommended) Roll of 5/8 inch Velcro cable tie material (3M Scotchmate SJ-3401 or similar)

HA upgrade overview

Both nodes in an HA pair must have an identical configuration. If any of the following values are different between the two nodes, the upgrade cannot be performed. Both nodes must:

The single node to HA upgrade requires a Professional Services engagement.

- Be the same model. (For example, you cannot configure a DD9300 system in an HA pair with a DD9500.)
- Have the same amount of memory.
- Have the same I/O modules installed in the same slots.
- Have the same DD OS version.

All alerts on the existing node must be resolved. Run the `alerts show current` command to display all alerts on the system.

Upgrading an existing Data Domain system to an HA pair consists of the following tasks:

Note

The following table describes the workflow to upgrade a single node system to an HA pair. The links provide the steps to complete the tasks described in the table. At the conclusion of each procedure, there is a link to return to this table to perform the next task.

Table 1 HA upgrade tasks

Task	Additional information
If necessary, perform a controller upgrade to convert an existing Data Domain system to an HA-capable system.	This task is beyond the scope of this document. The *Data Domain Operating System 6.0 Controller Upgrade Guide* provides details on how to upgrade an older system to an HA-capable system.
If necessary, upgrade the DD OS version on the existing system to the same version that is installed on the new Data Domain node.	This task is beyond the scope of this document.
If necessary, migrate data from SATA shelves to SAS shelves.	This task is beyond the scope of this document. The *Data Domain Operating System 6.0 Administration Guide* provides details on how to perform a storage migration.
If any data connections exist in the HA interconnect slot of the existing node, move those connections to ports on a different I/O module. • On DD6800/DD9300 systems, the HA interconnect slot is slot 1. • On DD9500/DD9800 systems, the HA interconnect slot is slot 11.	This task is beyond the scope of this document.
Disable the DDFS on the existing node.	Run the following command: `filesys disable`.
Power off the existing node.	Run the following command: `system poweroff`.
(DD6800/DD9300 systems only) Remove the SSDs from the existing node and replace them with filler panels .	Removing SSDs from the existing node on page 4
(DD9500/DD9800 systems only) Install the HA interconnect I/O module in the HA interconnect slot of the existing node.	Installing the HA interconnect I/O module on page 5
Install the new Data Domain node in the rack.	Install the second node in the rack on page 6
(DD6800/DD9300 systems only) Add a shelf with the appropriate number of SSDs.	Installing the SSD shelf on page 12
Connect the data cables on the new node to match the cabling configuration of the existing node.	Connect data cables on both nodes on page 16

Table 1 HA upgrade tasks (continued)

Task	Additional information
Cable the new node to the disk shelves.	Cable the HA pair to the disk shelves on page 16
Cable the interconnect between the two nodes.	Connecting the HA interconnect on page 37
Power on the disk shelves	Plug in the power cord for the disk shelves.
Power on both nodes, starting with the existing node.	1. Plug in the power cord for the Data Domain controller. 2. If there is a power button on the controller, press it.
Configure networking on the new node	Configure networking on the new node on page 39
If Fibre Channel (FC) I/O modules in the existing node were moved as part of a controller upgrade from an older model, or in preparation for the HA upgrade, verify the FC port indexes on both nodes match.	Verify the port indexes on both nodes match on page 42
Apply the HA license on the existing node.	• For DD OS releases earlier than 6.0: Run the following command: `license add <HA-license-code>`. • For DD OS 6.0 and later: Use electronic licensing to apply the HA license on the existing node. The licensing portal at https://support.emc.com/servicecenter/license/ provides additional information. When an electronic license is added, the old license is removed.
Configure HA from the existing node. [a]	Configure HA on page 43

a. This includes configuring the SSD shelf for DD6800/DD9300 systems.

Removing SSDs from the existing node

Before you begin

The DDFS on the existing node must be disabled, and the node must be powered off. Power off the node using the `system poweroff` command.

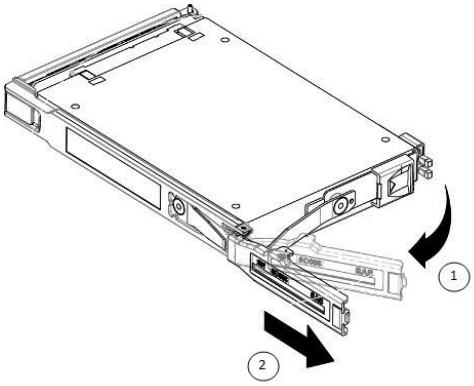
Upgrading DD6800/DD9300 systems from a single node to HA requires removing the metadata SSDs from the front of the existing node. In an HA pair, the metadata storage must be shared between the nodes. Do not put the SSDs from the front of the existing node into the SSD shelf. The SSDs removed from the existing node are no longer required.
Complete the following steps to remove the SSDs.

Procedure

1. If the bezel has a key lock, unlock the bezel with the provided key.

2. Push the buttons on either side of the bezel, and remove it gently from the front of the cabinet.
3. Attach an ESD wristband to your wrist and the enclosure.
4. Slide the disk's latch button to the right to release the latch.
5. Rotate the latch outward (1) and slowly pull the disk from its slot (2). Place the disk on a padded, static-free surface.

Figure 1 Removing a 3.5" disk drive



6. Insert a filler panel in the empty slot. Filler panels are included in the upgrade kit.
7. Repeat steps 4-5 until all the SSDs are removed from the system.
8. Align the bezel with the front of the system.
9. Gently push the bezel into place on the cabinet until it latches.
10. If the bezel has a key lock, lock the bezel with the provided key.
11. Return to HA upgrade overview on page 2.

Installing the HA interconnect I/O module

Before you begin

This task applies to DD9500 and DD9800 systems only. DD6800 and DD9300 systems come with the HA interconnect I/O module pre-installed.

Note

- If needed, place all new I/O modules on a clean, ESD-protected work surface.
- Be careful not to touch the components on the module.

Procedure

1. Power off the DD9500/DD9800 system.

   Run the following command:
   ```
   system poweroff
   ```
2. Move the cable management assembly (CMA) arms out of the way to access the I/O module.
3. Align and slide the interconnect I/O module into slot 11 of the DD9500/DD9800 system until it seats in its connector.

4. Apply firm pressure on the front of the I/O module until it seats fully into the slot.

   Note

   To avoid connector damage, do not slam the I/O module in.

5. Push the ejector button in to secure the module.

   Note

   If the module is not seated properly in its connector, the ejector button will not remain in the closed or engaged position.

6. Return to HA upgrade overview on page 2.

Install the second node in the rack

Install the second DD9500/DD9800 or DD6800/DD9300 system in the rack.

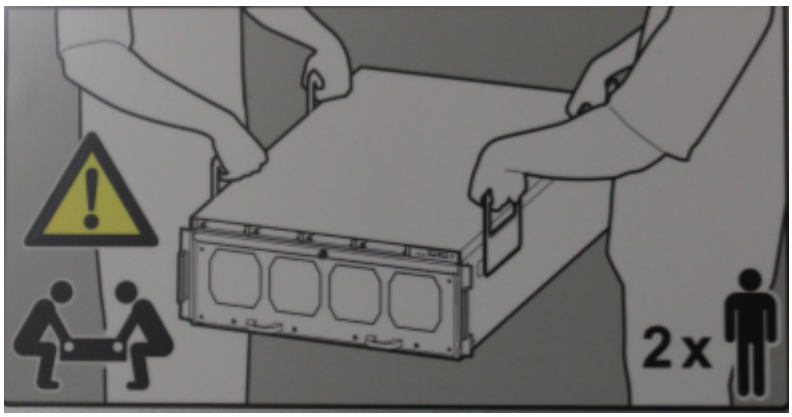
- To install a DD9500/DD9800 system: Install the DD9500/DD9800 system into a rack on page 6
- To install a DD6800/DD9300 system: Install the DD6800/DD9300 system into a rack on page 9

Install the DD9500/DD9800 system into a rack

⚠ CAUTION

Data Domain systems are heavy. Always use two people or a mechanical lift to move a system. The chassis displays warning signs.

Figure 2 Warning about lifting the system



⚠ CAUTION

- **Do not apply AC power to the DD9500/DD9800 system controller until all expansion shelves and cables are installed.**
- **Make sure the PSNT label, attached to the left rear of the chassis is not damaged or snagged during the installation of the system into the rack.**

Procedure

1. Identify the designated location for the system controller in the rack.
   - For systems with ES30 shelves in a single rack, the designated location is U18-21.
   - For systems with ES30 shelves in multiple racks, the designated location is U13-16 in rack 2.
   - For systems with DS60 shelves, the designated location is U27-30 in rack 1.
2. At each rack post, determine the vertical position in the rack where the brackets are to be installed. The top-most mounting hole for a particular rack unit (RU) mounting position is typically identified by a mark or hole. The bracket will be installed in the bottom hole of the 4 RU opening.

   ⚠ CAUTION

   If the bracket is mounted in holes that are not vertically aligned from front to back, the bracket may be damaged and mounting will not be secure.

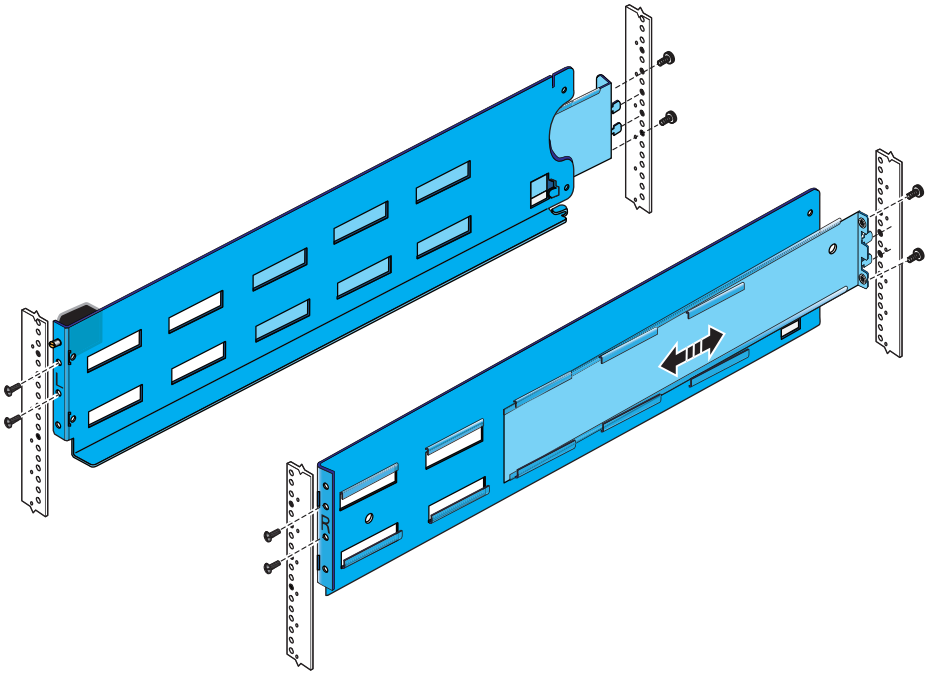
3. As needed, select the bracket marked right or left. The rear of the bracket contains an adjustable piece.
4. From the rear of the system, hold the bracket against the inside of the rack posts. Align the rear guide pin and slide the bracket towards the front. The guide pins can help to temporarily hold the rack mount bracket in place. Attach the bracket to the rear of the rack using the furnished screws. There are five screw holes. The picture shows two screws attached to the rear rack post.

   ⚠ CAUTION

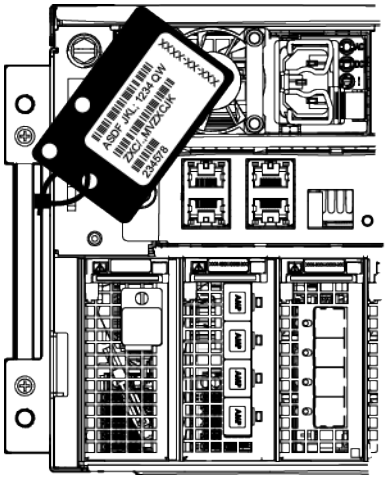
   If the bracket is mounted in holes that are not vertically aligned from front to back, the bracket may be damaged and mounting will not be secure.

5. Pull the adjustable sliding part of the bracket towards the front until it is close to, but not touching, the front of the rack.
6. Attach the front of the brackets with two screws each in the two middle holes (innermost holes) as shown in the picture.
7. Verify that the bracket is level.

