Qumulo-Certified Hardware Guide

July 27, 2022

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Replacing the Hardware Components in Your C-192T, C-432T, and K-432T Nodes

To Replace the Chassis

This section explains how you can replace the chassis in C-192T, C-432T, and K-432T nodes.

Step 1: Prepare for Chassis Replacement

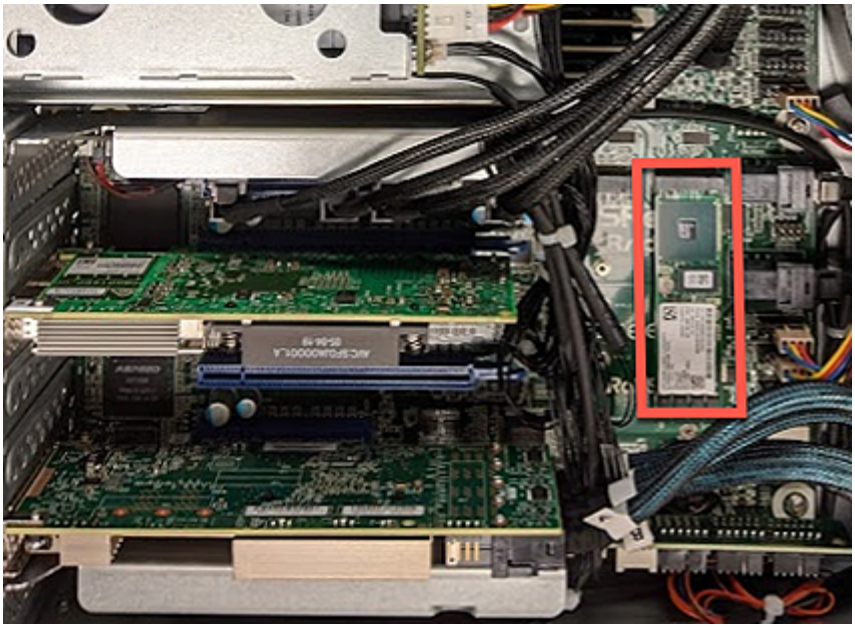
> **Note**
> We strongly suggest having another person help you with this process.

1. To shut down the node, use the power button at the front or connect using SSH and run the `sudo shutdown -h now` command.
2. Disconnect all cables from the back of the node.
3. To pull the node out from the rack, release the small, white tabs on the rails that hold the chassis in place.
4. Place the node on a flat surface.
5. To release the lid, remove the small screw on the upper-right side of the node (viewed from the rear).
6. Press the large **PUSH** button on each side of the chassis frame.

The inner components of the node are exposed.

Step 2: Replace the M.2 Boot Drive, NVMe SSDs, and HDDs

1. Remove the internal M.2 boot drive and then transfer it into the replacement chassis Qumulo provided to you.



2. Remove the rear NVMe SSDs and then transfer them into the replacement chassis. The following is the mapping for the drives.

6	4	2
5	3	1

3. To allow the HDD trays to slide open, ensure that any shipping screws are removed from the replacement chassis.

4. Install the replacement chassis in an appropriate location in your server rack.

5. Starting with the top drawer, transfer the HDDs from each tray in the original chassis into a corresponding slot in the replacement chassis. For more information about drive locations, see C-Series Drive Diagrams on Qumulo Care.

   > ⚠ Important
   > Work on one drawer at a time. If you apply 2 kg (or more) of downward force to a drawer, it might deform while opened.

   a. To open the HDD drawer, use the blue lever at the front of the node.

   b. To remove an HDD from the original chassis, gently lift up the drive tray knob. This lets the drive move forward and unlatch.

   c. To insert an HDD into the replacement chassis, gently slide the drive tray knob backwards. This latches the drive and knob in place.

6. Reconnect the power and networking cables to the node.
7. Power on the node.

Step 3: (Optional) Reconfiguring the Out-of-Band Management (IPMI) Settings

If the current IPMI settings for your node are configured statically (rather than using DHCP), you must reapply the static IPMI settings to the replacement node. For more information, see IPMI Quick Reference Guide for Qumulo C-Series on Qumulo Care.

Getting Started with Qumulo on HPE Apollo 4200 Gen9

This section explains how to prepare HPE Apollo 4200 Gen9 nodes for creating a Qumulo Core cluster. This guide is for system administrators, professional service providers, and colleagues in your organization who are responsible for installing and configuring server hardware. For more information, see HPE Apollo 4200 Gen9 - Server Document List .

Prerequisites

Qumulo Core USB Drive Installer

Step 1: Verify Your Node

1. Shut down your node and connect a display, a keyboard, and a mouse to it.
2. Plug the Qumulo Core USB Drive Installer into an available USB port on the node and then press the power button.

3. On the **HPE ProLiant** boot screen, do one of the following:
    - If the **Boot Mode: Legacy BIOS** message appears, skip the rest of this section and continue to boot by using the Qumulo Core USB Drive Installer (page 6).
    - If the **Boot Mode: Legacy BIOS** message doesn't appear, press **F9**.
4. On the **System Utilities** page, click **System Configuration > BIOS/Platform Configuration (RBSU) > Boot Options**.
5. On the **Boot Options** page, set **Boot Mode** to **Legacy BIOS Mode** and then press **F10**.
6. Press **Esc** until you return to the main page.
7. Click **Reboot the System**.

Step 2: Boot by Using the Qumulo Core USB Drive Installer

> **Caution**
> If your node contains any live data, *don't* run the FVT.

1. On the **HPE ProLiant** boot screen, press **F11**.

   > **Note**
   > The **Boot Menu** page might take a few minutes to appear.

2. On the **Boot Menu** page, to boot into the **Legacy BIOS One-Time Boot Menu**, press **Enter**.
3. In the **Select ENTER to enter the Legacy BIOS One-Time Boot Menu or Esc to cancel.** dialog box, press **Enter**.
4. From the **Default Boot Override Options** menu, select **2) One Time Boot to USB DriveKey**.

   Wait for Qumulo Installer to load.
5. Select **[1] Factory reset (DESTROYS ALL DATA)** and when prompted type `DESTROY ALL DATA`.

   The platform name and SmartArray mode appear.
6. Configure the encryption on your node.
   - If the SmartArray mode is **Secure**, **RAID**, or **Encrypted**, select **2) no, continue install in Non-Secure mode**.
   - If the SmartArray mode is **Not Secure**, **HBA**, or **Unencrypted**, do the following:

     a. Select **1) SET ENCRYPTION, set SmartArrays in RAID mode, destroy all data, reboot node**.

     b. After the node reboots, select **1) CONFIGURE ENCRYPTION, Set up encryption, input new keys**.

     The rules for the cryptographic login password and master key appear.

     > **Caution**
     > To avoid data loss, save your credentials.

Step 3: Run the Field Verification Tool (FVT)

1. Select **1) FVT, Enter FVT sub menu**.
2. To update the node components to required versions, choose **1) FLASH, Flash components to required versions**.
3. Do one of the following:
   - If the FVT verification passes, select **2) no, return to menu, run FVT to continue install**.
   - If the FVT flashes firmware, select **1) REBOOT, reboot node in 5 seconds** and the continue from step 2.

Step 4: Install Qumulo Core by Using the USB Drive Installer

Perform the following steps on every node in your cluster.

1. In the FVT, select **2) no, continue install**.

   When the installation is complete, the node shuts down automatically.
2. Remove the USB drive and power on the node.

Step 5: Create and Configure Your Cluster

1. Review the **End User Agreement**, click **I agree to the End User Agreement**, and then click **Submit**.
2. Name your cluster.
3. On the **1. Set up cluster** page, select the nodes to add to your cluster.

   As you select nodes, the installer updates the total capacity of your cluster at the bottom of the page.

   > **Note**
   > If any nodes are missing, confirm that they are powered on and connected to the same network.
4. On the **2. Confirm cluster protection level** page, Qumulo Core selects the recommended 2- or 3-drive protection level based on your cluster size and node type.
5. If the **Customize Protection Level** option appears, you can increase your system resilience by selecting 3-drive protection.

> ⚠ Important
>
> - The option for selecting the drive protection level is available only at cluster creation time. You can't change it later.
> - Using 3-drive protection reduces the total capacity of your cluster.

6. Enter a password for the administrative account and click **Create Cluster**.
7. To access the Qumulo Core Web UI, connect to any node by entering its IP address into a web browser. For more information, see Qumulo Core Web UI Browser Compatibility on Qumulo Care.

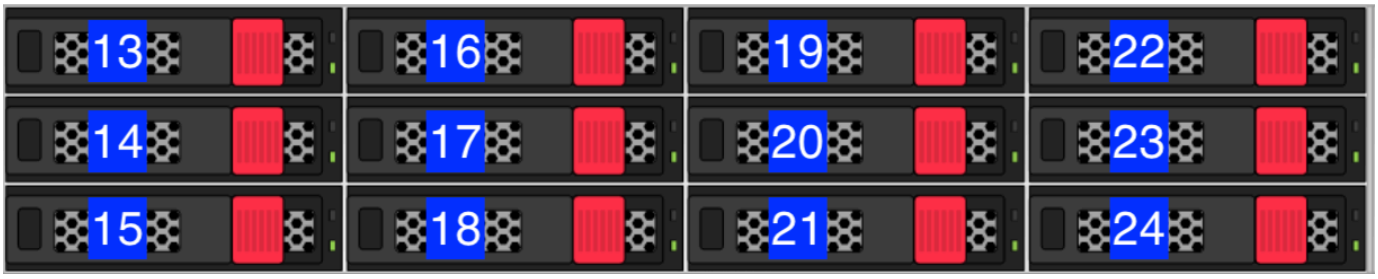
For more information about configuring your cluster configuration and getting started with Qumulo Core, see Qumulo Installation FAQ on Qumulo Care.

Front and Rear Drive Locations on HPE Apollo 4200 Gen9 Nodes

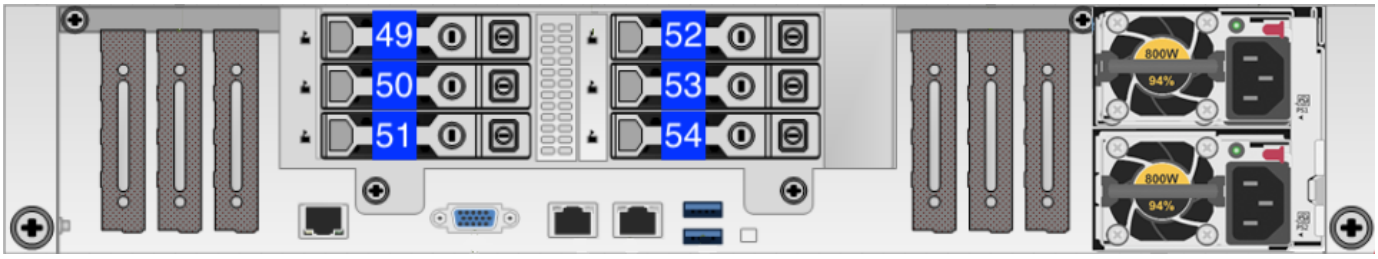
This section shows the front large form factor (LFF) and rear small form factor (SFF) drive locations in your HPE Apollo 4200 Gen9 node. For more information, see HPE Apollo 4200 Gen9 Server - Document List .

Front LFF Drive Row

Second LFF Drive Row



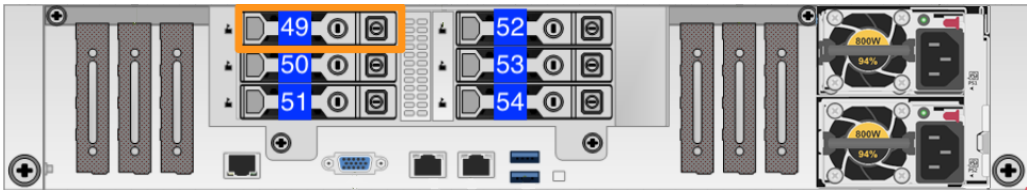
Rear SFF Hot-Plug Drives



Boot Drive

> ⚠ Important
> Before you remove the boot drive, contact the Qumulo Care Team for additional instructions.

The following diagram shows the boot drive in 90T, 180T, and 288T nodes.

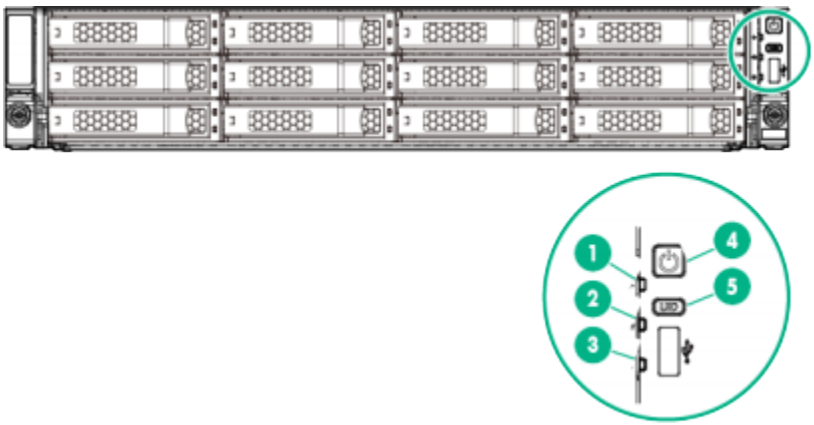


Panel LEDs on HPE Apollo 4200 Gen9 Nodes

This section explains the LEDs of your HPE Apollo 4200 Gen9 node, including front panel LEDs and buttons, power fault LEDs, and rear panel LEDs. You can use these LEDs to diagnose hardware health issues. For more information, see HPE Apollo 4200 Gen9 Server - Document List .

Front Panel LEDs and Buttons

To locate the front panel LEDs, use the following diagram.



1. Health LED
    - 🟢 **Solid Green:** Normal
    - 🟢 **Flashing Green:** (1 flash per second) iLO is rebooting
    - 🟠 **Flashing Amber:** System degraded
    - 🔴 **Flashing Red:** (1 flash per second) System critical

    > **Note**
    > If the Health LED indicates a degraded or critical state, review the system integrated management log (IML) or use iLO to review the system health status.

2. NIC Status LED
    - 🟢 **Solid Green:** Link to network
    - 🟢 **Flashing Green:** (1 flash per second) Network active
    - **Off:** No network activity
3. Front Drive Health or Thermal LED

- 🟢 **Solid Green:** Drives which the SAS expander supports are functional. This applies to all front drives and the rear drives connected to the front drive cage 2 backplane.
- 🟠 **Solid Amber:** Failure or predictive failure of one or more drives that the SAS expander supports. This applies to all front drives and to the rear drives connected to the front drive cage 2 backplane.
- 🟠 **Flashing Amber:** (1 flash per second) The temperature sensor in one or more front drives is about to reach the thermal threshold. You must immediately slide the front drive cages back into the chassis and keep them there until the LED turns green.

  > **Note**
  > This LED behavior depends on the iLO 08-HD Max sensor reading.

- **Off:** No power present

4. Power On or Standby Button and System Power LED
   - 🟢 **Solid Green:** System on
   - 🟢 **Flashing Green:** (1 flash per second) Performing power-on sequence
   - 🟠 **Solid Amber:** System in standby mode
   - **Off:** No power present
5. UID Button and LED
   - 🔵 **Solid Blue:** Activated
   - 🔵 **Flashing Blue:**
     - 1 flash per second: Remote management or firmware upgrade in progress
     - 4 flashes per second: iLO manual reboot sequence initiated
     - 8 flashes per second: iLO manual reboot sequence in progress
   - **Off:** Deactivated

> **Note**
> If the (3) Front Drive Health or Thermal LED, or the (4) Power On or Standby Button and System Power LED is off, one of the following conditions is possible:
>
> - Facility power not present
> - Power cord detached

- No power supplies installed
- Power supply failure
- Front I/O cable disconnected

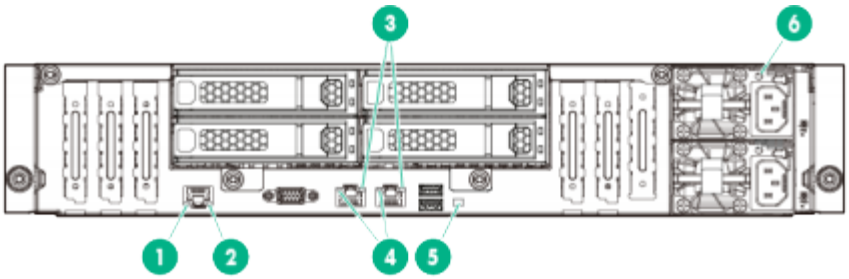
Power Fault LEDs

If the (1) Health LED, (2) NIC status LED, (4) Power On and Standby button, and (4) System Power LED, and the (5) UID Button and LED (5) flash simultaneously, a power fault has occurred. The following table lists the LED behavior corresponding to affected subsystems.

Number of LED Flashes	Affected Subsystem
1	System board
2	Processor
3	Memory
4	Riser board PCIe slots
5	FlexibleLOM
6	Removable HPE Flexible Smart Array controller or Smart SAS HBA controller
7	System board PCIe slots
8	Power backplane or storage backplane
9	Power supply

Rear Panel LEDs

To locate the rear panel LEDs, use the following diagram.



1. Dedicated iLO Activity LED
    - 🟢 **Solid Green:** Link to network
    - 🟢 **Flashing Green:** Network active
    - **Off:** No network activity
2. Dedicated iLO Link LED
    - 🟢 **Green:** Network link
    - **Off:** No network link
3. NIC Activity LED
    - 🟢 **Solid Green:** Link to network
    - 🟢 **Flashing Green:** Network active
    - **Off:** No network activity
4. NIC Link LED
    - 🟢 **Green:** Network link
    - **Off:** No network link
5. UID LED
    - 🔵 **Solid Blue:** Activated
    - 🔵 **Flashing Blue:**
        - 1 flash per second: Remote management or firmware upgrade in progress
        - 4 flashes per second: iLO manual reboot sequence initiated
        - 8 flashes per second: iLO manual reboot sequence in progress
    - **Off:** Deactivated
6. Power Supply LED
    - 🟢 **Solid Green:** Normal
    - **Off:** One or more of the following conditions exist:

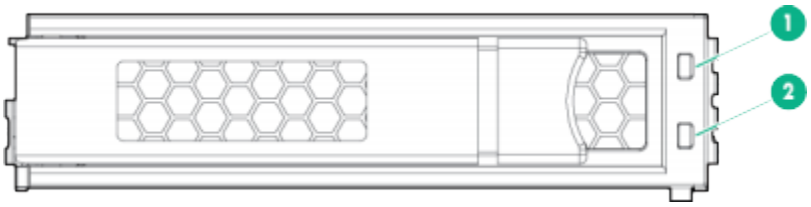
- Power unavailable
- Power supply failed
- Power supply in standby mode
- Power supply error

Drive LEDs on HPE Apollo 4200 Gen9 Nodes

This section explains the LEDs of large form factor (LFF) and small form factor (SFF) drives in your HPE Apollo 4200 Gen9 node. For more information, see HPE Apollo 4200 Gen9 Server - Document List .

Large Form Factor (LFF) Drive LEDs

To locate the LFF drive LEDs, use the following diagram.



You can determine the current state of an LFF drive by reviewing the status of the following LEDs:

1. Fault or UID LED
    - 🟠 Amber
    - 🔵 Blue
2. Online or Activity LED
    - 🟢 Green

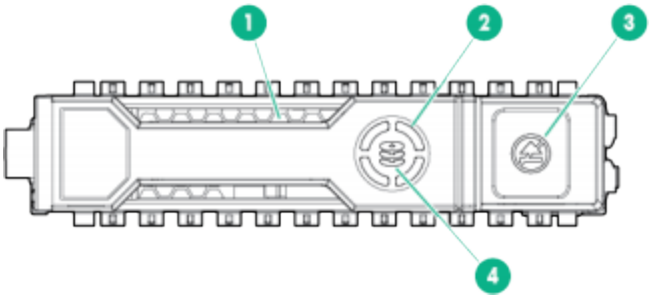
The following table explains the various combinations of the two LFF LEDs.

Online or Activity LED	Fault or UID LED	Description
On, off, or flashing	Alternating amber and blue	One or more of the following conditions exist: • The drive has failed. • This system received a predictive failure alert about the drive. • A management application has selected the drive.
On, off, or flashing	Solid blue	One or more of the following conditions exist: • The drive is operating normally. • A management application has selected the drive.

Online or Activity LED	Fault or UID LED	Description
On	Flashing amber	This system received a predictive failure alert about the drive. Replace the drive as soon as possible.
On	Off	The drive is online but isn't active currently.
1 flash per second	Flashing amber	Don't remove the drive. Removing the drive might terminate the current operation and cause data loss. The drive is part of an array that is undergoing capacity expansion or stripe migration. However, the system received a predictive failure alert about the drive. To minimize the risk of data loss, don't remove the drive until the expansion or migration is complete.
1 flash per second	Off	Don't remove the drive. Removing the drive might terminate the current operation and cause data loss. The drive is rebuilding, erasing, or is part of an array that is undergoing capacity expansion or stripe migration.
4 flashes per second	Flashing amber	The drive is active but it received a predictive failure alert. Replace the drive as soon as possible.
4 flashes per second	Off	The drive is active and is operating normally.
Off	Solid amber	The drive has a critical fault condition and the controller has placed it offline. Replace the drive as soon as possible.
Off	Flashing amber	This system received a predictive failure alert about the drive. Replace the drive as soon as possible.
Off	Off	The drive is offline, a spare, or isn't configured as part of an array.

Small Form Factor (SFF) Drive LEDs

To locate the SFF drive LEDs, use the following diagram.



1. Locate LED
    - 🔵 **Solid Blue:** A host application is identifying the drive.
    - 🔵 **Flashing Blue:** The drive carrier firmware is updating or requires an update.

    > **Note**
    > The Locate LED is behind the release lever. When it is illuminated, it is visible.

2. Activity Ring LED
    - 🟢 **Rotating Green:** Drive activity
    - **Off:** No drive activity
3. Do Not Remove LED
    - ⚬ **Solid White:** Don't remove the drive. Removing the drive causes one or more of the logical drives to fail.
    - **Off:** Removing the drive doesn't cause a logical drive to fail.
4. Drive Status LED
    - 🟢 **Solid Green:** The drive is a member of one or more logical drives
    - 🟢 **Flashing Green:** The drive is rebuilding or performing a RAID migration, strip-size migration, capacity expansion, or logical drive extension or is erasing.
    - 🟠🟢 **Flashing Amber and Green:** The drive is a member of one or more logical drives and predicts drive failure.
    - 🟠 **Flashing Amber:** The drive isn't configured and predicts drive failure.
    - 🟠 **Solid Amber:** The drive has failed.
    - **Off:** A RAID controller hasn't configured the drive.

Configuring and Using Integrated Lights Out (iLO) on HPE Apollo 4200 Gen9 Nodes

This section explains how to configure and use Integrated Lights Out (iLO) on HPE Apollo 4200 Gen9 nodes.

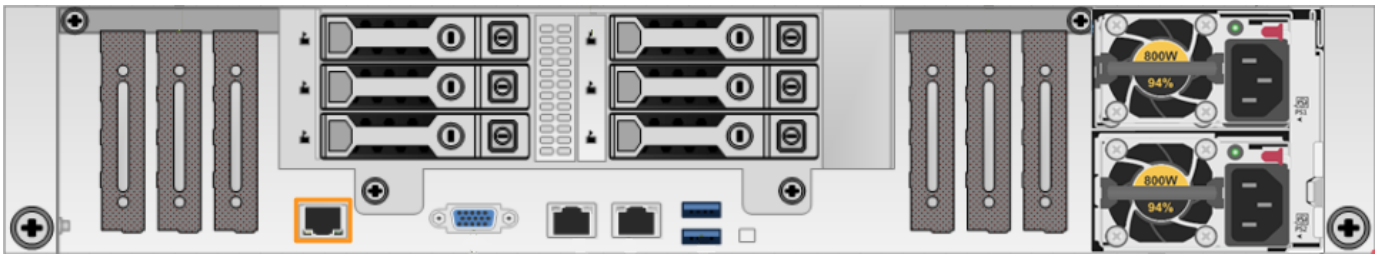
> ⚠ Important
> Access to the iLO port on a public LAN can have serious security implications because it can grant anyone with credentials direct access to your server's hardware and console. Follow security best practices when implementing iLO access.

Prerequisites

To configure the iLO port, you must have root access to the client-facing network through SSH. For example, you can use the `sudo -s` command.

How the iLO Port Works

HPE Apollo 4200 Gen9 nodes provide iLO support for out-of-band maintenance access even when the node is plugged in but powered off. The following diagram shows the location of the iLO port.