Figure 3 Installing the rails



8. Repeat the steps to attach the remaining bracket to the other side of the rack.
9. After installing both brackets, make sure that they are level with one another.
10. From the front of the rack, lift the DD9500/DD9800 system using the handles supplied for lifting to install the system in the rack in the correct location.
11. At each side, align the bottom of the chassis with the lip of each installed rack bracket.
12. Carefully slide the chassis into the rack and remove the back handles while supporting the chassis weight. Continue to slide the rest of the chassis and remove the front handles. Finally, push the chassis all the way into the back of the rack.
13. The rear of the chassis should engage with the tabs located in the rear of the rack mount kit.
14. At the front, attach the system to each installed bracket using the screws on the front of the system.
15. Check the PSNT label at the rear of the chassis.



16. Return to HA upgrade overview on page 2.

Install the DD6800/DD9300 system into a rack

⚠ CAUTION

Data Domain systems are heavy. Always use two people or a mechanical lift to move a system.

Figure 4 Warning about lifting the system

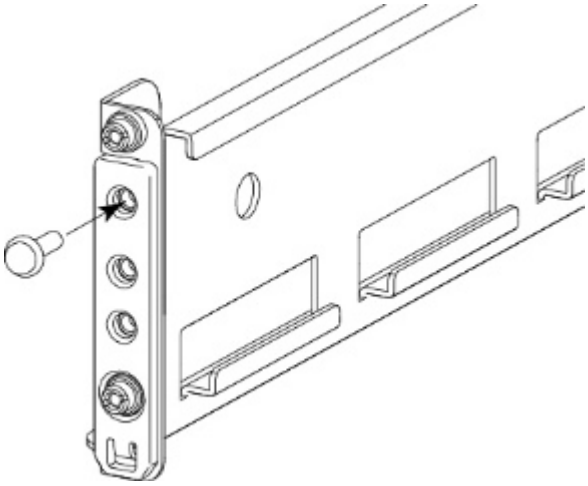
⚠ CAUTION

- **The system controller should be installed in the pre-defined location for the system controller in the rack to comply with Data Domain rack mounting guidelines.**
- **Do not apply AC power to the system controller until all expansion shelves and cables are installed.**
- **Ensure the PSNT label, which is in a slot just beneath the power supply on the rear of the chassis is not damaged or snagged during the installation of the system into the rack.**

Procedure

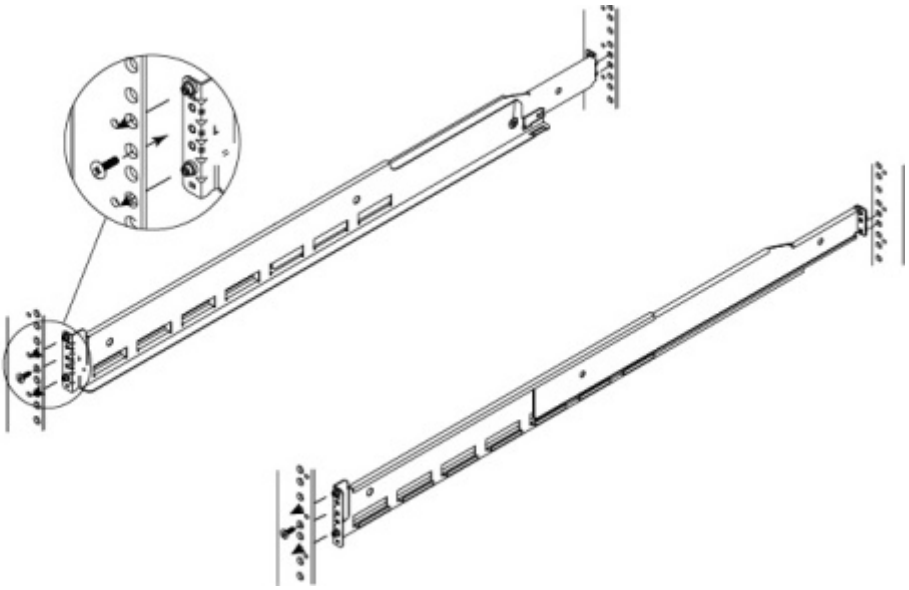
1. Identify the designated location for the system controller in the rack.
   - For systems with ES30 shelves the designated location is U15-16 in rack 1.
   - For systems with DS60 shelves, the designated location is U25-26 in rack 1.

2. If EIA rail mounting holes of 7.1 MM diameter round, or M5, 12-24, 10-32 threaded, are being used, install the filler using the pin as shown. If not, proceed to the next step.



Once the filler is installed to the rail, the installation can continue as follows.

3. At the front of the cabinet, insert the two adaptors on the front of the rail into the correct holes in the 2U space.

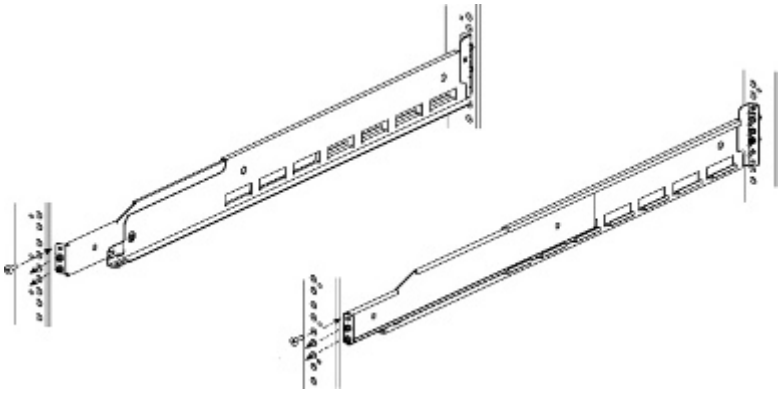


4. Insert one screw into the lower hole to hold the front of the rails in place. Do not fully tighten the screw at this time.

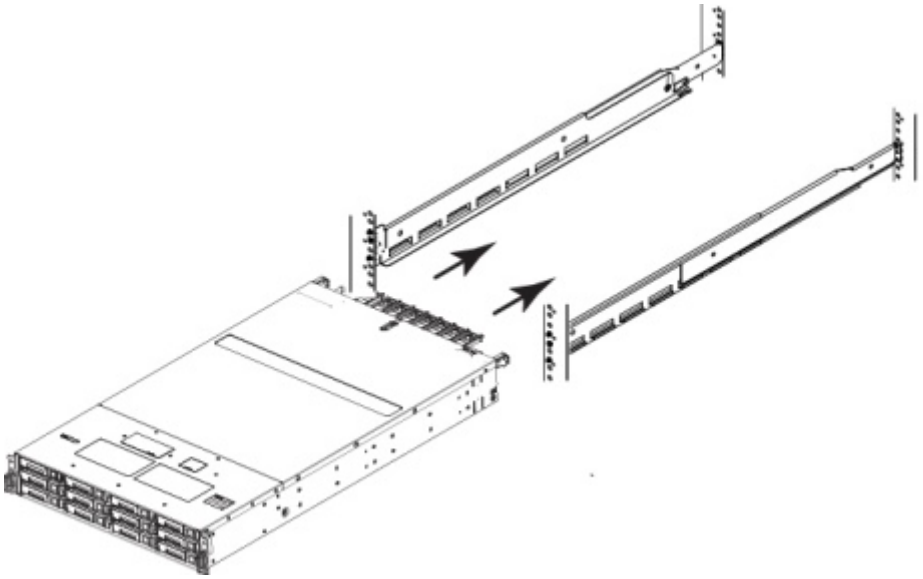
Note

An 18-inch screwdriver (minimum) is required to install the screw into the rear of the rails.

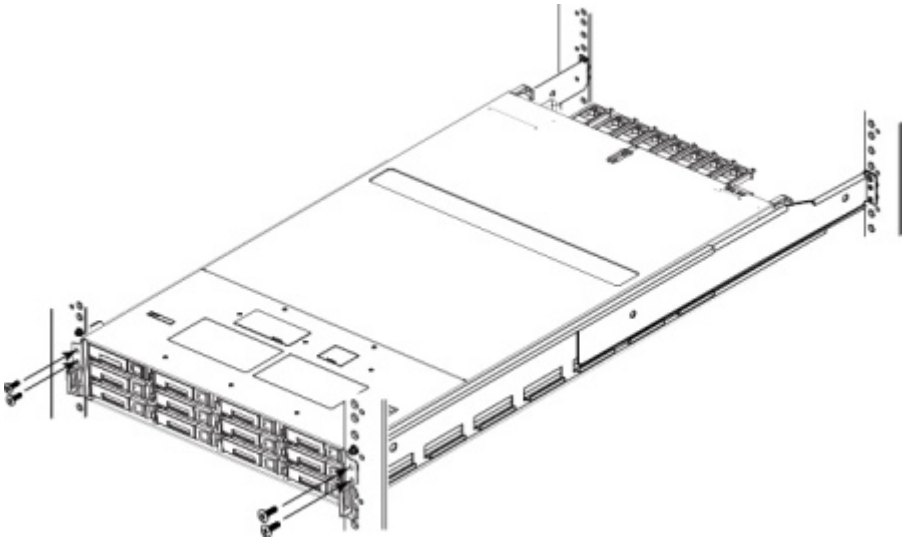
5. At the rear of the cabinet, align and insert the two adaptors on the rear of the rail with the mounting holes in the NEMA channel. Make sure the rail is level.



6. Use an 18-inch screwdriver (minimum) to secure the rear of the rail to the NEMA channel using one screw.
7. Tighten the front screw.
8. Repeat for the other rail.
9. From the front of the rack, lift the chassis to install the system in the rack in the correct location.
10. Slide the unit onto the rails and push it fully into the cabinet until the mounting holes on the unit are flush with the NEMA channel.

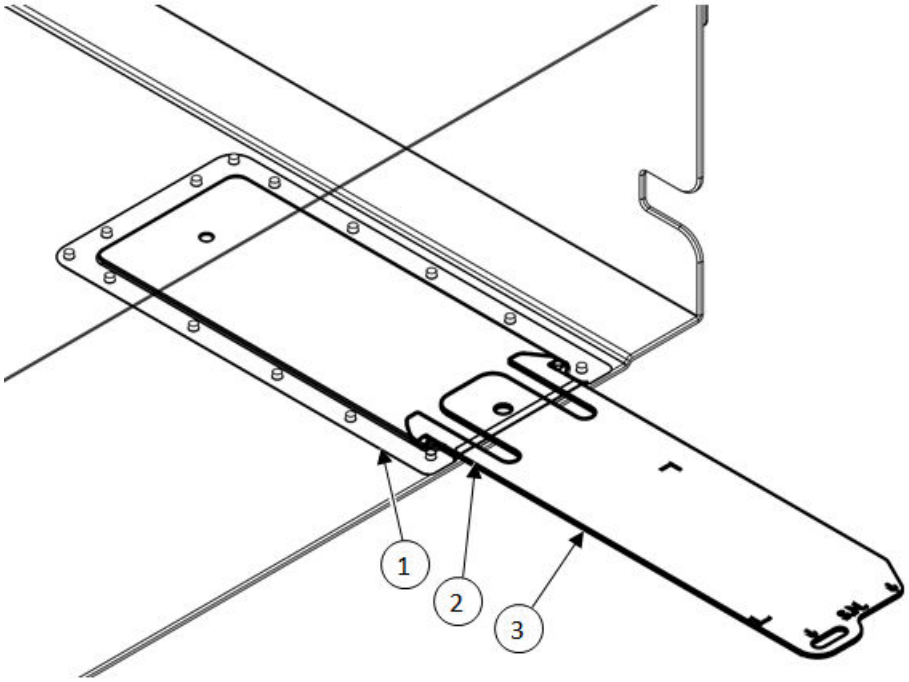


11. Secure the unit to the NEMA channel and rails using four screws, two on each side.



12. Check the PSNT label in the slot just beneath the power supply at the rear of the chassis.

Figure 5 Service tag (components removed for clarity)



1. Service tag bracket
2. Locking tab
3. Service tag

13. Return to HA upgrade overview on page 2.

Installing the SSD shelf

Before you begin

DD6800/DD9300 HA pairs require the installation of an SSD shelf that is connected to both nodes to replace the metadata SSDs that were removed from the existing node.

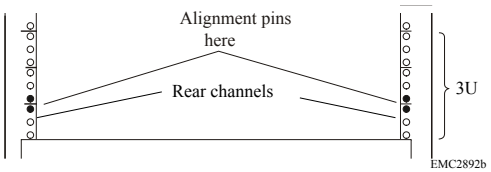
If possible, install the SSD shelf in the V1.1 position, but if that is not possible, the shelf can be placed in a different location in the rack so long as cables of sufficient length are available.