Your nodes receive DHCP address assignments by default. When you configure a node's iLO port, you can access the node by using the IP address (that the DHCP server assigns to the node) and a web browser that supports HTML5, Java, and .NET

> ⚠ Important
> We strongly recommend separating your iLO access network from your client-facing network

To access iLO configuration from the BIOS System Utilities menu, press **F9**. The default iLO username is `Administrator`. The password is printed on top of your node chassis.

> **Note**
> The IMPI username and password are unrelated to your Qumulo administrative credentials.

iLO Configuration Commands

Use the following commands to configure the iLO port on your nodes.

To Verify iLO LAN Configuration

```
# ipmitool lan print 2
```

To Configure iLO LAN by Using Static IP Addresses

1. Set the iLO Ethernet interface to a static IP address.

   ```
   # ipmitool lan set 2 ipsrc static
   ```

2. Set the interface IP address. For example:

   ```
   # ipmitool lan set 2 ipaddr 203.0.113.0
   ```

3. Set the interface subnet mask. For example:

   ```
   # ipmitool lan set 2 netmask 255.0.0.1
   ```

4. Set the default gateway IP address. For example:

   ```
   # ipmitool lan set 2 defgw ipaddr 192.168.0.1
   ```

5. (Optional) Enable baseboard management controller (BMC) Address Resolution Protocol (ARP) responses.

   ```
   # ipmitool lan set 2 arp respond on
   ```

To List Current Users

```
# ipmitool user list 2
ID Name Callin Link Auth IPMI Msg Channel Priv Limit
1 false false true ADMINISTRATOR
2 root false true true ADMINISTRATOR
```

To Change the Default Administrator Password

```
# ipmitool user set password 2
Password for user 2:
Password for user 2:
```

To Create a New User

In the following example, we create the administrative user `netadmin` in user slot `4`.

```
# ipmitool user set name 4 netadmin
# ipmitool user set password 4
Password for user 4:
Password for user 4:
```

To Configure User Access

```
# ipmitool channel setaccess 2 4 link=on ipmi=on callin=on privilege=4
# ipmitool user enable 4
```

To Verify User Access Level

```
# ipmitool channel getaccess 2 4
Maximum User IDs : 10
Enabled User IDs : 4

User ID : 4
User Name : ADMIN
Fixed Name : No
Access Available : call-in / callback
Link Authentication : disabled
IPMI Messaging : enabled
Privilege Level : ADMINISTRATOR
```

To Reset the Baseboard Management Controller

If you can’t connect to the iLO management console and your network configuration is correct, reset the BMC through an SSH or KVM Console session for the affected node.

```
# ipmitool bmc reset cold
```

Networking Your HPE Apollo 4200 Gen9 Cluster

This section explains how to network your HPE Apollo 4200 Gen9 cluster.

Prerequisites

- A network switch with the following criteria:
    - 40 Gbps Ethernet connection
    - Fully non-blocking architecture
    - IPv6 compatibility
- Compatible network cables
- A sufficient number of ports for connecting all nodes to the same switch fabric
- One static IP per node, per defined VLAN

> ⚠ Important
> Before you connect any Qumulo-supported equipment to your network, we strongly recommend consulting with your network engineering team.

Recommended Configuration

- Two redundant switches
- One physical connection to each redundant switch, per node
- One Link Aggregation Control Protocol (LACP) port-channel per node with the following configuration:
    - Active mode
    - Slow transmit rate
    - Trunk port with a native VLAN
    - Enabled IEEE 802.3x flow control (full-duplex mode)
- DNS servers
- Network Time Protocol (NTP) server
- Firewall protocol or ports configured for Qumulo Care Proactive Monitoring

- Where N is the number of nodes, up to 10 N-1 floating IP addresses per node, per client-facing VLAN

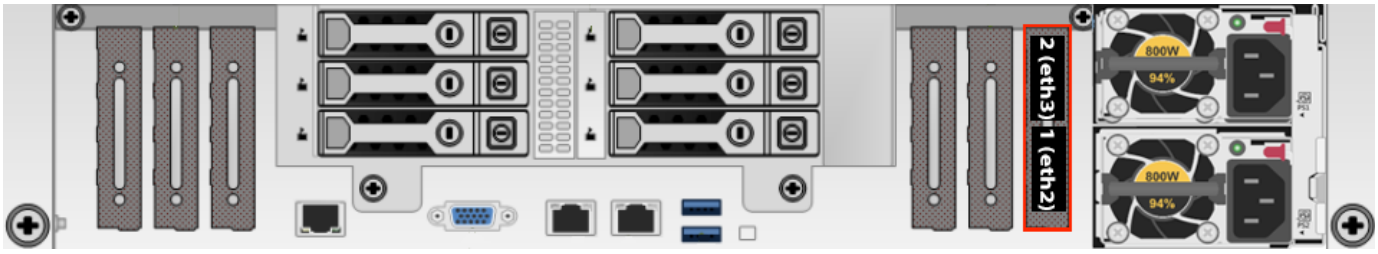
  > **Note**
  > The number of floating IP addresses depends on your workflow and on the clients that connect to the cluster, with a minimum of two floating IP addresses per node, per client-facing VLAN, but with no more than ten floating IP addresses per node, per client-facing VLAN.

- Nodes connected at their maximum Ethernet speed (this ensures advertised performance). To avoid network bottlenecks, Qumulo validates system performance with this configuration by using clients connected at the same link speed and to the same switch as the nodes.

Node NICs and Ports

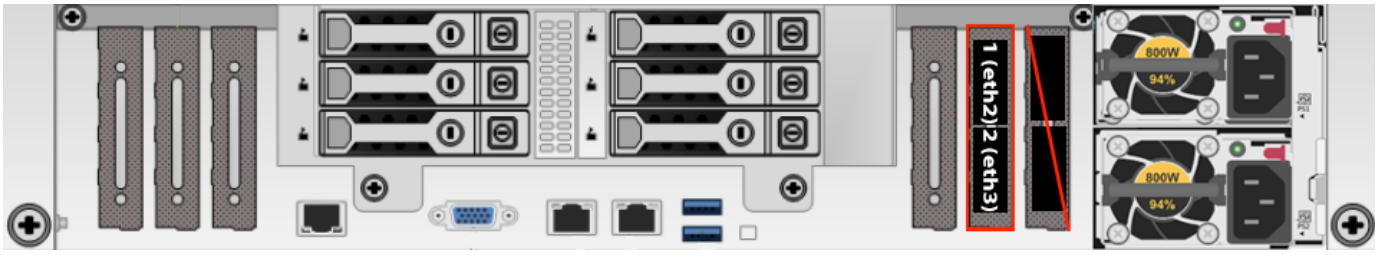
The following diagrams show the NICs and ports on HPE Apollo 4200 Gen9 nodes.

90T NIC1 Ports

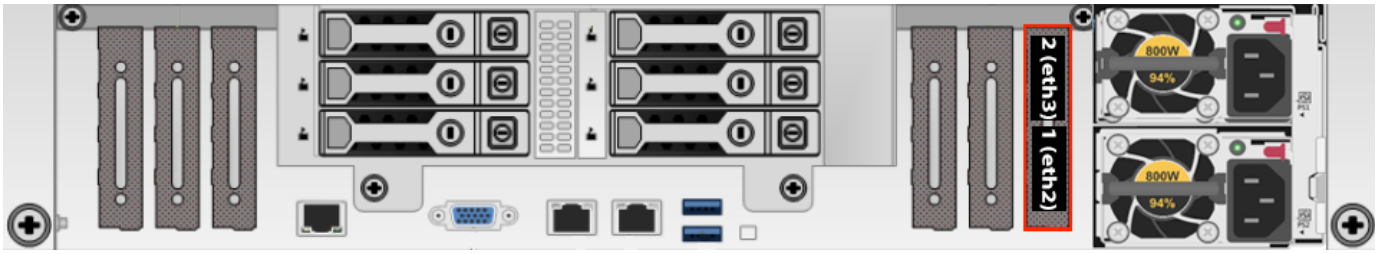


180T NIC1 Ports

> **Note**
> Currently, NIC2 on this model is unused.

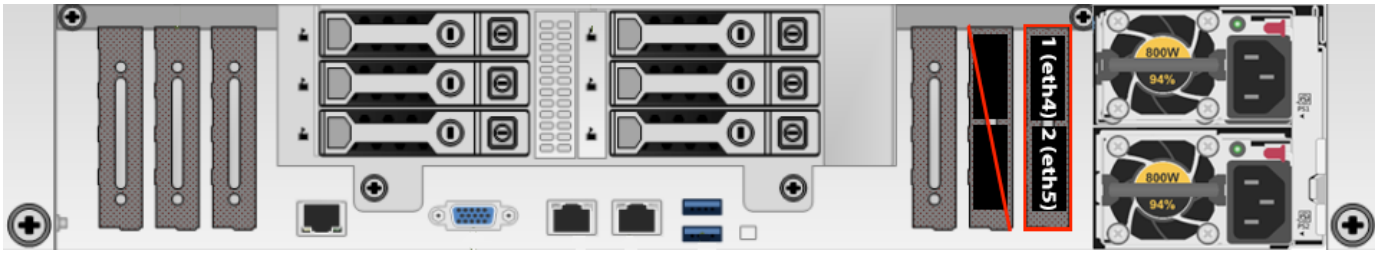


288T NIC1 Ports (Single)



288T NIC1 Ports (Dual)

> **Note**
> Currently, NIC2 on this model is unused.



Connecting to Redundant Switches

This section explains how to connect a four-node HPE cluster to dual switches for redundancy. We recommend this configuration for HPE hardware. If either switch becomes inoperative, the cluster remains accessible through the remaining switch.

- Connect the two 40 Gbps ports on the nodes to separate switches.
- Use at least one port on both switches as an uplink to the client network. To ensure an acceptable level of physical network redundancy and to meet the necessary client access throughput rates, use an appropriate combination of 10 Gbps, 25 Gbps, 40 Gbps, or 100 Gbps network uplinks.
- Use at least one peer link between the switches.

Connecting to a Single Switch

This section explains how to connect a four-node HPE cluster to a single switch.

> **Note**
> If the switch becomes inoperative, the cluster becomes inaccessible.

- Connect two 40 Gbps ports to the switch.
- Connect any uplink ports to the client network.

Getting Started with Qumulo on HPE Apollo 4200 Gen10

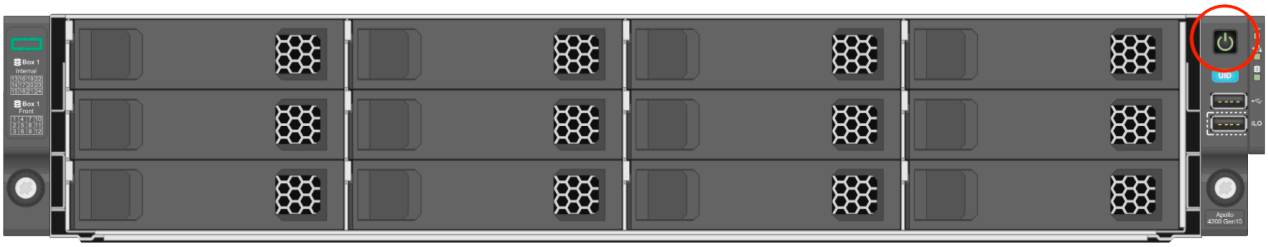
This section explains how to prepare HPE Apollo 4200 Gen10 nodes for creating a Qumulo Core cluster. This guide is for system administrators, professional service providers, and colleagues in your organization who are responsible for installing and configuring server hardware. For more information, see HPE Apollo 4200 Gen10 Server - Document List .

Prerequisites

Qumulo Core USB Drive Installer

Step 1: Verify Your Node

1. Shut down your node and connect a display, a keyboard, and a mouse to it.
2. Plug the Qumulo Core USB Drive Installer into an available USB port on the node and then press the power button.



3. On the **HPE ProLiant** boot screen, do one of the following:
   - If the **Boot Mode: Legacy BIOS** message appears, skip the rest of this section and continue to boot by using the Qumulo Core USB Drive Installer (page 28).
   - If the **Boot Mode: Legacy BIOS** message doesn't appear, press **F9**.
4. On the **System Utilities** page, click **System Configuration** > **BIOS/Platform Configuration (RBSU)** > **Boot Options**.
5. On the **Boot Options** page, set **Boot Mode** to **Legacy BIOS Mode** and then press **F10**.
6. Press **Esc** until you return to the main page.
7. Click **Reboot the System**.

Step 2: Boot by Using the Qumulo Core USB Drive Installer

1. On the **HPE ProLiant** boot screen, press **F11**.

   > **Note**
   > The **Boot Menu** page might take a few minutes to appear.