Complete the following steps to install an SSD shelf in the rack.

Procedure

1. From the front of the cabinet, insert the rail alignment pins above and below the bottom U mark on the rear cabinet channel (Figure 6 on page 13).

   Figure 6 Holes for alignment pins

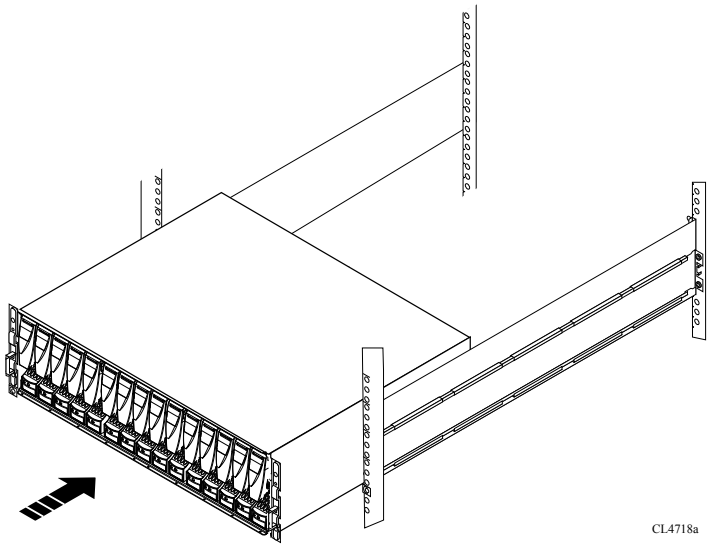
   

2. Pull the sliding rail to the front of the cabinet, and secure it to the front channel using two of the provided screws at the middle two holes of the rail (Figure 2).
3. Secure the rail to the rear channel with two screw loosely to allow for adjustment when you install the DAE enclosure (Figure 2).

   Figure 7 Installing the DAE rails

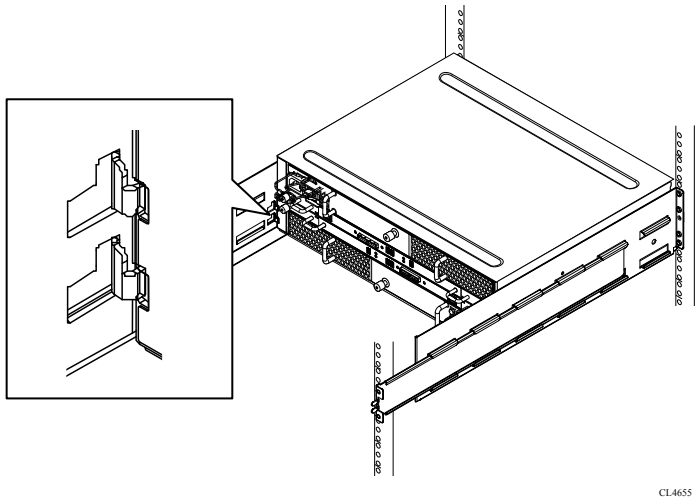
4. With help from another person, lift the enclosure and, from the front of the cabinet/rack, slide the enclosure onto the rails (Figure 8 on page 13).

   Figure 8 Sliding the enclosure onto the rails

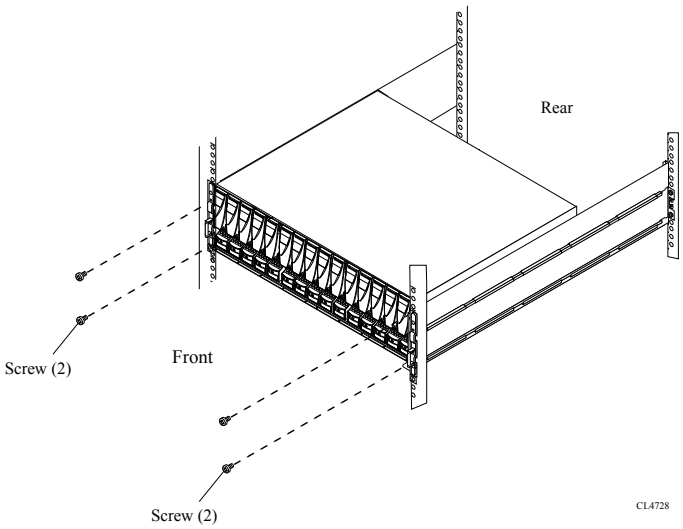
   When the enclosure slides to the back of the cabinet, the rear tabs on the rails insert into the two notches in the rear of the enclosure. The tabs secure and support the rear of the enclosure (Figure 9 on page 14).
   If the chassis does not slide all the way into the cabinet, you may need to further loosen the screws that hold the rear of the rails in place, then adjust the rails to allow the tabs to fit into the notches.

Figure 9 Rail tabs securing the rear of the enclosure



5. Once the enclosure is completely seated into the rear tabs, secure the enclosure, tighten the screws (two on each rail) that secure the rails to the channels.
6. Secure the front of the enclosure to the front vertical channels with four screws (two per side), but do not tighten the screws until they are all in place (Figure 3).

Figure 10 Securing the front of the enclosure



7. If the SSD shelf will be added to an existing set of ES30 shelves, add it to the set:

Note

If possible, install the SSD shelf in the V1.1 positon, but if that is not possible, the shelf can be placed in a different location in the rack so long as cables of sufficient length are available.

Table 2 ES30 to ES30 cable options

Cable Part Number	Part Number to Order	Cable Length	Vertical Span (RU)[1]
Mini-SAS cable, SFF-8088 connectors on both ends, one end keyed for host ports and the other keyed for expansion ports			
038-003-786	X-SAS-MSMS1	1 m (39 in.)	9
038-003-787	X-SAS-MSMS2	2 m (79 in.)	31
038-003-751	X-SAS-MSMS3	3 m (118 in.)	53
038-003-628	X-SAS-MSMS4	4 m (158 in.)	75
038-003-666	X-SAS-MSMS5	5 m (196 in.)	97

[1] RU distances are approximate measurements and may require adjustment depending on the environment.

a. Move the cables that go between the existing ES30 at the end of the chain and the DD6800/DD9300 system to the same ports on the SSD shelf.

b. Connect the A controller HOST ● port on the existing shelf to the A controller EXPANSION ◆ port of the SSD shelf.

c. Connect the B controller EXPANSION ◆ port on the existing shelf to the B controller HOST ● port of the SSD shelf.

8. If the SSD shelf will be on a new set of shelves, connect it to the primary node:

Note

If possible, install the SSD shelf in the V1.1 positon, but if that is not possible, the shelf can be placed in a different location in the rack so long as cables of sufficient length are available.

Table 3 Primary node to ES30 host port cable options

Cable Part Number	Part Number to Order	Cable Length	Vertical Span (RU)[1]
HD-mini-SAS connector on controller, SFF-8088 connector keyed for host port on ES30			
	X-SAS-HDMS1	1 m (39 in.)	9
038-003-810	X-SAS-HDMS2	2 m (79 in.)	31
038-003-811	X-SAS-HDMS3	3 m (118 in.)	53
038-003-813	X-SAS-HDMS5	5 m (196 in.)	97

Table 4 Standby node to ES30 expansion port cable options

Cable Part Number	Part Number to Order	Cable Length	Vertical Span (RU)[1]
HD-mini-SAS connector on controller, SFF-8088 connector keyed for expansion port on ES30			
038-004-108	X-SAS-HDMS2	2 m (79 in.)	31
038-004-111	X-SAS-HDMS5	5 m (196 in.)	97

[1] RU distances are approximate measurements and may require adjustment depending on the environment.

a. Move the cables that go between the existing ES30 at the end of the chain and the DD6800/DD9300 system to the same ports on the SSD shelf.

b. Connect the A controller HOST ● port to the Data Domain controller.

c. Connect the B controller HOST ● port to the Data Domain controller.

9. Return to HA upgrade overview on page 2.

Connect data cables on both nodes

Note

The data cabling for both nodes of the HA pair must be identical.

1. Enable data transfer Ethernet connectivity. Repeat for each connection.
   a. If using 1 Gb copper Ethernet, attach a Cat 5e or Cat 6 copper Ethernet cable to an RJ-45 Ethernet network port (start with ethMa and go up).
   b. If using 10 Gb copper Ethernet with an SFP+ connector, use a qualified SFP+ copper cable.
   c. If using 1/10 Gb fiber Ethernet, use MMF-850nm cables with LC duplex connectors.
   d. For 10GBaseT connections, use Cat6a S-STP Ethernet cables.
2. Enable data transfer Fibre Channel (FC) connectivity. Repeat for each connection.
   a. Attach a Fibre Channel fiber optical cable (LC connector) to an I/O module port on the controller, and attach the other end (LC connector) to an FC switch or to an FC port on your server.
3. Return to HA upgrade overview on page 2.

Cable the HA pair to the disk shelves

Cable the DD9500/DD9800 or DD6800/DD9300 standby node to the disk shelves.

- To connect a DD9500/DD9800 system to ES30 shelves: Connecting multiple ES30 shelves to the DD9500/DD9800 system on page 19
- To connect a DD9500/DD9800 system to DS60 shelves: Connecting multiple DS60 shelves to the DD9500/DD9800 system on page 25
- To connect DD6800/DD9300 systems to ES30 shelves: Connecting multiple ES30 shelves to DD6800/DD9300 systems on page 29

- To connect DD6800/DD9300 systems to DS60 shelves: Connecting multiple DS60 shelves to DD6800/DD9300 systems on page 31

ES30 cable information

The cable end that connects to an ES30 from node 1 has a mini-SAS connector with a ◆ port.

Cables between ES30s have mini-SAS connectors on both ends.

Figure 11 Node 1 SAS I/O module to ES30 expansion port connector

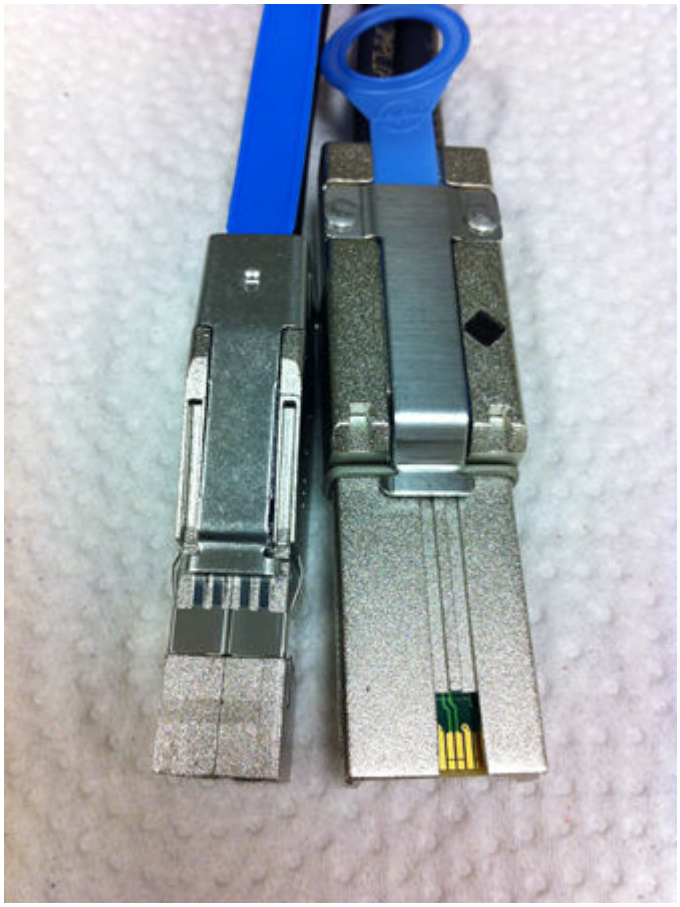


Table 5 Cables for node 1 to ES30 shelf loop

HD-mini-SAS connector on controller, SFF-8088 connector keyed for expansion port on ES30		
Cable model	**Part number**	**Cable length**
X-HA-ES30-SAS-2	038-004-108	2 m (79 in)
X-HA-ES30-SAS-5	038-004-111	5 m (196 in)

DS60 cable information

The primary and secondary nodes use the same cable type to connect to DS60 disk shelves.

Figure 12 SAS I/O module to DS60 connector

Table 6 Cables for node 0 and node 1 to DS60 shelf loop

HD-mini-SAS connector on controller and enclosure		
Cable model code	**Part number**	**Cable length**
XC-DS60-SAS-3M	038-004-380-01	3 m (118 in)
XC-DS60-SAS-4M	038-000-212-00	4 m (158 in)
XC-DS60-SAS-5M	038-000-214-00	5 m (196 in)

Connecting multiple ES30 shelves to the DD9500/DD9800 system

Add shelf-to-shelf cables between shelves in a loop and to the controller as shown in the diagrams.

1. Cable from the B Controller EXPANSION ◆ port of the lower shelf to the B controller HOST ● port of the next higher shelf.
2. Then cable from the A Controller HOST ● port of lower shelf to the A controller EXPANSION ◆ port of the next higher shelf
3. There are no specific placement or cabling requirements for SSD shelves, or the metadata shelves for DD Cloud Tier configurations. These shelves can be installed and cabled the same way as standard ES30 shelves. SSD shelves and DD Cloud Tier metadata do not need to be cabled in a separate set from the other ES30 shelves.

The primary and standby nodes use different cables to connect to ES30 shelves. The primary node uses cables for ES30 host ports (●), and the standby node uses cables for ES30 expansion ports (◆).

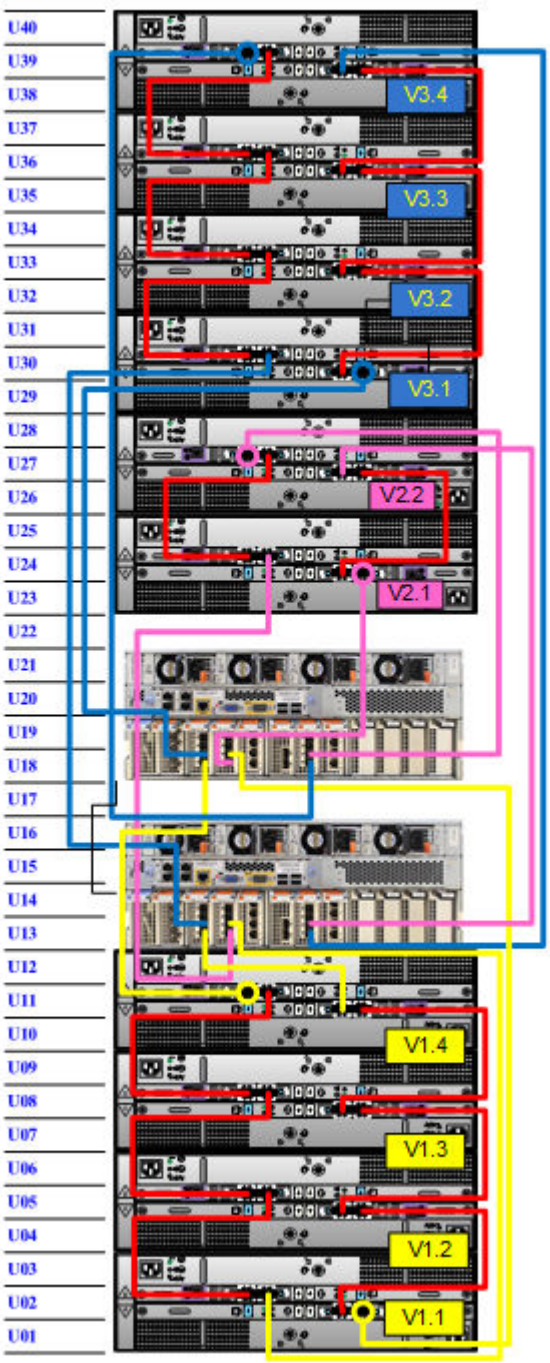
DD9500/DD9800 with HA (one rack)

Table 7 Standby node cabling instructions

String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 3 - Port 1	A controller EXPANSION ◆ port of shelf V1.1	2M
1	I/O 2 - Port 0	B controller EXPANSION ◆ port of the highest number shelf in V1	2M
2	I/O 3 - Port 0	A controller EXPANSION ◆ port of shelf V2.1	2M
2	I/O 6 - Port 1	B controller EXPANSION ◆ port of the highest number shelf in V2	2M
3	I/O 2 - Port 1	A controller EXPANSION ◆ port of shelf V3.1	2M
3	I/O 6 - Port 0	B controller EXPANSION ◆ port of the highest number shelf in V3	2M

* Cable lengths shown are designed for Data Domain racks with all components in their recommended locations. Longer cables (up to 5M) can be used.

Figure 13 Cabling for HA DD9500/DD9800 systems in one rack



DD9500/DD9800 with HA (two racks)

Table 8 Standby node cabling instructions

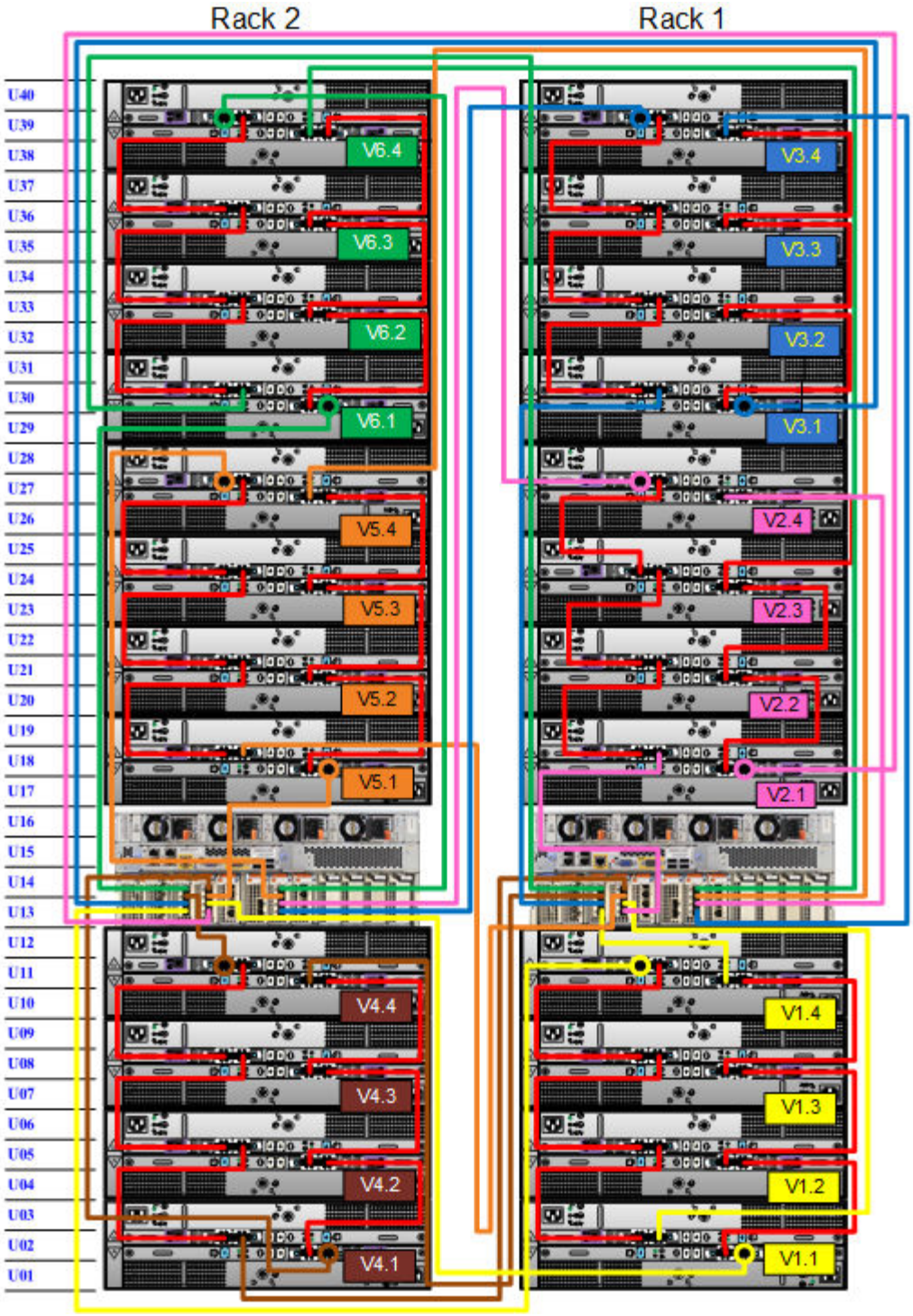
String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 3 - Port 1	A controller EXPANSION ◆ port of shelf V1.1	2M

Table 8 Standby node cabling instructions (continued)

String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 2 - Port 0	B controller EXPANSION ◆ port of the highest number shelf in V1	2M
2	I/O 3 - Port 0	A controller EXPANSION ◆ port of shelf V2.1	2M
2	I/O 6 - Port 1	B controller EXPANSION ◆ port of the highest number shelf in V2	2M
3	I/O 2 - Port 1	A controller EXPANSION ◆ port of shelf V3.1	2M
3	I/O 6 - Port 0	B controller EXPANSION ◆ port of the highest number shelf in V3	2M
4	I/O 3 - Port 3	A controller EXPANSION ◆ port of shelf V4.1	3M
4	I/O 2 - Port 2	B controller EXPANSION ◆ port of the highest number shelf in V4	3M
5	I/O 3 - Port 2	A controller EXPANSION ◆ port of shelf V5.1	3M
5	I/O 6 - Port 2	B controller EXPANSION ◆ port of the highest number shelf in V5	3M
6	I/O 2 - Port 3	A controller EXPANSION ◆ port of shelf V6.1	3M
6	I/O 6 - Port 3	B controller EXPANSION ◆ port of the highest number shelf in V6	3M

* Cable lengths shown are designed for Data Domain racks with all components in their recommended locations. Longer cables (up to 5M) can be used.

Figure 14 Cabling for HA DD9500/DD9800 systems in two racks



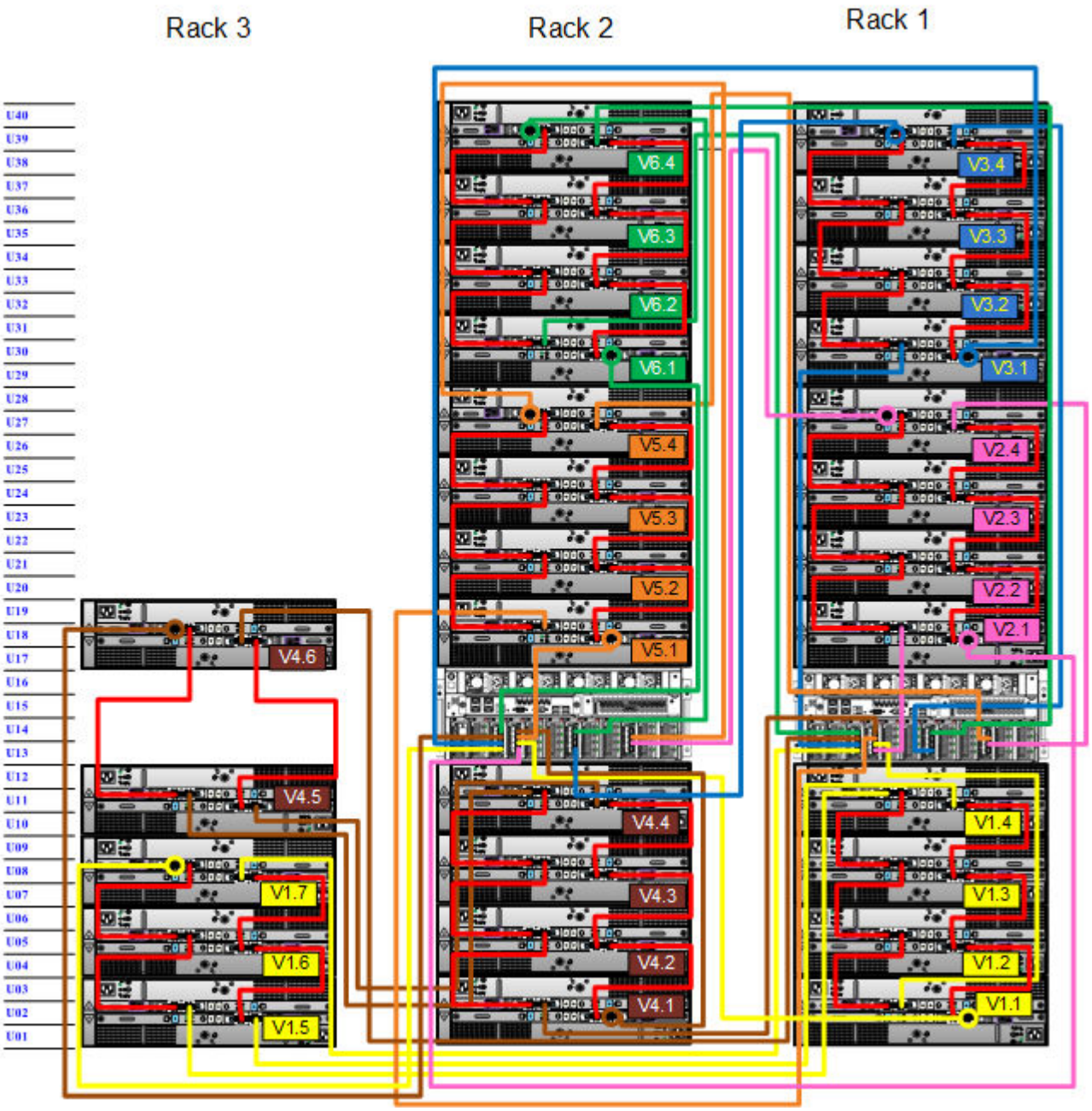
DD9500/DD9800 with Data Domain Cloud Tier and HA