2. On the **Boot Menu** page, to boot into the **Legacy BIOS One-Time Boot Menu**, press **Enter**.
3. In the **Question** dialog box, click **OK**.
4. From the **Default Boot Override Options** menu, select **2) One Time Boot to USB DriveKey**.

Step 3: Run the Field Verification Tool (FVT)

After the node reboots, the Field Verification Tool runs automatically.

Select **[1] Factory reset (DESTROYS ALL DATA)** and then enter `DESTROY ALL DATA`.

Fixable Issues During Installation

If the FVT finds fixable issues, it prompts you to auto-correct any detected issues, depending on your installation scenario. Issues that the FVT can auto-correct include the following:

- BIOS Configuration
- Drive firmware
- Drive controller firmware
- NIC mode for CX5
- Boot order

1. To attempt auto-correction, select **[1] Run FVT Flash. This will try to fix issues then reboot.**

   If the fixes are successful, the FVT reboots the node automatically.

2. To re-attempt verification, boot by using the Qumulo Core USB Drive Installer (page 28) and then continue the installation.

Non-Fixable Issues

If the FVT is unable to auto-correct any issues, the message **Not fixable issues were detected.** appears, providing reasons for failure.

For help with troubleshooting your node, contact Qumulo Care .

Step 4: Install Qumulo Core by Using the USB Drive Installer

> **Caution**
> Store your master key in a secure location. If you lose your master key, you might not be able to recover your data from certain hardware failures.

Perform the following steps on every node in your cluster.

1. Do one of the following:
    - Choose **[1] Install Qumulo Core without HPE Hardware encryption**
    - Choose **[2] Install Qumulo Core with HPE Hardware encryption**.
2. If you install Qumulo Core with encryption, enter your cryptographic login password and master encryption key.

    > **Note**
    > - Your login password must be 8-16 characters long and must contain at least:
    >   - One uppercase character
    >   - One lowercase character
    >   - One numeric character
    >   - One symbol (such as # or $)
    > - Your encryption master key must be 10-32 characters long.
    > - Both your login password and encryption master key:
    >   - Can use uppercase and lowercase letters, numbers, and symbols
    >   - Must use only ASCII characters
    >   - Must not use spaces, semicolons (;), or quotation marks (")
    > - Store your master key in a secure location for the lifetime of the cluster.

Step 5: Create and Configure Your Cluster

1. Review the **End User Agreement**, click **I agree to the End User Agreement**, and then click **Submit**.
2. Name your cluster.

3. On the **1. Set up cluster** page, select the nodes to add to your cluster.

   As you select nodes, the installer updates the total capacity of your cluster at the bottom of the page.

   > **Note**
   > If any nodes are missing, confirm that they are powered on and connected to the same network.

4. On the **2. Confirm cluster protection level** page, Qumulo Core selects the recommended 2- or 3-drive protection level based on your cluster size and node type.
5. If the **Customize Protection Level** option appears, you can increase your system resilience by selecting 3-drive protection.

   > **Important**
   >
   > - The option for selecting the drive protection level is available only at cluster creation time. You can't change it later.
   > - Using 3-drive protection reduces the total capacity of your cluster.

6. Enter a password for the administrative account and click **Create Cluster**.
7. To access the Qumulo Core Web UI, connect to any node by entering its IP address into a web browser. For more information, see Qumulo Core Web UI Browser Compatibility on Qumulo Care.

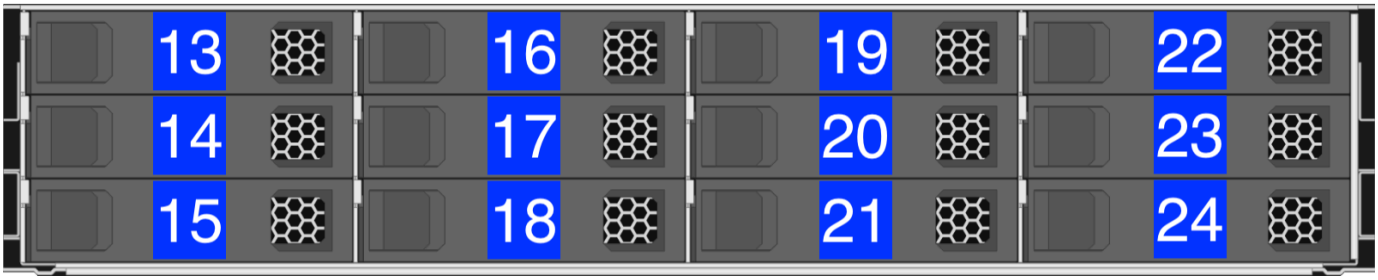
For more information about configuring your cluster configuration and getting started with Qumulo Core, see Qumulo Installation FAQ on Qumulo Care.

Front and Rear Drive Locations on HPE Apollo 4200 Gen10 Nodes

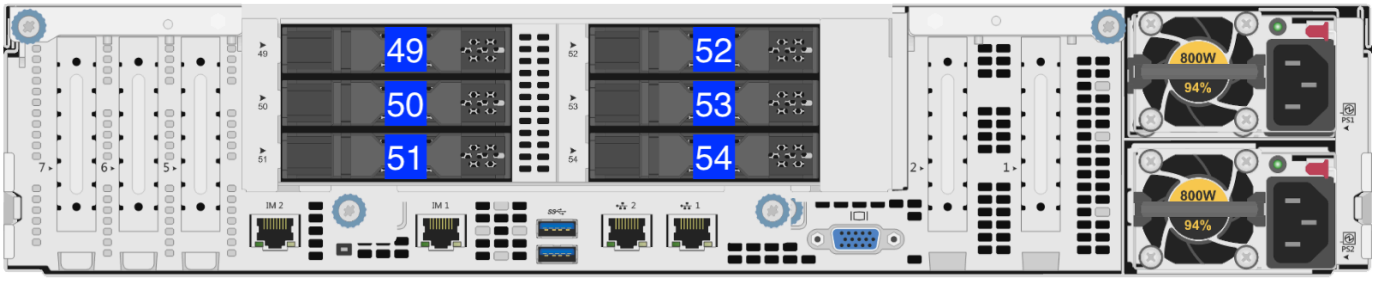
This section shows the front large form factor (LFF) and rear small form factor (SFF) drive locations in your HPE Apollo 4200 Gen10 node. For more information, see HPE Apollo 4200 Gen10 Server - Document List .

Front LFF Drive Row

Second LFF Drive Row



Rear SFF Hot-Plug Drives

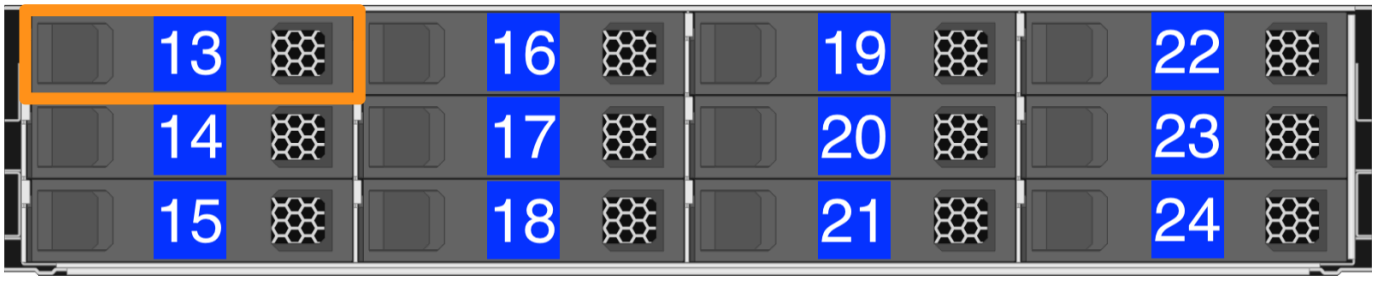


Boot Drive

> ⚠ Important
> Before you remove the boot drive, contact the Qumulo Care Team for additional instructions.

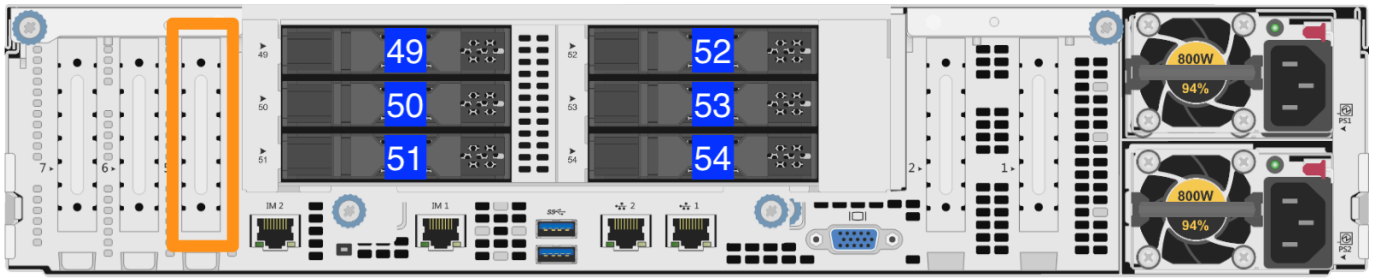
36T and 90T Nodes

In 36T and 90T nodes, the boot drive is located in the second LFF drive row.



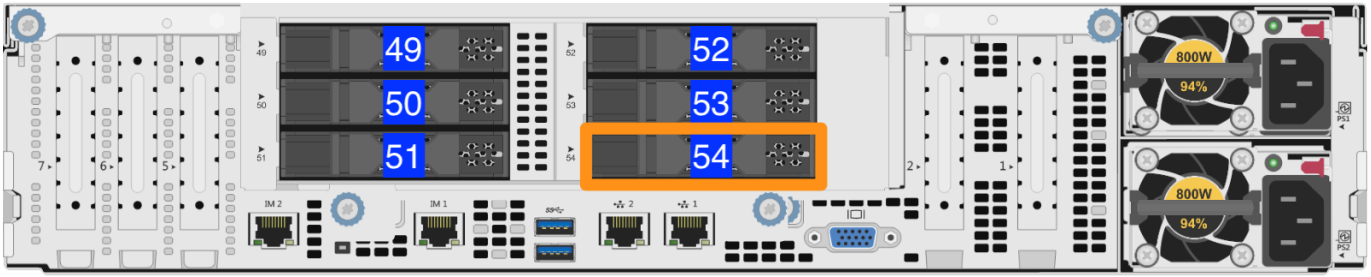
192T Nodes

In 192T nodes, the boot drive is a BOSS PCIe riser card.



336T Nodes

In 336T nodes, the boot drive is located with the rear SFF hot-plug drives.

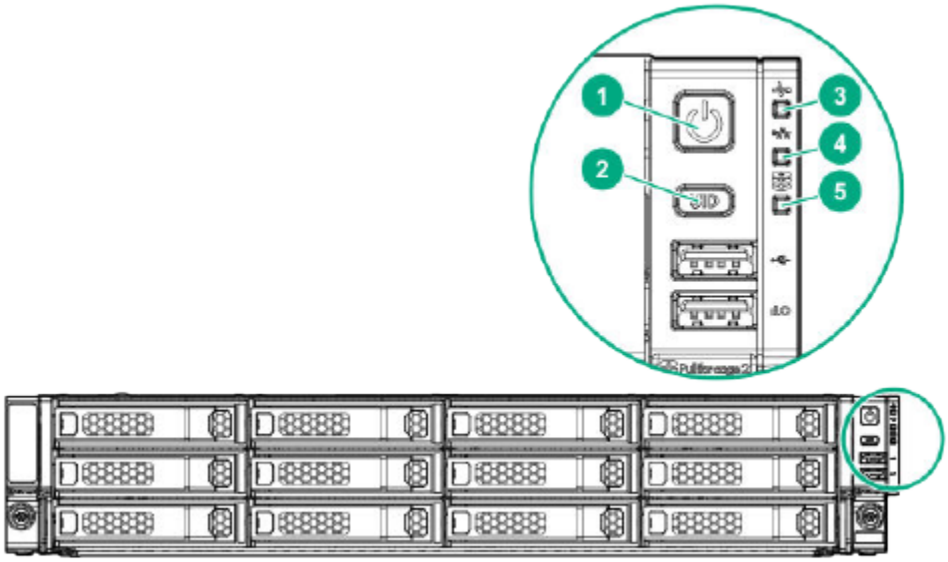


Panel LEDs on HPE Apollo 4200 Gen10 Nodes

This section explains the LEDs of your HPE Apollo 4200 Gen10 node, including front panel LEDs and buttons, power fault LEDs, and rear panel LEDs. You can use these LEDs to diagnose hardware health issues. For more information, see HPE Apollo 4200 Gen10 Server - Document List
.