Table 9 Standby node cabling instructions

String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 3 - Port 1	A controller EXPANSION ◆ port of shelf V1.1	2M
1	I/O 2 - Port 0	B controller EXPANSION ◆ port of the highest number shelf in V1	3M
2	I/O 3 - Port 0	A controller EXPANSION ◆ port of shelf V2.1	2M
2	I/O 9 - Port 1	B controller EXPANSION ◆ port of the highest number shelf in V2	2M
3	I/O 2 - Port 1	A controller EXPANSION ◆ port of shelf V3.1	2M
3	I/O 6 - Port 0	B controller EXPANSION ◆ port of the highest number shelf in V3	2M
4	I/O 3 - Port 3	A controller EXPANSION ◆ port of shelf V4.1	3M
4	I/O 2 - Port 2	B controller EXPANSION ◆ port of the highest number shelf in V4	3M
5	I/O 3 - Port 2	A controller EXPANSION ◆ port of shelf V5.1	3M
5	I/O 9 - Port 2	B controller EXPANSION ◆ port of the highest number shelf in V5	3M
6	I/O 2 - Port 3	A controller EXPANSION ◆ port of shelf V6.1	3M
6	I/O 6 - Port 3	B controller EXPANSION ◆ port of the highest number shelf in V6	3M

* Cable lengths shown are designed for Data Domain racks with all components in their recommended locations. Longer cables (up to 5M) can be used.

Figure 15 Cabling for DD9500/DD9800 systems with Data Domain Cloud Tier and HA



Next steps

Return to HA upgrade overview on page 2.

Connecting multiple DS60 shelves to the DD9500/DD9800 system

Some of the DS60 configurations described in the following sections also include FS15 shelves for shared metadata storage between the two nodes.

Add shelf-to-shelf cables between shelves in a loop and to the controller as shown in the diagrams.

1. The recommended cabling for HA utilizes a maximum of three loops.
2. There are no specific placement or cabling requirements for SSD shelves. These shelves can be installed and cabled the same way as standard ES30 shelves.
3. The SSD shelf counts towards the total number of shelves connected to the system.
4. If possible, install the SSD shelf in the V1.1 positon, but if that is not possible, the shelf can be placed in a different location in the rack so long as cables of sufficient length are available.

   Note

   V1.1 is recommended for better performance because this will the 1st hop where data will be written. If the SSD shelf is connected to the last enclosure in a chain, then each read/write request has to go through many hops, which introduces latency issues when compared to when the SSD shelf is on the 1st shelf of a chain.
5. Use the cable management assembly to support and organize all cables.

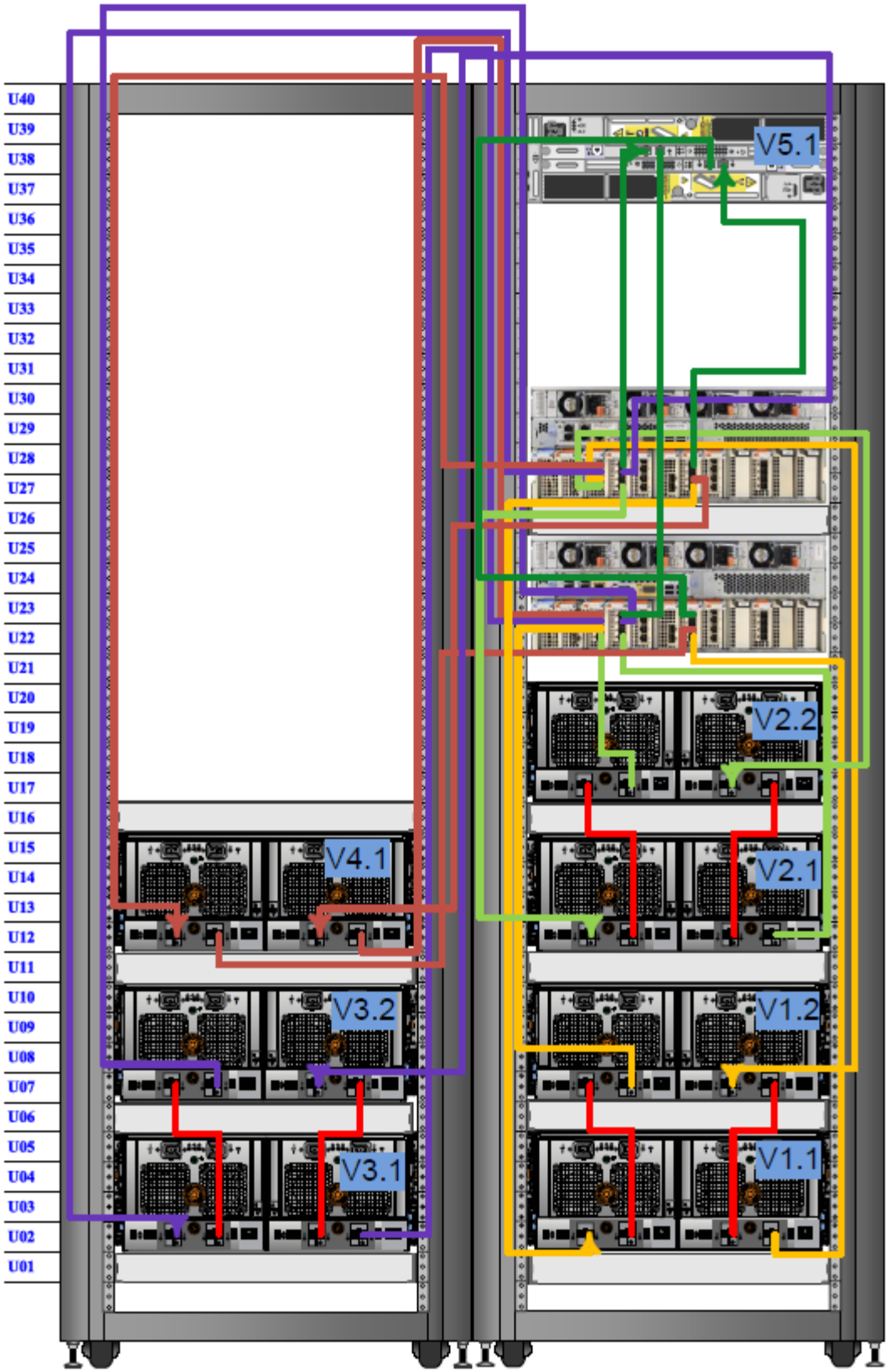
DD9500/DD9800 with HA

Table 10 Standby node cabling instructions

String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 6 - Port 0	B controller port 2 of shelf V1.1	2M
1	I/O 2 - Port 1	A controller port 2 of the highest number shelf in V1	2M
2	I/O 3 - Port 0	B controller port 2 of shelf V2.1	2M
2	I/O 2 - Port 0	A controller port 2 of the highest number shelf in V2	2M
3	I/O 2 - Port 2	B controller port 2 of shelf V3.1	5M
3	I/O 3 - Port 2	A controller port 2 of the highest number shelf in V3	5M
4	I/O 2 - Port 3	B controller port 2 of shelf V4.1	5M
4	I/O 6 - Port 1	A controller port 2 of the highest number shelf in V4	5M
5	I/O 6 - Port 3	A controller EXPANSION ◆ port of the SSD shelf	2M
5	I/O 3 - Port 3	B controller EXPANSION ◆ port of the SSD shelf	2M

* Cable lengths shown are designed for Data Domain racks with all components in their recommended locations. Longer cables (up to 5M) can be used.

Figure 16 Cabling for HA DD9500 and DD9800systems



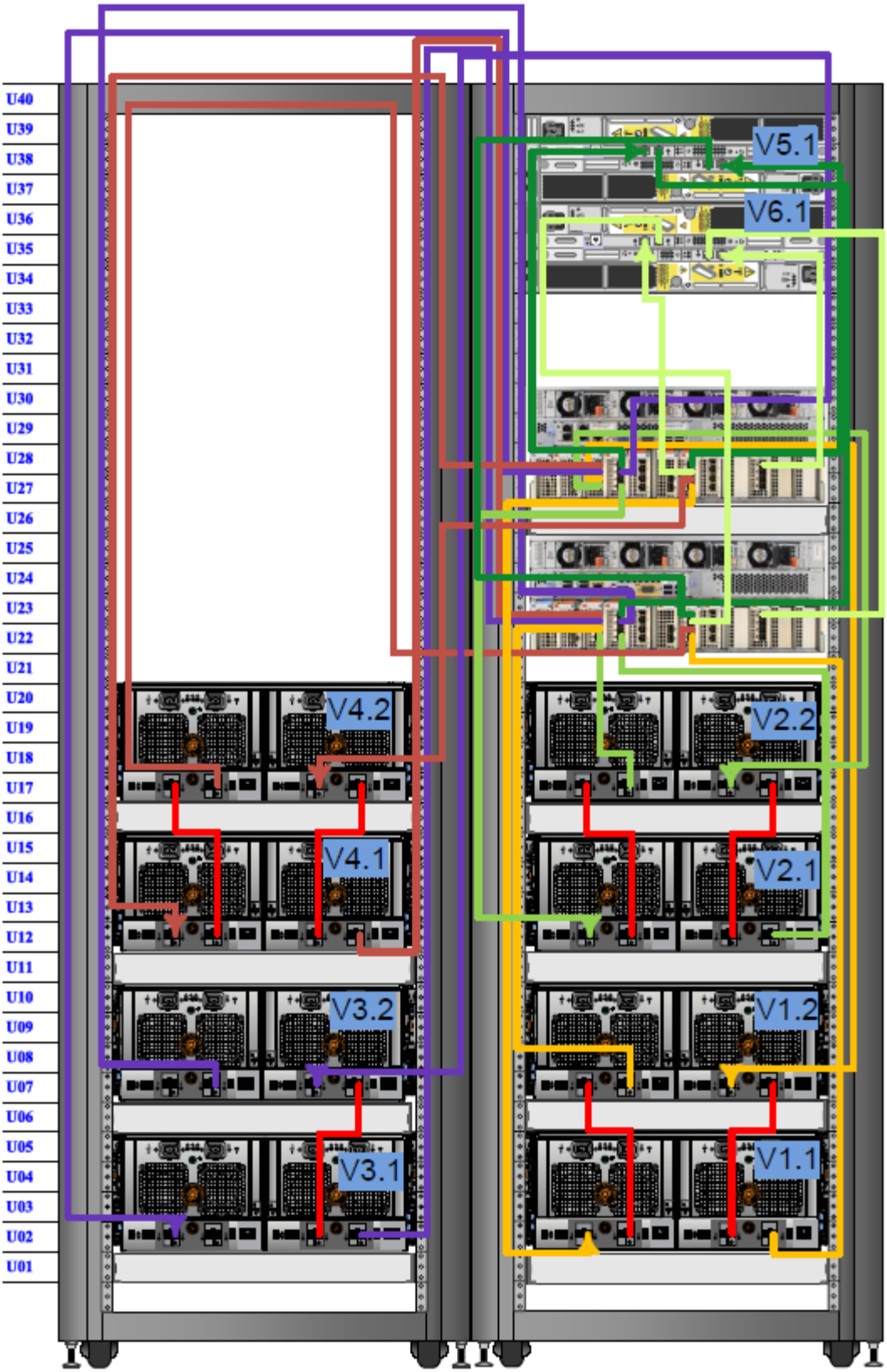
DD9500 and DD9800 with Data Domain Cloud Tier and HA

Table 11 Standby node cabling instructions

String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 6 - Port 0	B controller port 2 of shelf V1.1	2M
1	I/O 2 - Port 1	A controller port 2 of the highest number shelf in V1	2M
2	I/O 3 - Port 0	B controller port 2 of shelf V2.1	2M
2	I/O 2 - Port 0	A controller port 2 of the highest number shelf in V2	2M
3	I/O 2 - Port 2	B controller port 2 of shelf V3.1	5M
3	I/O 3 - Port 2	A controller port 2 of the highest number shelf in V3	5M
4	I/O 2 - Port 3	B controller port 2 of shelf V4.1	5M
4	I/O 6 - Port 1	A controller port 2 of the highest number shelf in V4	5M
5	I/O 6 - Port 3	A controller EXPANSION ◆ port of the SSD shelf or LTR Cloud metadata shelf	2M
5	I/O 3 - Port 3	B controller EXPANSION ◆ port of the SSD shelf or LTR Cloud metadata shelf	2M
6	I/O 9 - Port 3	A controller EXPANSION ◆ port of the SSD shelf or LTR Cloud metadata shelf	2M
6	I/O 6 - Port 2	B controller EXPANSION ◆ port of the SSD shelf or LTR Cloud metadata shelf	2M

* Cable lengths shown are designed for Data Domain racks with all components in their recommended locations. Longer cables (up to 5M) can be used.

Figure 17 Cabling for HA DD9500 and DD9800 systems with Data Domain Cloud Tier



Next steps

Return to HA upgrade overview on page 2.

Connecting multiple ES30 shelves to DD6800/DD9300 systems

DD6800 and DD9300 systems support a maximum of 28 shelves, divided into four sets of seven shelves.

Add shelf-to-shelf cables between shelves in a loop and to the controller as shown in the diagrams.

1. Cable from the B Controller EXPANSION ◆ port of the lower shelf to the B controller HOST ● port of the next higher shelf.
2. Then cable from the A Controller HOST ● port of lower shelf to the A controller EXPANSION ◆ port of the next higher shelf
3. There are no specific placement or cabling requirements for SSD shelves, or the metadata shelves for DD Cloud Tier configurations. These shelves can be installed and cabled the same way as standard ES30 shelves. SSD shelves and DD Cloud Tier metadata do not need to be cabled in a separate set from the other ES30 shelves.

The primary and standby nodes use different cables to connect to ES30 shelves. The primary node uses cables for ES30 host ports (●), and the standby node uses cables for ES30 expansion ports (◆).

Note

For configurations of 16 SAS shelves or less, do not exceed four shelves per set.

Table 12 Standby node cabling instructions

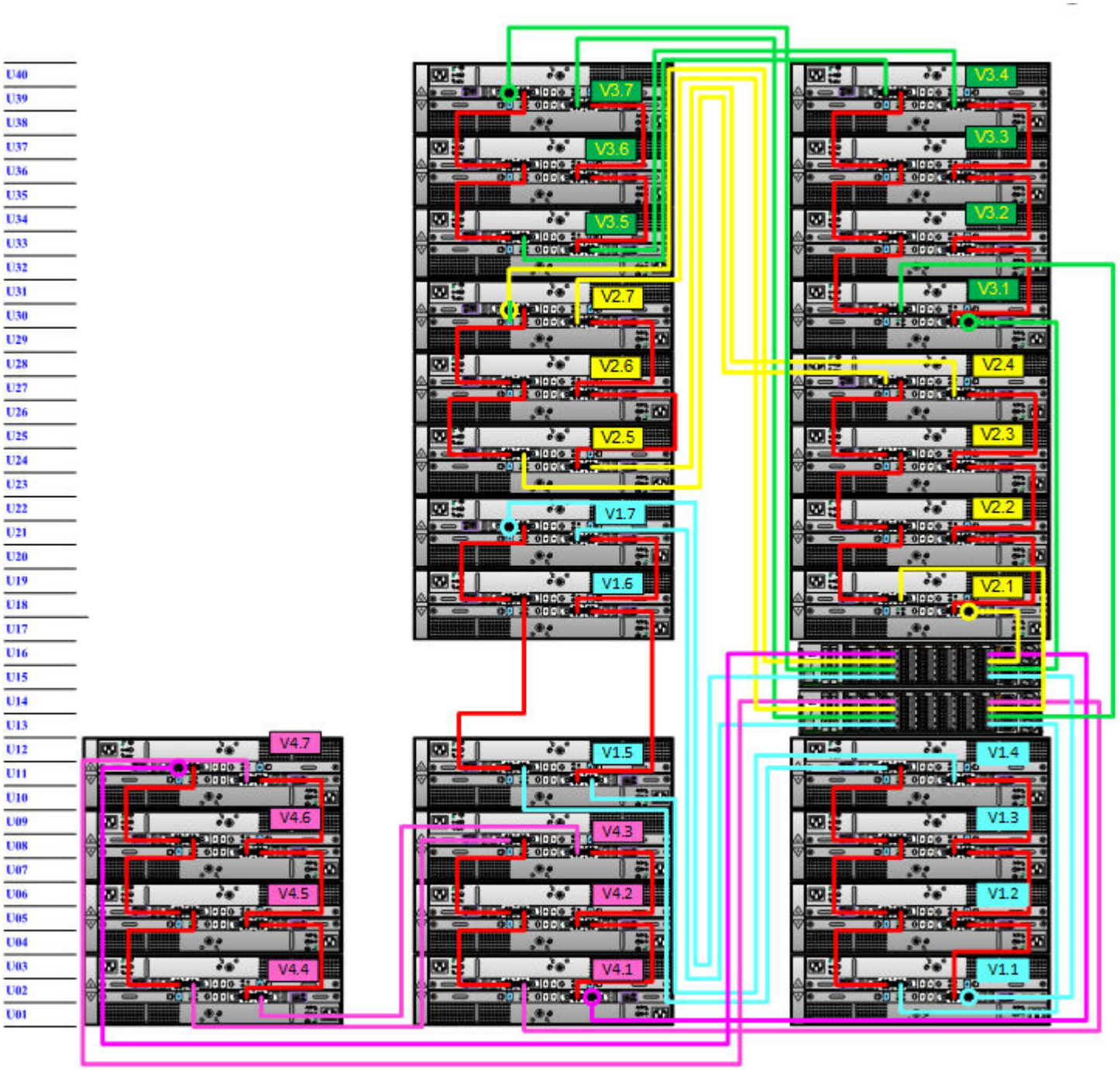
String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 7 - Port 0	A controller EXPANSION ◆ port of shelf V1.1	2M
1	I/O 2 - Port 0	B controller EXPANSION ◆ port of the highest number shelf in V1	2M
2	I/O 7 - Port 2	A controller EXPANSION ◆ port of shelf V2.1	2M
2	I/O 2 - Port 2	B controller EXPANSION ◆ port of the highest number shelf in V2	2M
3	I/O 7 - Port 1	A controller EXPANSION ◆ port of shelf V3.1	2M
3	I/O 2 - Port 1	B controller EXPANSION ◆ port of the highest number shelf in V3	2M
4	I/O 7 - Port 3	A controller EXPANSION ◆ port of shelf V4.1	3M

Table 12 Standby node cabling instructions (continued)

String (Loop)	I/O - Port	Shelf Port	Length*
4	I/O 2 - Port 3	B controller EXPANSION ◆ port of the highest number shelf in V4	3M

* Cable lengths shown are designed for Data Domain racks with all components in their recommended locations. Longer cables (up to 5M) can be used.

Figure 18 DD6800 and DD9300 with ES30s and HA or HA with LTR Cloud



Next steps

Return to HA upgrade overview on page 2.

Connecting multiple DS60 shelves to DD6800/DD9300 systems

The DS60 configurations described in the following sections also include FS15 shelves for shared metadata storage between the two nodes, and may include ES30 shelves for DD Cloud Tier metadata storage.

Add shelf-to-shelf cables between shelves in a loop and to the controller as shown in the diagrams.

1. The recommended cabling for HA utilizes a maximum of three loops.
2. There are no specific placement or cabling requirements for SSD shelves. These shelves can be installed and cabled the same way as standard ES30 shelves.
3. The SSD shelf counts towards the total number of shelves connected to the system.
4. If possible, install the SSD shelf in the V1.1 positon, but if that is not possible, the shelf can be placed in a different location in the rack so long as cables of sufficient length are available.

   Note

   V1.1 is recommended for better performance because this will the 1st hop where data will be written. If the SSD shelf is connected to the last enclosure in a chain, then each read/write request has to go through many hops, which introduces latency issues when compared to when the SSD shelf is on the 1st shelf of a chain.

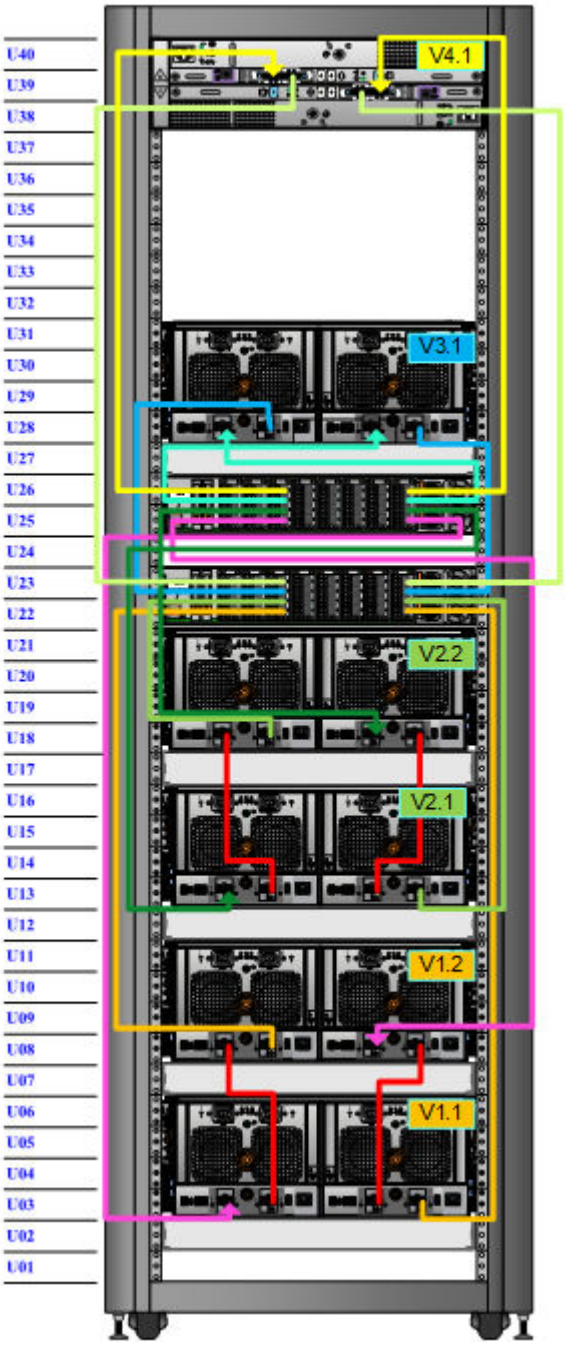
5. Use the cable management assembly to support and organize all cables.

DD6800 and DD9300 with HA

Table 13 Standby node cabling instructions

String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 7 - Port 0	B controller port 2 of shelf V1.1	2M
1	I/O 2 - Port 0	A controller port 2 of the highest number shelf in V1	2M
2	I/O 7 - Port 1	B controller port 2 of shelf V2.1	2M
2	I/O 2 - Port 1	A controller port 2 of the highest number shelf in V2	2M
3	I/O 7 - Port 2	B controller port 2 of shelf V3.1	2M
3	I/O 2 - Port 2	A controller port 2 of the highest number shelf in V3	2M
4	I/O 7 - Port 3	A controller EXPANSION ◆ port of the SSD shelf	2M
4	I/O 2 - Port 3	B controller EXPANSION ◆ port of the SSD shelf	2M

* Cable lengths shown are designed for Data Domain racks with all components in their recommended locations. Longer cables (up to 5M) can be used.