Front Panel LEDs and Buttons

To locate the front panel LEDs, use the following diagram.



1. Power On or Standby Button and System Power LED
    - 🟢 **Solid Green:** System on
    - 🟢 **Flashing Green:** (1 flash per second) Performing power-on sequence
    - 🟠 **Solid Amber:** System in standby
    - **Off:** No power present
2. UID Button and LED
    - 🔵 **Solid Blue:** Activated
    - 🔵 **Flashing Blue:**
        - 1 flash per second: Remote management or firmware upgrade in progress
        - 4 flashes per second: iLO manual reboot sequence initiated

        - 8 flashes per second: iLO manual reboot sequence in progress
    - **Off:** Deactivated
3. Health LED
    - 🟢 **Solid Green:** Normal
    - 🟢 **Flashing Green:** (1 flash per second) iLO is rebooting
    - 🟠 **Flashing Amber:** System degraded
    - 🔴 **Flashing Red:** (1 flash per second) System critical

    > **Note**
    > If the Health LED indicates a degraded or critical state, review the system integrated management log (IML) or use iLO to review the system health status.

4. NIC Status LED
    - 🟢 **Solid Green:** Link to network
    - 🟢 **Flashing Green:** (1 flash per second) Network active
    - **Off:** No network activity
5. Front Drive Health or Thermal LED
    - 🟢 **Solid Green:** Drives which the SAS expander supports are functional. This applies to all front drives and the rear drives connected to the front drive cage 2 backplane.
    - 🟠 **Solid Amber:** Failure or predictive failure of one or more drives that the SAS expander supports. This applies to all front drives and to the rear drives connected to the front drive cage 2 backplane.
    - 🟠 **Flashing Amber:** (1 flash per second) The temperature sensor in one or more front drives is about to reach the thermal threshold. You must immediately slide the front drive cages back into the chassis and keep them there until the LED turns green.

      > **Note**
      > This LED behavior depends on the iLO 08-HD Max sensor reading.

    - **Off:** No power present

> **Note**

If the (5) Front Drive Health or Thermal LED, or the (1) Power On or Standby Button and System Power LED are off, one of the following conditions is possible:

- Facility power not present
- Power cord detached
- No power supplies installed
- Power supply failure
- Front I/O cable disconnected

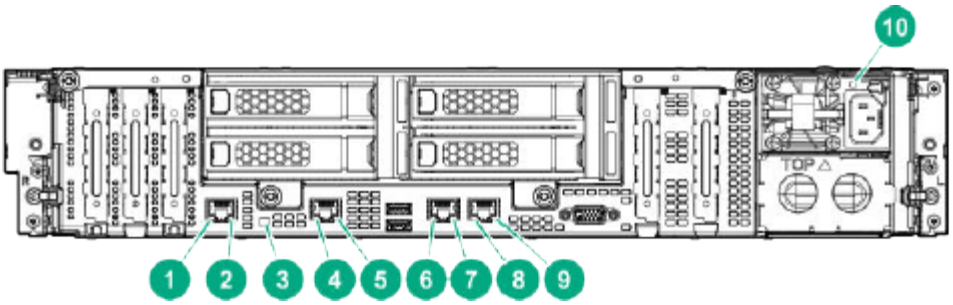
Power Fault LEDs

If the (1) Power On or Standby Button and System Power LED, (2) UID Button and LED, (3) Health LED, and (4) NIC Status LED flash simultaneously, a power fault has occurred. The following table lists the LED behavior corresponding to affected subsystems.

Number of LED Flashes	Affected Subsystem
1	System board
2	Processor
3	Memory
4	Riser board PCIe slots
5	FlexibleLOM
6	Removable HPE Flexible Smart Array controller or Smart SAS HBA controller
7	System board PCIe slots
8	Power backplane or storage backplane
9	Power supply

Rear Panel LEDs

To locate the rear panel LEDs, use the following diagram.



1. Dedicated iLO Port 1 Link LED
    - 🟢 **Green:** Network link
    - **Off:** No network link
2. Dedicated iLO Port 1 Activity LED
    - 🟢 **Solid Green:** Link to network
    - 🟢 **Flashing Green:** Network active
    - **Off:** No network activity
3. UID LED
    - 🔵 **Solid Blue:** Activated
    - 🔵 **Flashing Blue:**
        - 1 flash per second: Remote management or firmware upgrade in progress
        - 4 flashes per second: iLO manual reboot sequence initiated
        - 8 flashes per second: iLO manual reboot sequence in progress
    - **Off:** Deactivated
4. Dedicated iLO Port 2 Link LED
    - 🟢 **Green:** Network link
    - **Off:** No network link
5. Dedicated iLO Port 2 Activity LED
    - 🟢 **Solid Green:** Link to network
    - 🟢 **Flashing Green:** Network active
    - **Off:** No network activity
6. NIC Port 1 Link LED
    - 🟢 **Green:** Network link

- **Off:** No network link

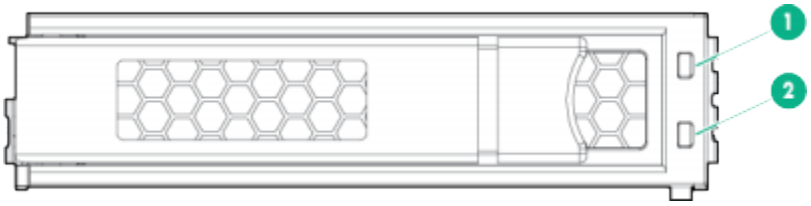
7. NIC Port 1 Activity LED
    - 🟢 **Solid Green:** Link to network
    - 🟢 **Flashing Green:** Network active
    - **Off:** No network activity
8. NIC Port 2 Link LED
    - 🟢 **Green:** Network link
    - **Off:** No network link
9. NIC Port 2 Activity LED
    - 🟢 **Solid Green:** Link to network
    - 🟢 **Flashing Green:** Network active
    - **Off:** No network activity
10. Power Supply LED
    - 🟢 **Solid Green:** Normal
    - **Off:** One or more of the following conditions exist:
        - Power unavailable
        - Power supply failed
        - Power supply in standby mode
        - Power supply error

Drive LEDs on HPE Apollo 4200 Gen10 Nodes

This section explains the LEDs of large form factor (LFF) and small form factor (SFF) drives in your HPE Apollo 4200 Gen10 node. For more information, see HPE Apollo 4200 Gen10 Server - Document List .

Large Form Factor (LFF) Drive LEDs

To locate the LFF drive LEDs, use the following diagram.



You can determine the current state of an LFF drive by reviewing the status of the following LEDs:

1. Fault or UID LED
    - 🟠 Amber
    - 🔵 Blue
2. Online or Activity LED
    - 🟢 Green

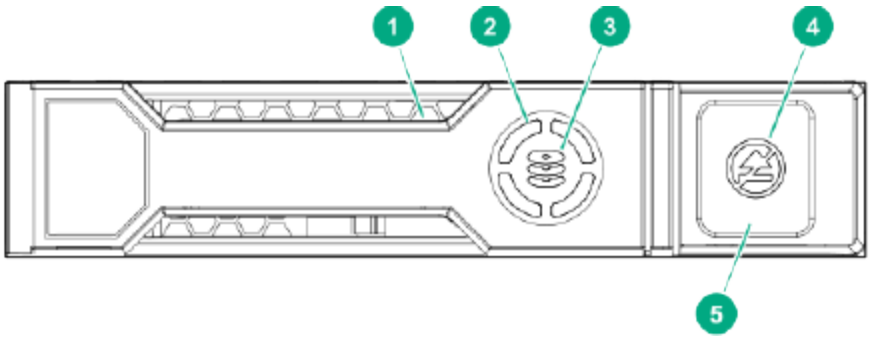
The following table explains the various combinations of the two LFF LEDs.

Online or Activity LED	Fault or UID LED	Description
On, off, or flashing	Alternating amber and blue	One or more of the following conditions exist: • The drive has failed. • This system received a predictive failure alert about the drive. • A management application has selected the drive.

Online or Activity LED	Fault or UID LED	Description
On, off, or flashing	Solid blue	One or more of the following conditions exist: • The drive is operating normally. • A management application has selected the drive.
On	Flashing amber	This system received a predictive failure alert about the drive. Replace the drive as soon as possible.
On	Off	The drive is online but isn't active currently.
1 flash per second	Flashing amber	Don't remove the drive. Removing the drive might terminate the current operation and cause data loss. The drive is part of an array that is undergoing capacity expansion or stripe migration. However, the system received a predictive failure alert about the drive. To minimize the risk of data loss, don't remove the drive until the expansion or migration is complete.
1 flash per second	Off	Don't remove the drive. Removing the drive might terminate the current operation and cause data loss. The drive is rebuilding, erasing, or is part of an array that is undergoing capacity expansion or stripe migration.
4 flashes per second	Flashing amber	The drive is active but it received a predictive failure alert. Replace the drive as soon as possible.
4 flashes per second	Off	The drive is active and is operating normally.
Off	Solid amber	The drive has a critical fault condition and the controller has placed it offline. Replace the drive as soon as possible.
Off	Flashing amber	This system received a predictive failure alert about the drive. Replace the drive as soon as possible.
Off	Off	The drive is offline, a spare, or isn't configured as part of an array.

Small Form Factor (SFF) Drive LEDs

To locate the SFF drive LEDs, use the following diagram.



1. Locate LED
    - 🔵 **Solid Blue:** A host application is identifying the drive.
    - 🔵 **Flashing Blue:** The drive carrier firmware is updating or requires an update.

    > **Note**
    > The Locate LED is behind the release lever. When it is illuminated, it is visible.

2. Activity Ring LED
    - 🟢 **Rotating Green:** Drive activity
    - **Off:** No drive activity
3. Drive Status LED
    - 🟢 **Solid Green:** The drive is a member of one or more logical drives
    - 🟢 **Flashing Green:** The drive is rebuilding or performing a RAID migration, strip-size migration, capacity expansion, or logical drive extension or is erasing.
    - 🟠🟢 **Flashing Amber and Green:** The drive is a member of one or more logical drives and predicts drive failure.
    - 🟠 **Flashing Amber:** The drive isn't configured and predicts drive failure.
    - 🟠 **Solid Amber:** The drive has failed.
    - **Off:** A RAID controller hasn't configured the drive.
4. Do Not Remove LED
    - ⚪ **Solid White:** Don't remove the drive. Removing the drive causes one or more of the logical drives to fail.

- **Off:** Removing the drive doesn't cause a logical drive to fail.

5. Do Not Remove Button

   To open the carrier, press the release lever.

Configuring and Using Integrated Lights Out (iLO) on HPE Apollo 4200 Gen10 Nodes

This section explains how to configure and use Integrated Lights Out (iLO) on HPE Apollo 4200 Gen10 nodes.

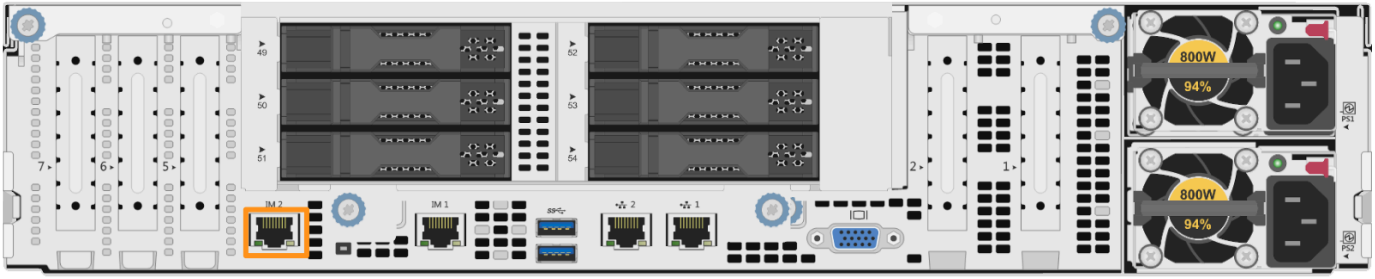
> ⚠ Important
> Access to the iLO port on a public LAN can have serious security implications because it can grant anyone with credentials direct access to your server's hardware and console. Follow security best practices when implementing iLO access.

Prerequisites

To configure the iLO port, you must have root access to the client-facing network through SSH. For example, you can use the `sudo -s` command.