DD6800 and with HA and LTR Cloud

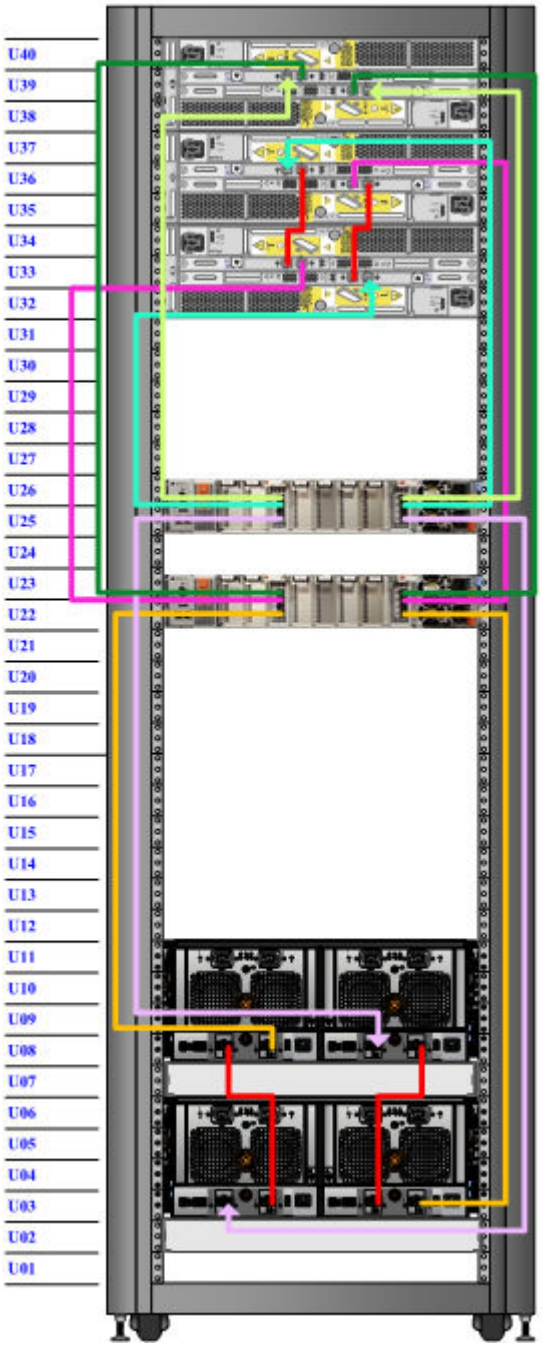
Table 14 Standby node cabling instructions

String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 7 - Port 0	B controller port 2 of shelf V1.1	2M
1	I/O 2 - Port 0	A controller port 2 of the highest number shelf in V1	2M

Table 14 Standby node cabling instructions (continued)

String (Loop)	I/O - Port	Shelf Port	Length*
2	I/O 7 - Port 2	B controller EXPANSION ◆ port of the second metadata shelf	2M
2	I/O 2 - Port 2	A controller EXPANSION ◆ port of the first metadata shelf	2M
3	I/O 7 - Port 3	A controller EXPANSION ◆ port of the SSD shelf	2M
3	I/O 2 - Port 3	B controller EXPANSION ◆ port of the SSD shelf	2M

* Cable lengths shown are designed for Data Domain racks with all components in their recommended locations. Longer cables (up to 5M) can be used.



DD9300 with HA and LTR Cloud

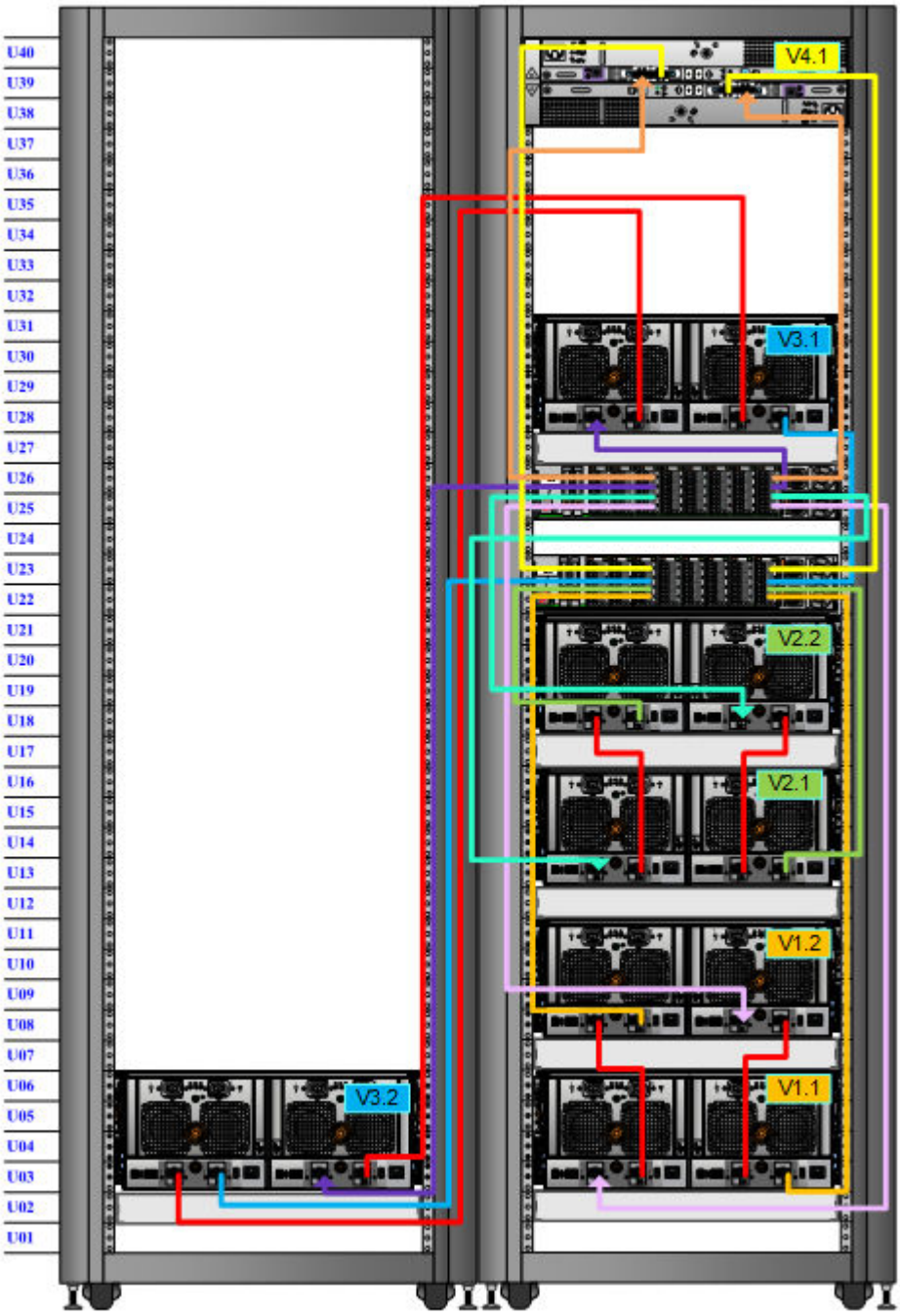
Table 15 Standby node cabling instructions

String (Loop)	I/O - Port	Shelf Port	Length*
1	I/O 7 - Port 0	B controller port 2 of shelf V1.1	2M
1	I/O 2 - Port 0	A controller port 2 of the highest number shelf in V1	2M

Table 15 Standby node cabling instructions (continued)

String (Loop)	I/O - Port	Shelf Port	Length*
2	I/O 7 - Port 1	B controller port 2 of shelf V2.1	2M
2	I/O 2 - Port 1	A controller port 2 of the highest number shelf in V2	2M
3	I/O 7 - Port 2	B controller port 2 of shelf V3.1	2M
3	I/O 2 - Port 2	A controller port 2 of the highest number shelf in V3	5M
4	I/O 7 - Port 3	A controller EXPANSION ◆ port of the SSD shelf	2M
4	I/O 2 - Port 3	B controller EXPANSION ◆ port of the SSD shelf	2M

* Cable lengths shown are designed for Data Domain racks with all components in their recommended locations. Longer cables (up to 5M) can be used.



Next steps

Return to HA upgrade overview on page 2.

Connecting the HA interconnect

The HA interconnect consists of a 10 GbE I/O module installed on each node in the HA pair. This connection between the two nodes provides the standby node with the

information it needs to fail over if the active node suffers a failure, and maintain the connections to hosts and clients after the failover is complete.

Note

The interconnect IP address is automatically configured with the IPv6 prefix d:d:d:d:d:/80. If the default prefix causes an IP conflict, set the registry key `config.net.interconnect_ip6prefix` to specify a different value for the IPv6 prefix.

Table 16 on page 38 describes the slot location and the number of connections required for each HA-capable system.

DD9500/DD9800 systems use optical fiber cables in joining the two nodes. DD6800/DD9300 systems instead use Cat6 S-STP cables.

Table 16 HA interconnect I/O module requirements

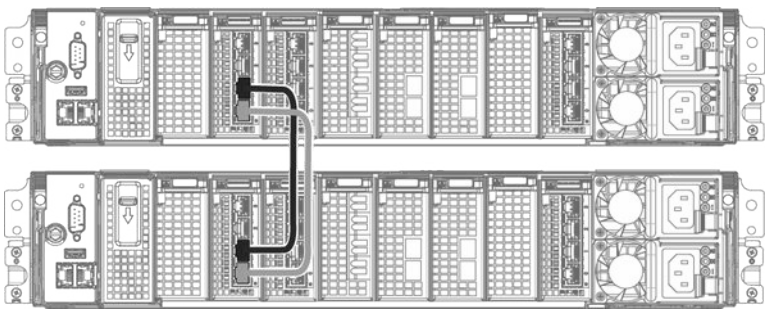
System	HA interconnect I/O module slot	Number of connections required
DD9500/DD9800	11	4
DD6800/DD9300	1	2

Connect HA interconnect for DD6800/DD9300 systems

Procedure

1. Cable port 0 of the interconnect I/O module in node 0, slot 1 to port 0 of the interconnect I/O module in node 1, slot 1.
2. Cable port 1 of the interconnect I/O module in node 0, slot 1 to port 1 of the interconnect I/O module in node 1, slot 1.

   Figure 19 DD6800/DD9300 HA interconnect

3. Return to HA upgrade overview on page 2.

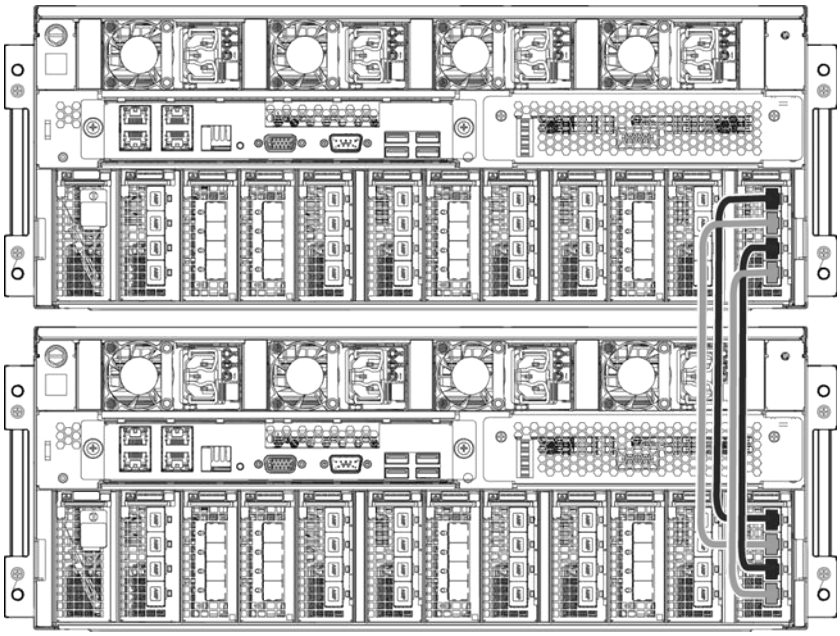
Connect HA interconnect for DD9500/DD9800 systems

Procedure

1. Cable port 0 of the interconnect I/O module in node 0, slot 11 to port 0 of the interconnect I/O module in node 1, slot 11.
2. Cable port 1 of the interconnect I/O module in node 0, slot 11 to port 1 of the interconnect I/O module in node 1, slot 11.
3. Cable port 2 of the interconnect I/O module in node 0, slot 11 to port 2 of the interconnect I/O module in node 1, slot 11.

4. Cable port 3 of the interconnect I/O module in node 0, slot 11 to port 3 of the interconnect I/O module in node 1, slot 11.

Figure 20 DD9500/DD9800 HA interconnect



5. Return to HA upgrade overview on page 2.

Configure networking on the new node

Complete the following steps to configure networking on the new node.
The administrative interfaces are located on the management module on the rear of the chassis. These interfaces are for management network traffic only. Do not use these interfaces for data traffic.