How the iLO Port Works

HPE Apollo 4200 Gen10 nodes provide iLO support for out-of-band maintenance access even when the node is plugged in but powered off. The following diagram shows the location of the iLO port.



Your nodes receive DHCP address assignments by default. When you configure a node's iLO port, you can access the node by using the IP address (that the DHCP server assigns to the node) and a web browser that supports HTML5, Java, and .NET

> ⚠ Important
> We strongly recommend separating your iLO access network from your client-facing network

To access iLO configuration from the BIOS System Utilities menu, press **F9**. The default iLO username is `Administrator`. The password is printed on top of your node chassis.

> **Note**
> The IMPI username and password are unrelated to your Qumulo administrative credentials.

iLO Configuration Commands

Use the following commands to configure the iLO port on your nodes.

To Verify iLO LAN Configuration

```
# ipmitool lan print 1
```

To Configure iLO LAN by Using Static IP Addresses

1. Set the iLO Ethernet interface to a static IP address.

   ```
   # ipmitool lan set 1 ipsrc static
   ```

2. Set the interface IP address. For example:

   ```
   # ipmitool lan set 1 ipaddr 203.0.113.0
   ```

3. Set the interface subnet mask. For example:

   ```
   # ipmitool lan set 1 netmask 255.0.0.1
   ```

4. Set the default gateway IP address. For example:

   ```
   # ipmitool lan set 1 defgw ipaddr 192.168.0.1
   ```

5. (Optional) Enable baseboard management controller (BMC) Address Resolution Protocol (ARP) responses.

   ```
   # ipmitool lan set 1 arp respond on
   ```

To List Current Users

```
# ipmitool user list 1
ID Name Callin Link Auth IPMI Msg Channel Priv Limit
1 false false true ADMINISTRATOR
2 root false true true ADMINISTRATOR
```

To Change the Default Administrator Password

```
# ipmitool user set password 2
Password for user 2:
Password for user 2:
```

To Create a New User

In the following example, we create the administrative user `netadmin` in user slot `4`.

```
# ipmitool user set name 4 netadmin
# ipmitool user set password 4
Password for user 4:
Password for user 4:
```

To Configure User Access

```
# ipmitool channel setaccess 1 4 link=on ipmi=on callin=on privilege=4
# ipmitool user enable 4
```

To Verify User Access Level

```
# ipmitool channel getaccess 1 4
Maximum User IDs : 10
Enabled User IDs : 4

User ID : 4
User Name : ADMIN
Fixed Name : No
Access Available : call-in / callback
Link Authentication : disabled
IPMI Messaging : enabled
Privilege Level : ADMINISTRATOR
```

To Reset the Baseboard Management Controller

If you can’t connect to the iLO management console and your network configuration is correct, reset the BMC through an SSH or KVM Console session for the affected node.

```
# ipmitool bmc reset cold
```

Networking Your HPE Apollo 4200 Gen10 Cluster

This section explains how to network your HPE Apollo 4200 Gen10 cluster.

Prerequisites

- A network switch with the following criteria:
    - Ethernet connection
        - 36T and 90T: 25, 40, or 100 Gbps
        - 192T: 100 Gbps
        - 336T: 25 Gbps or 40 Gbps
    - Fully non-blocking architecture
    - IPv6 compatibility
- Compatible network cables
- A sufficient number of ports for connecting all nodes to the same switch fabric
- One static IP per node, per defined VLAN

> ⚠ Important
> Before you connect any Qumulo-supported equipment to your network, we strongly recommend consulting with your network engineering team.

Recommended Configuration

- Two redundant switches
- One physical connection to each redundant switch, per node
- One Link Aggregation Control Protocol (LACP) port-channel per node with the following configuration:
    - Active mode
    - Slow transmit rate
    - Trunk port with a native VLAN
    - Enabled IEEE 802.3x flow control (full-duplex mode)
- DNS servers

- Network Time Protocol (NTP) server
- Firewall protocol or ports configured for Qumulo Care Proactive Monitoring
- Where N is the number of nodes, up to 10 N-1 floating IP addresses per node, per client-facing VLAN

  > **Note**
  > The number of floating IP addresses depends on your workflow and on the clients that connect to the cluster, with a minimum of two floating IP addresses per node, per client-facing VLAN, but with no more than ten floating IP addresses per node, per client-facing VLAN.

- Nodes connected at their maximum Ethernet speed (this ensures advertised performance). To avoid network bottlenecks, Qumulo validates system performance with this configuration by using clients connected at the same link speed and to the same switch as the nodes.

Node NICs and Ports

The following diagrams show the NICs and ports on HPE Apollo 4200 Gen10 nodes.

Connecting to Redundant Switches

This section explains how to connect a four-node HPE cluster to dual switches for redundancy. We recommend this configuration for HPE hardware. If either switch becomes inoperative, the cluster remains accessible through the remaining switch.

- Connect the two 25 Gbps, 40 Gbps, or 100 Gbps ports on the nodes to separate switches.
- Use at least one port on both switches as an uplink to the client network. To ensure an acceptable level of physical network redundancy and to meet the necessary client access throughput rates, use an appropriate combination of 10 Gbps, 25 Gbps, 40 Gbps, or 100 Gbps network uplinks.
- Use at least one peer link between the switches.

Connecting to a Single Switch

This section explains how to connect a four-node HPE cluster to a single switch.

> **Note**
> If the switch becomes inoperative, the cluster becomes inaccessible.

- Connect two 25 Gbps, 40 Gbps, or 100 Gbps ports to the switch.
- Connect any uplink ports to the client network.

HPE Apollo 4200 Gen10 Technical Specifications

This section provides technical specifications for HPE Apollo 4200 Gen10 nodes.

	HPE Apollo 36 TB Hybrid SSD and Disk	HPE Apollo 90 TB Hybrid SSD and Disk	HPE Apollo 192 TB Hybrid SSD and Disk	HPE Apollo 336 TB Active Archive
Raw Capacity	36 TB	90 TB	192 TB	336 TB
HDDs	9 × 4 TB	9 × 10 TB	24 × 8 TB	24 × 14 TB
Logical Flash Cache Capacity	1.44 TB	2.88 TB	5.76 TB	7.68 TB
Connectivity Ports	2 × 25 GbE or 2 × 100 GbE		2 × 100 GbE (25 GbE minimum link speed)	2 × 25 GbE
Management Ports	2 × iLO 1 GbE baseT (RJ45)			
Connectivity Ports	1 × Intel Xeon Silver 4210 2.2 GHz 10 cores		2 × Intel Xeon Silver 4210 2.2 GHz 10 cores	1 × Intel Xeon Silver 4210 2.2 GHz 10-cores
Physical Dimensions	3.44" (8.75 cm) × 17.63" (44.8 cm) × 32" (81.28 cm)			

Getting Started with Qumulo on HPE ProLiant DL325 Gen10 Plus

This section explains how to prepare HPE ProLiant DL325 Gen10 Plus nodes for creating a Qumulo Core cluster. This guide is for system administrators, professional service providers, and colleagues in your organization who are responsible for installing and configuring server hardware. For more information, see HPE ProLiant DL325 Gen10 Plus Server - Document List .

Prerequisites

Qumulo Core USB Drive Installer

Step 1: Verify Your Node

1. Shut down your node and connect a display, a keyboard, and a mouse to it.
2. Plug the Qumulo Core USB Drive Installer into an available USB port on the node and then press the power button.

Step 2: Boot by Using the Qumulo Core USB Drive Installer

1. On the **HPE ProLiant** boot screen, press **F11**.

   > **Note**
   > The **Boot Menu** page might take a few minutes to appear.

2. On the **Boot Menu** page, to perform a one-time boot, do one of the following:
   - If the **Legacy BIOS One-Time Boot Menu** option is available, click it.
   - If the **Legacy BIOS One-Time Boot Menu** option is unavailable, click **Generic USB Boot** and continue to run the Field Verification Tool (FVT).
3. In the **Question** dialog box, click **OK**.

   > **Note**
   > The **Default Boot Override Options** page might take a few minutes to appear.

4. In the **Default Boot Override Options** menu, select **2) One Time Boot to USB DriveKey**.

Step 3: Run the Field Verification Tool (FVT)

After the node reboots, the Qumulo Installer runs automatically.

1. Choose **[1] Factory reset (DESTROYS ALL DATA)**.
2. To perform a clean installation of Qumulo Core on your node, type `DESTROY ALL DATA` (case-sensitive).
3. Review the verification results and consider the following before proceeding with the installation.
    - If the **FVT Passed!** message appears, select **[1] Install Qumulo Core**.
    - If **FAIL** messages appear, use one of the following resolutions.
4. When the FVT passes all checks, select **[1] Install Qumulo Core**.

Fixable Issues During Installation

If the FVT finds fixable issues, it prompts you to auto-correct any detected issues, depending on your installation scenario. Issues that the FVT can auto-correct include the following:

- BIOS Configuration
- Drive firmware
- NVMe sector size
- NIC mode
- NIC firmware
- Boot order

1. To attempt auto-correction, select **[1] Run FVT Flash. This will try to fix issues then reboot.**

   If the fixes are successful, the FVT reboots the node automatically.
2. To re-attempt verification, boot by using the Qumulo Core USB Drive Installer (page 50) and then continue the installation.

Non-Fixable Issues

If the FVT is unable to auto-correct any issues, the message **Not fixable issues were detected.** appears, providing reasons for failure.

For help with troubleshooting your node, contact Qumulo Care .

Step 4: Create and Configure Your Cluster

1. Review the **End User Agreement**, click **I agree to the End User Agreement**, and then click **Submit**.
2. Name your cluster.
3. On the **1. Set up cluster** page, select the nodes to add to your cluster.

   As you select nodes, the installer updates the total capacity of your cluster at the bottom of the page.

   > **Note**
   > If any nodes are missing, confirm that they are powered on and connected to the same network.

4. On the **2. Confirm cluster protection level** page, Qumulo Core selects the recommended 2- or 3-drive protection level based on your cluster size and node type.
5. If the **Customize Protection Level** option appears, you can increase your system resilience by selecting 3-drive protection.

   > **Important**
   >
   > - The option for selecting the drive protection level is available only at cluster creation time. You can't change it later.
   > - Using 3-drive protection reduces the total capacity of your cluster.

6. Enter a password for the administrative account and click **Create Cluster**.
7. To access the Qumulo Core Web UI, connect to any node by entering its IP address into a web browser. For more information, see Qumulo Core Web UI Browser Compatibility on Qumulo Care.

For more information about configuring your cluster configuration and getting started with Qumulo Core, see Qumulo Installation FAQ on Qumulo Care.

Front and Rear Drive Locations on HPE ProLiant DL325 Gen10 Plus Nodes

This section explains the front and rear drive locations in your HPE ProLiant DL325 Gen10 Plus node. On this platform, the drives in a node are arranged into *rows* and groups called *boxes*.

Front Drive Row

The following diagram shows the front drive row. In the diagram, box 1 holds bays 1-8 (indicated in green) and box 2 holds bays 1-2 (indicated in orange).

Second Drive Row

The second drive row flips up behind the first drive row in the node.

For the second row, box 3 holds bays 1-8 and box 4 holds bays 1-2.

Boot Drive

The boot drive is in box 1, bay 1.

⚠ Important

Before you remove the boot drive, contact the Qumulo Care Team for additional instructions.

Networking Your HPE ProLiant DL325 Gen10 Plus Cluster

This section explains how to network your HPE ProLiant DL325 Gen10 Plus cluster.

Prerequisites

- A network switch with the following criteria:
    - 100 Gbps Ethernet connection
    - Fully non-blocking architecture
    - IPv6 compatibility
- Compatible network cables
- A sufficient number of ports for connecting all nodes to the same switch fabric
- One static IP per node, per defined VLAN

> ⚠ Important
> Before you connect any Qumulo-supported equipment to your network, we strongly recommend consulting with your network engineering team.

Recommended Configuration

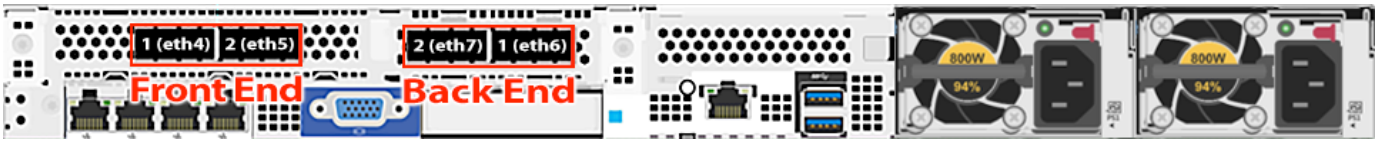
- One set of redundant switches for the front-end network, with an MTU that matches that of the clients that use the storage cluster. Typically, we recommend 1,500 MTU but in some instances 9,000 MTU is the optimal setting.
- One set of redundant switches for the back-end network (9,000 MTU minimum)
- One physical connection to each redundant switch, per node
- One Link Aggregation Control Protocol (LACP) port-channel per network (front-end and back-end) on each node with the following configuration:
    - Active mode
    - Slow transmit rate
    - Trunk port with a native VLAN
- DNS servers
- Network Time Protocol (NTP) server

- Firewall protocol or ports configured for Qumulo Care Proactive Monitoring
- Where N is the number of nodes, up to 10 N-1 floating IP addresses per node, per client-facing VLAN
- Nodes connected at their maximum Ethernet speed (this ensures advertised performance). To avoid network bottlenecks, Qumulo validates system performance with this configuration by using clients connected at the same link speed and to the same switch as the nodes.

Node NICs and Ports

The following diagram shows the NICs and ports on HPE DL325 Gen10 Plus nodes. On this platform, there are two sets of NICs, one for the front end and one for the back end.

> ⚠ Important
> For your node to work correctly, you must connect at least one port in each NIC.



Connecting to Redundant Switches

This section explains how to connect a four-node HPE cluster to dual switches for redundancy. We recommend this configuration for HPE hardware. If either switch becomes inoperative, the cluster remains accessible through the remaining switch.

- Front End
  - Connect the two front-end 100 Gbps ports on your nodes to separate switches.
  - The uplinks to the client network must equal the bandwidth from the cluster to the switch.
  - The two ports form an LACP port channel by using a multi-chassis link aggregation group.
- Back End
  - Connect the two back-end 100 Gbps NIC ports on your nodes to separate switches.
  - Use an appropriate inter-switch link or virtual port channel.
- MTU
  - For all connection speeds, the default behavior is that of an LACP with 1,500 MTU

for the front-end and 9,000 MTU for the back-end.

Connecting to a Single Switch

This section explains how to connect a four-node HPE cluster to a single switch.

- Front End
  - Each node has two front-end 100 Gbps NIC ports connected to a single switch.
  - The uplinks to the client network must equal the bandwidth from the cluster to the switch.
  - The two ports form an LACP port channel.
- Back End
  - Each node has two back-end 100 Gbps ports connected to a single switch.
- MTU
  - For all connection speeds, the default behavior is that of an LACP with 1,500 MTU for the front-end and 9,000 MTU for the back-end.

HPE ProLiant DL325 Gen10 Plus Technical Specifications

This section provides technical specifications for HPE ProLiant DL325 Gen10 Plus nodes.

	34T	145T	291T
Form Factor	1U	1U	1U
Raw Storage Capacity	34 TB	145 TB	291 TB
SSD or NVM3	9 × 3.84 TB NVMe	19 × 7.68 TB NVMe	19 × 15.36 TB NVMe
Networking	4 × 100 GbE	4 × 100 GbE	4 × 100 GbE
CPU	24 cores 2.8 GHz	24 cores 2.8 GHz	24 cores 2.8 GHz
Memory	128 GB	128 GB	128 GB

Racking Your Supermicro A+ WIO 1114S-WN10RT Nodes

This section describes how to use the outside and inside rails of your Supermicro 1114S node and how to rack your nodes in your data center.

To Attach the Outer and Inner Rails

> **Note**
>
> - Because the left and right rails of your nodes are identical, the words FRONT and BACK might appear upside down.
> - Each *outer rail* comes as two connected pieces and attaches to your server rack.
> - Each *inner rail* comes as two separate pieces and attaches to the node chassis.

1. Adjust the outer rails to the length of your server rack.
2. Line up the edge of the outer rail between the rack unit (RU) markers, insert the tabs on the edge of the rail into the mounting holes, and push the rail into the rack until the quick-release clicks into place. This process is the same for the front and back of your rack.

3. Snap the inner rails to the chassis and secure them using two screws on each side, near the middle of the chassis.

> **Note**
> First attach the front inner rails, then the back inner rails.

To Insert the Chassis

1. Align the outer and inner rails and insert the chassis into the server rack.
2. Attach the chassis to the rack using one screw on each side, on the front of the chassis.

To Remove the Chassis

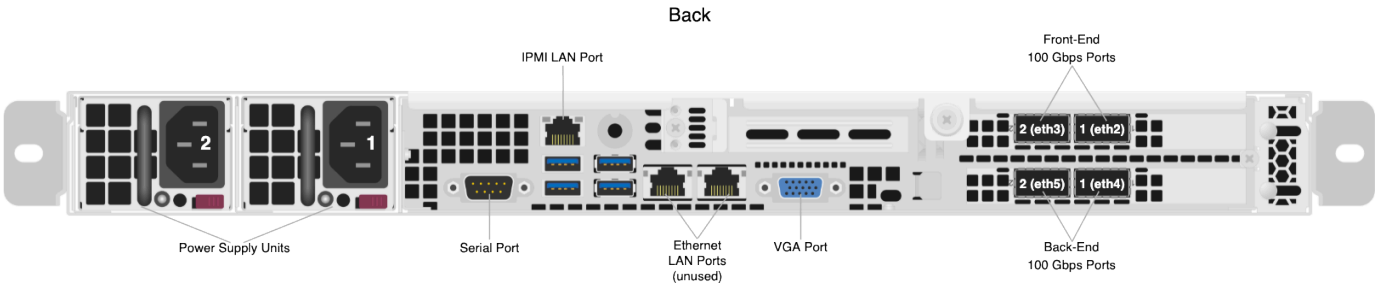
1. Disconnect any cables from the chassis.
2. Remove one screw from each side of the front of the chassis.
3. Pull the chassis out from the server rack partially. When the first set of black snaps appears, pinch the long piece of the snap towards the short one (up on one side, down on the other).

4. Continue to pull the chassis from the server rack. When the second set of black snaps appears, pinch the long piece of each snap towards the short one (up on one side, down on the other) and remove the chassis completely.

Wiring Your Supermicro A+ WIO 1114S-WN10RT Nodes

This section explains how to wire your out-of-band management (IPMI) port, 100 Gbps ports, and power on Supermicro A+ WIO 1114S-WN10RT nodes.

> **Note**
> The two Ethernet ports on the back of your node (to the right of the USB ports) are unused.



Step 1: Connecting the Out-of-Band Management (IPMI) Port

The dedicated out-of-band management port allows functionality such as remote display, control, and power (similar to HPE iLO). The port uses the Intelligent Platform Management Interface (IPMI) protocol. Connect the IPMI port first on the back of your node (above the USB ports).

> **Important**
> The list of IPMI accounts contains the user `qumulo_<random>`. This account is critical for Qumulo Core functionality. Don't disable or tamper with it. To administer Qumulo Core, create your own IPMI user account.

Step 2: Connecting the 100 Gbps Ports

After you connect the IPMI port, connect your front-end and back-end 100 Gbps ports (compatible with QSFP28 and QSFP56). There are four 100 Gbps ports on the back of your node. To maximize redundancy, split interfaces across subnets by connecting each port to a different switch.

Port Location	Port Labels	Port Type	Purpose
Top row	2 (eth3), 1 (eth2)	Front end	Communication with clients

Port Location	Port Labels	Port Type	Purpose
Bottom row	2 (eth5), 1 (eth4)	Back end	Communication between nodes

Step 3: Connecting the Power

> ⚠ Important
> Make sure that the voltages for both power supply units (PSUs) are the same (for example, both at 115 V or both at 208 V).

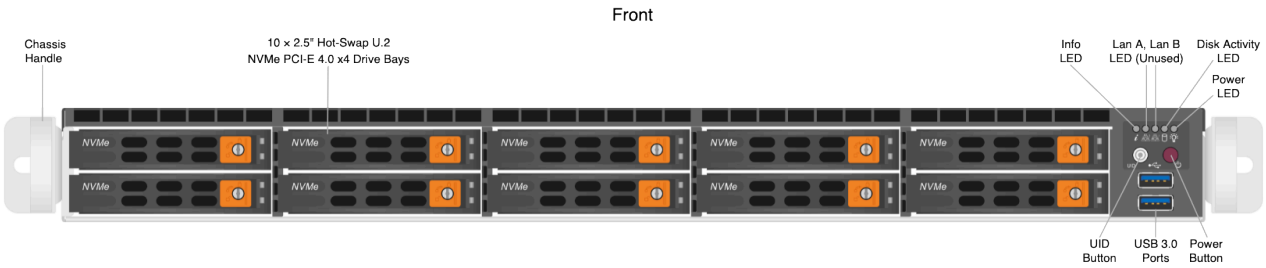
After you connect your 100 Gbps ports, connect power to the node. There are two power sockets on the back of your node. To maximize redundancy, connect each PSU to a separate power supply or power distribution unit (PDU).

Getting Started with Qumulo on Supermicro A+ WIO 1114S-WN10RT

This section explains how to prepare Supermicro 1114S nodes for creating a Qumulo Core cluster.

Step 1: Verify Your Node

1. Shut down your node and connect a display, a keyboard, and a mouse to it.
2. Plug the Qumulo Core USB Drive Installer (page 0) into an available USB port on the node and then press the power button.



Step 2: Boot by Using the Qumulo Core USB Drive Installer

1. When the node powers on and begins to boot, on the **Supermicro** screen, press **F11**.

   > **Note**
   > The boot setting is persistent: When you boot from a USB drive once, the node continues to boot from the USB drive. After you finish installing Qumulo Core, remove the USB drive from the node.

2. On the **Please select boot device:** screen, select your USB drive (usually labelled with `UEFI OS`) and boot into it.

Step 3: Install Qumulo Core

After the node reboots, the Field Verification Tool runs automatically.

Select **[1] Factory reset (DESTROYS ALL DATA)** and then enter `DESTROY ALL DATA`.

When the FVT finishes, the **FVT passed!** message appears.

Qumulo Core is now installed on your node.

Fixable Issues During Installation

If the FVT finds fixable issues, it prompts you to auto-correct any detected issues, depending on your installation scenario. Issues that the FVT can auto-correct include the following:

- BIOS Configuration
- Drive firmware
- NIC mode
- Boot order

1. To attempt auto-correction, select **[1] Run FVT Flash. This will try to fix issues then reboot.**

   If the fixes are successful, the FVT reboots the node automatically.

2. To re-attempt verification, boot by using the Qumulo Core USB Drive Installer (page 64) and then continue the installation.

Non-Fixable Issues

If the FVT is unable to auto-correct any issues, the message **Not fixable issues were detected.** appears, providing reasons for failure.

For help with troubleshooting your node, contact Qumulo Care .

Step 4: Create and Configure Your Cluster

1. Review the **End User Agreement**, click **I agree to the End User Agreement**, and then click **Submit**.
2. Name your cluster.
3. On the **1. Set up cluster** page, select the nodes to add to your cluster.

   As you select nodes, the installer updates the total capacity of your cluster at the bottom of the page.

   > **Note**
   > If any nodes are missing, confirm that they are powered on and connected to the same network.

4. On the **2. Confirm cluster protection level** page, Qumulo Core selects the recommended 2- or 3-drive protection level based on your cluster size and node type.
5. If the **Customize Protection Level** option appears, you can increase your system resilience by selecting 3-drive protection.

> ⚠ Important
>
> - The option for selecting the drive protection level is available only at cluster creation time. You can't change it later.
> - Using 3-drive protection reduces the total capacity of your cluster.

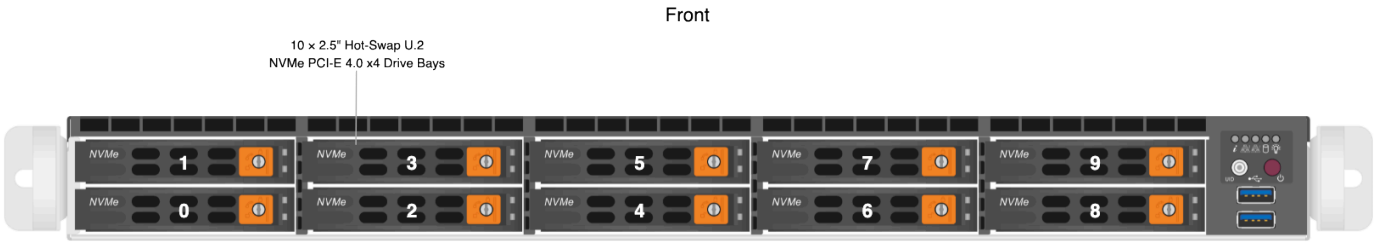
6. Enter a password for the administrative account and click **Create Cluster**.
7. To access the Qumulo Core Web UI, connect to any node by entering its IP address into a web browser. For more information, see Qumulo Core Web UI Browser Compatibility on Qumulo Care.