Procedure

1. Connect an administrative console to the serial port on the back panel of the system.

2. Launch a terminal emulation program from your computer and configure the following communication settings:

Note

You must have 115200 baud rate for the system to work correctly; 9600 baud rate does not work.

Table 17 Communications settings

Setting	Value
Baud rate	115200
Data bits	8
Stop bits	1

Table 17 Communications settings (continued)

Setting	Value
Parity	None
Flow control	None
Emulation	VT-100

3. Press `Enter` to activate the console.

Note

If you do not see the prompt on your terminal to log in, then complete Step 4.

4. Verify the front blue power LED is on. If it is not, make sure the power cables are fully seated at both ends, and both AC sources are on.
5. Log in to the Data Domain console using the `sysadmin` username.

```
localhost.localdomain login: sysadmin
```

6. Type the default password, which is the system serial number. The Product ID/SN tag is attached beneath the power supply at the rear of the system. See the rear panel of the system for the Product ID/SN tag.

```
Password: system_serial_number
```

Note

If you type an incorrect password four consecutive times, the system locks out the specified username for 120 seconds. The login count and lockout period are configurable and might be different on your system. See the *Data Domain Operating System Administration Guide* and the *Data Domain Operating System Command Reference Guide* for setting these values.

7. Accept the EULA.

Note

The customer must accept the EULA. A Data Domain representative should not accept this agreement. If a customer is not present, press `Ctrl-C` to exit from the EULA acceptance screen and continue with the configuration. The customer can run the `system show eula` command to display and accept the EULA at a later time.

8. Run the configuration wizard.

   The CLI configuration wizard starts automatically the first time the system starts. The wizard prompts you through a series of questions that provide just enough information for initial system configuration and basic network connectivity.

Note

You can begin the CLI configuration wizard manually by typing `config setup`.

9. Enter **yes** to configure the system for network connectivity.

```
Network Configuration
Configure Network at this time (yes|no) [no]:
yes
```

10. Select whether or not to use DHCP.

    The HA configuration will fail if one node is configured to use DHCP and the other node is configured to use static IP addresses. Both nodes must use the same method to configure IP addresses.

```
Use DHCP
Use DHCP for hostname, domainname, default gateway
and DNS servers? (At least one interface needs to
be configured using DHCP)  (yes|no|?)
```

11. Enter a fully qualified domain name (FQDN) for the host name; for example, **str01.yourcompany.com**. Or accept the host name, if the system was able to discover it.

```
Enter the hostname for this system
(fully-qualified domain name)[]:
```

12. Enter the DNS (Domain Name System) domain name; for example, **yourcompany.com**. Or accept the domain name, if the system was able to discover it.

```
Domainname
Enter your DNS domainname []:
```

13. Enable and configure the Ethernet management interface, ethMa. Accept or decline DHCP. If the port does not use DHCP to discover network parameters automatically, enter the information manually.

    Note

    Do not configure any other interfaces at this time.

```
Ethernet port eth0a
Enable Ethernet port eth0a (yes|no|?) [yes]:
no

Ethernet port eth0b
Enable Ethernet port eth0b (yes|no|?) [no]:
no

Ethernet port ethMa
Enable Ethernet port ethMa (yes|no|?) [no]:
no

Use DHCP on Ethernet port ethMa (yes|no|?) [no]:

Enter the IP address for ethMa [192.168.10.185]:

Enter the netmask for ethMa [255.255.255.0]:
```

14. Enter the IP address of the default routing gateway. Or accept the default gateway, if the system was able to discover it.

```
Default Gateway
Enter the default gateway IP address:
192.168.10.1
```

15. Enter the IPv6 address of the default routing gateway. Or accept the IPv6 address of the default gateway, if the system was able to discover it. If IPv6 is not in use, leave the field empty, and press **Enter** to continue.

```
IPV6 Default Gateway
Enter the ipv6 default gateway IP address:
```

16. Enter up to three DNS servers to use for resolving host names to IP addresses. Use a comma-separated or space-separated list. Enter a space for no DNS servers. Or accept the IP addresses of the DNS servers, if the system was able to discover them.

```
DNS Servers
Enter the DNS Server list (zero, one, two or three IP
addresses):
192.168.10.1
```

17. A summary of the network settings is displayed. Enter **Save** to accept the settings and and exit to the CLI.

```
Pending Network Settings
Hostname          ddbeta1.dallasrdc.com
Domain name       dallasrdc.com
Default Gateway   192.168.10.1
DNS Server List   192.168.10.1
Port       Enabled      Cable      DHCP      IP Address        Netmask or Prefix Length
-----      -------      -----      ----      --------------    ------------------------
eth0a      no           no         n/a       n/a               n/a
eth0b      no           no         n/a       n/a               n/a
eth0c      no           no         n/a       n/a               n/a
eth0d      no           no         n/a       n/a               n/a
ethMa      yes          yes        no        192.168.10.181    255.255.255.0
ethMb      no           no         n/a       n/a               n/a
ethMc      no           no         n/a       n/a               n/a
ethMd      no           no         n/a       n/a               n/a
ethMe      no           no         n/a       n/a               n/a
ethMf      no           no         n/a       n/a               n/a
-----      -------      -----      ----      --------------    ------------------------
Do you want to save these settings (Save|Cancel|Retry):
```

18. Return to HA upgrade overview on page 2.

Verify the port indexes on both nodes match

Before you begin

Establish an SSH session on each node. Use the customer-provided password to log into the existing node. Use the serial number of the new node as the password to log into it.

DD OS requires the FC port indexes on both nodes to be an identical match to proceed with the HA upgrade. This is required for VTL and DD Boost over Fibre Channel (DFC) to fail over from the primary node to the standby node. The chance of a port index mismatch exists if FC I/O modules in the existing node were moved as part of a controller upgrade from an older model, or in preparation for the HA upgrade. Complete the following steps to check the FC port indexes on both nodes.

Procedure

1. Verify the FC port indexes on the existing node.

   Run the following command:
   `reg show config_fixed.scsitgtd`

```
# reg show config_fixed.scsitgtd
config_fixed.scsitgtd.state = 2
config_fixed.scsitgtd.transport.port.5.name = 5a
config_fixed.scsitgtd.transport.port.5.transport = 1
config_fixed.scsitgtd.transport.port.6.name = 5b
config_fixed.scsitgtd.transport.port.6.transport = 1
config_fixed.scsitgtd.transport.port.7.name = 6a
config_fixed.scsitgtd.transport.port.7.transport = 1
config_fixed.scsitgtd.transport.port.8.name = 6b
config_fixed.scsitgtd.transport.port.8.transport = 1
config_fixed.scsitgtd.transport.port.id.5 = 5
```

```
config_fixed.scsitgtd.transport.port.id.6 = 6
config_fixed.scsitgtd.transport.port.id.7 = 7
config_fixed.scsitgtd.transport.port.id.8 = 8
```

2. Verify the FC port indexes on the new node.

   Run the following command:
   `reg show config_fixed.scsitgtd`

```
# reg show config_fixed.scsitgtd
config_fixed.scsitgtd.state = 2
config_fixed.scsitgtd.transport.port.1.name = 1a
config_fixed.scsitgtd.transport.port.1.transport = 1
config_fixed.scsitgtd.transport.port.2.name = 1b
config_fixed.scsitgtd.transport.port.2.transport = 1
config_fixed.scsitgtd.transport.port.3.name = 2a
config_fixed.scsitgtd.transport.port.3.transport = 1
config_fixed.scsitgtd.transport.port.4.name = 2b
config_fixed.scsitgtd.transport.port.4.transport = 1
config_fixed.scsitgtd.transport.port.id.1 = 1
config_fixed.scsitgtd.transport.port.id.2 = 2
config_fixed.scsitgtd.transport.port.id.3 = 3
config_fixed.scsitgtd.transport.port.id.4 = 4
```

3. Compare the command output from both nodes.
   - If the values on both nodes match, proceed with the HA upgrade.
   - If the values on both nodes do not match, the values must be changed to be the same on both nodes before proceeding with the HA upgrade. If VTL or DFC is configured and running on the existing node, modify the port indexes on the new node to match the existing node. Contact Data Domain support to make changes in the system registry.
4. Return to HA upgrade overview on page 2.

Configure HA

Before you begin

- The HA interconnect between both nodes is connected.

  Note

  Connecting the HA interconnect on page 37 describes how to cable the HA interconnect.

- The data connections on both nodes are connected.

Configure the two nodes as an HA pair.

Note

Configuring an HA pair sets the system password on the standby node to match the system password on the active node, however, that synchronization is not set until the HA configuration is complete. If the HA configuration fails, or if there is a need to access either node before the HA configuration is complete, use the serial number of each node as the password.

Procedure

1. Verify the certificate subject name on the existing node.

   Run the following command:
   `adminaccess certficate show`

```
sysadmin@dd9500-ha3a# adminaccess certificate show
Subject                       Type   Application   Valid From                Valid
Until
---------------------------   ----   -----------   ------------------------
------------------------
dd9500-ha3a.datadomain.com    host   https         Tue Aug  8 14:11:28 2018   Sat Aug  7
21:11:28 2022
dd9500-ha3a.datadomain.com    ca     trusted-ca    Tue Aug  8 21:04:53 2018   Mon Aug  7
21:04:53 2024
---------------------------   ----   -----------   ------------------------
------------------------
```

2. Verify the certificate subject name on the new node.

   Run the following command:
   `adminaccess certficate show`

```
sysadmin@dd9500-ha3b# adminaccess certificate show
Subject                       Type   Application   Valid From                Valid Until
---------------------------   ----   -----------   ------------------------
------------------------
dd9500-ha3b.datadomain.com    host   https         Tue Aug  8 15:11:28 2018   Sat Aug  7
22:11:28 2022
dd9500-ha3b.datadomain.com    ca     trusted-ca    Tue Aug  8 22:04:53 2018   Mon Aug  7
22:04:53 2024
---------------------------   ----   -----------   ------------------------
------------------------
```

3. Complete one of the following options:
   - If the values in the `Subject` column on both nodes are different, continue to Step 4.
   - If the values in the `Subject` column on both nodes are the same:
     a. Change the hostname of the new node.
     b. Run the `adminaccess certificate generate self-signed-cert regenerate-ca` command on the new node to generate new certificates with the new hostname.
     c. Proceed to Step 4.
4. On the existing node, create the HA pairing.

   Note

   - Specify the hostname or the IP address of the standby node.
   - The `ha create` command will fail if one node is configured to use DHCP and the other node is configured to use static IP addresses. Both nodes must use the same method to configure IP addresses.

   Run the following command:
   `ha create peer {<ipaddr> | <hostname>} [ha-name <ha-system-name>]`

   ```
   ha create peer mysystem-p1.emc.com
   ```

   This command:
   - Reboots both nodes, and completes the HA pairing when the nodes come back online.
   - Promotes the existing node's hostname to be the HA system name.
   - Assigns node 0 the local hostname *<HA-system-name>*-p0.

- Assigns node 1 the local hostname *<HA-system-name>*-p1.

5. When both nodes are up, verify the following information matches on both nodes:
   - Hardware model
   - Software version
6. Set the system time on both nodes. The HA configuration will fail if the time on the two nodes is more than 10 seconds apart.

   Run the following command:
   `system set date MMDDhhmm [[CC] YY]`

   Note

   After HA configuration is complete, point both nodes to an NTP or Active Directory time server.

7. Check the system for alerts.

   Run the following command:
   `alerts show current`

   If the system displays `System is misconfigured`, the SSDs were not removed from the front of the existing node. Run the `enclosure show misconfiguration` command to get more details.
8. Verify the HA status

   Run the following command:
   `ha status`

```
HA System Name: apollo-ha3a.emc.com
HA System Status: highly available
Node Name Node ID Role HA State
------------------------- --------- --------- --------
apollo-ha3a-p0.emc.com 0 active online
apollo-ha3a-p1.emc.com 1 standby online
------------------------- --------- --------- --------
```

9. On node 0, convert all data IP addresses to floating IP addresses.

   Run the following command for each IP address that needs to be converted to a floating IP address:
   `net config <interface-name> <IP address> netmask <netmask> type floating`

   Note

   The
   `net config`
   command with the float option is the only way to configure a floating IP address. There is no method available in Data Domain System Manager to configure a floating IP address.

```
# net config eth1a 2.2.2.1 netmask 255.255.255.0 type floating
```

10. Add the SSD enclosure to cache tier.

    Run the following command:
    `storage add tier cache enclosure`
    <enclosure number>

11. Enable the filesystem on node 0.

    Run the following command:
    ```
    filesys enable
    ```

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