For more information about configuring your cluster configuration and getting started with Qumulo Core, see Qumulo Installation FAQ on Qumulo Care.

Drive Slot Mapping in Supermicro A+ WIO 1114S-WN10RT Nodes

This section explains the drive slot mapping on Supermicro 1114S nodes.

Your node contains slots for 10 drives and one boot drive (in an internal M.2 slot). The following is the mapping for the drives.



Panel LEDs on Supermicro A+ WIO 1114S-WN10RT Nodes

This section explains the LEDs of your Supermicro 1114 node.

Front Panel LEDs and Buttons

On the front, right side of your node, there are five LEDs.

Label	Colors	Description
Info	🔴 (solid red)	Node overheated
Info	🔴 (1 s. blinking red)	Fan failed
Info	🔴 (4 s. blinking red)	Power Supply Unit (PSU) failed
Info	🔵 (solid blue)	Unit Identification (UID) activated locally
Info	🔵 (blinking blue)	UID activated using IPMI
Lan A	⚬ (off)	Unused
Lan B	⚬ (off)	Unused
Disk Activity	🟡 (solid yellow)	On or blinking
Power	🟢 (solid green)	On

> **Note**
> During normal operation, the **Lan B** LED might appear to be lit slightly when the **Disk Activity** LED is on.

Rear LAN LEDs

On the back of your node, LAN LEDs are located behind the vent holes on the NIC. Each port has one light.

> **Note**
> Network traffic *doesn't* affect the speed of the light's blinking.

Color	Status	Description
—	Off	No link
🟢 (solid green)	On or blinking	Link established

Networking Your Supermicro A+ WIO 1114S-WN10RT Cluster

This section explains the networking prerequisites, outlines the recommended configuration, and explains how you can connect to redundant switches or to a single switch.

Prerequisites

> **Important**
> Before you create your Qumulo cluster, you must configure all switch ports connected to the back-end NIC to have at least 9,000 MTU, with Jumbo Frames enabled.

Your node requires the following resources.

- A network switch with the following specifications:
  - 100 Gbps Ethernet

    > **Note**
    > You can use 40 Gbps connections with 40 Gbps transceivers.

  - Fully non-blocking architecture
  - IPv6 capability
  - Jumbo Frame support (9,000 MTU minimum) for the back-end network
- Compatible networking cables
- A sufficient number of ports for connecting all nodes to the same switch fabric
- One static IP per node, per defined VLAN

Recommended Configuration

> **Important**
> We don't recommend connecting to a single back-end NIC port because the node becomes unavailable if the single connection fails.

The Supermicro 1114S platform uses a networking configuration in which different NICs handle back-end and front-end traffic. You can connect the front-end and back-end NICs to the same switch or to different switches. However, for greater reliability, we recommend connecting all four 100 Gbps ports on every node: Connect both front-end NIC ports to the front-end switch and both back-end NIC ports to the back-end switch.

We recommend the following configuration for your node.

- One set of redundant switches for the front-end network, with an MTU that matches that of the clients that use the storage cluster. Typically, 1,500 MTU is recommended, but in some instances it might be 9,000 MTU.
- One set of redundant switches for the back-end network (9,000 MTU minimum)
- One physical connection per node, per each redundant switch
- One Link Aggregation Control Protocol (LACP) port-channel per network (front-end and back-end) on each node, with the following configuration
    - Active mode
    - Slow transmit rather
    - Access port or trunk port with a native VLAN
- DNS servers
- A Network Time Protocol (NTP) server
- Firewall protocols or ports allowed for proactive monitoring
- Where `N` is the number of nodes, `N-1` floating IPs per node, per client-facing VLAN

Connecting to Redundant Switches

For redundancy, we recommend connecting a Supermicro 1114S cluster to dual switches. If either switch becomes inoperative, the cluster is still be accessible from the remaining switch.

- Front End
    - Connect the two front-end NIC ports (2 × 100 Gbps) on your nodes to separate switches.
    - The uplinks to the client network must equal the bandwidth from the cluster to the switch.
    - The two ports form an LACP port channel using a multi-chassis link aggregation group.
- Back End

    - Connect the two back-end NIC ports (2 × 100 Gbps) on your nodes to separate switches.
    - Use an appropriate inter-switch link or virtual port channel.
- MTU
    - For all connection speeds, the default behavior is that of an LACP with 1,500 MTU for the front-end and 9,000 MTU for the back-end interfaces.

Connecting to a Single Switch

You can connect a Supermicro 1114S cluster to a single switch. If this switch becomes inoperative, the entire cluster becomes inaccessible.

- Front End
    - Each node has two front-end NIC ports (2 × 100 Gbps) connected to a single switch.
    - The uplinks to the client network must equal the bandwidth from the cluster to the switch.
    - The two ports form an LACP port channel.
- Back End
    - Each node has two band-end ports (2 × 100 Gbps) connected to a single switch.
- MTU
    - For all connection speeds, the default behavior is that of an LACP with 1,500 MTU for the front-end and 9,000 MTU for the back-end interfaces.

Four-Node Cluster Architecture Diagram

The following is the recommended configuration for a four-node cluster connected to an out-of-band management switch, redundant front-end switches, and redundant back-end switches.

Replacing Hardware Components in Your Supermicro A+ WIO 1114S-WN10RT Nodes

This section explains how you can replace hardware components in your Supermicro 1114S nodes.

Caution

- We strongly recommend engaging an on-site Supermicro engineer to replace failed hardware components including but not limited to any procedure that:
  - This guide doesn't cover
  - You haven't received training on
  - Requires precautions to avoid damage caused by electrostatic discharge (ESD) by using industry standard anti-static equipment (such as gloves or wrist straps)
- Don't update your node firmware unless a Qumulo representative instructs you to perform an update.

This section explains the most common scenarios of replacing failed hardware components such as:

- Drives (excluding boot drives)
- Power Supply Units (PSUs)
- Fans
- DIMM (memory)

Performing the Part Replacement Procedure by Using the FVT

When you replace a component of your node (such as the motherboard or an NIC card), you must ensure that the firmware version and configuration are correct for your new components. To do this, you must perform the part replacement procedure using the FVT.

Note

Before you replace the motherboard, you must request a new Data Center Management Suite (DCMS) license key from Supermicro and apply it before you run the FVT. (The license key uses the BMC MAC address which changes with the motherboard.) If you don’t install a DCMS licenseon a Supermicro 1114S node, the Field Verification Tool (FVT) fails, preventing you from installing Qumulo Core.

1. Boot using the latest version of the Qumulo Core USB Drive Installer.
2. Select **[*] Perform maintenance**.
3. Select **[2] Perform automatic repair after part replacement (non-destructive)**.

   The part replacement procedure runs and the **FVT passed!** message appears.

> **Note**
> In some cases, after the part replacement procedure, the message `FIX: Run the FVT flash command.` appears. Enter `1` as you would for a fixable issue (page 0) to reboot the node and then repeat the part replacement procedure.

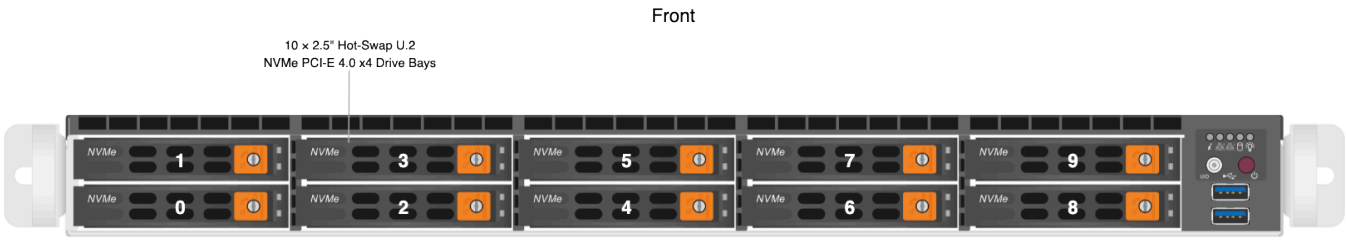
To Replace a Drive

The ten hot-swap drive carriers are located at the front of your Supermicro 1114S chassis. The boot drive is located in the internal M.2 slot.

Replacement drives, including the on-site spare drives that you received with your original nodes, are provided without a drive carrier. When replacing a faulty drive, you must remove the existing drive from its carrier and then insert the new drive into the carriers. The drive carriers are toolless and don't require any screws.

> **Caution**
> We strongly recommend having a Supermicro engineer perform on-site boot drive replacement.

1. Locate the drive that requires replacement using the drive bay mapping.



2. To remove the existing drive, do the following:

   a. Press the orange release button on the right of the drive carrier until the drive carrier handle extends on the left.

   b. Use the drive carrier handle to pull the carrier out of the chassis.

   c. To remove the drive from the carrier, undo the mounting clips.

3. To install a replacement drive, do the following:

a. Insert the new drive into the drive carrier with the printed circuit board (PCB) side facing down and the connector end facing towards the rear of the tray.

b. Secure the drive to its carrier using the mounting clips.

c. Insert the drive carrier into the chassis with the orange release button facing right.

d. Push the drive carrier into the chassis until the handle retracts and clicks into place.

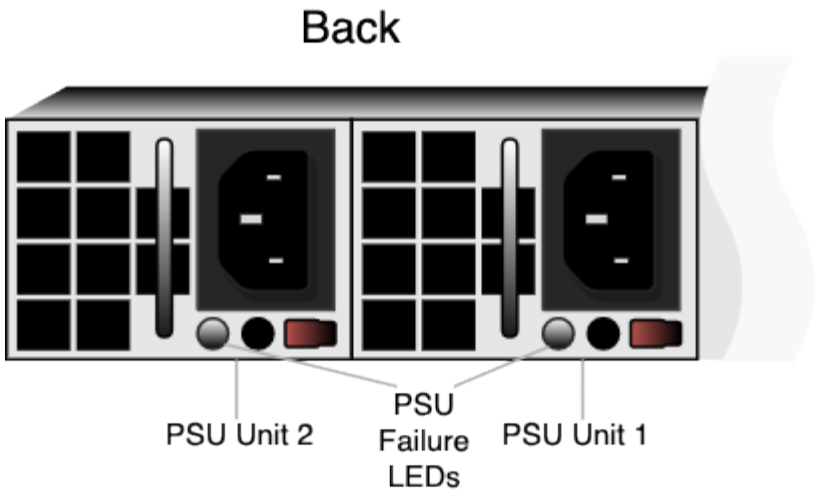
> **Note**
> If you remove and reinsert a drive extremely quickly (faster than one second), the baseboard management controller (BMC) doesn't recognize the drive and the activity LEDs do not return to their normal states. To resolve this issue, remove the drive, wait five seconds, and then reinsert it.

To Replace a Power Supply Unit (PSU)

The two hot-swap PSUs are located at the front of your Supermicro 1114S chassis. If either of the two PSUs fails, the other PSU takes on the full load and lets the node continue operating without interruption.

When a PSU fails, the Info LED at the front of the node begins to blink red every four seconds. In addition, the failure LED on the PSU at the back of the node lights up.

1. To determine which PSU failed, check the PSU LED.



2. Disconnect the power cord from the existing PSU.
3. To remove the existing PSU, press the purple release tab to the left while pulling on the handle.
4. Insert the new PSU and push it into the chassis until it clicks into place.
5. Connect the power cord to the new PSU.

To Replace a Fan

Your Supermicro 1114S chassis has six internal fans. When a fan fails, the **Info** LED at the front of the node begins to blink red every second.

> **Caution**
>
> - The fans aren't hot-swappable. You must power off the node to replace a fan. However, you may remove the top cover to determine which fan failed.
> - For optimal air circulation, you must always reinstall the top chassis cover. You must never run the node for an extended period of time with the top chassis cover removed.

1. Power off the node, remove the top chassis cover, and disconnect the power cords from both PSUs.
2. Disconnect the existing fan housing cable from the motherboard and remove the fan housing from its two mounting posts.
3. Insert a new fan provided by Supermicro into the housing, making sure that the airflow direction arrows on top of the fan face the same direction as the arrows on the other fans.
4. Reposition the fan housing over the two mounting posts and connect the fan housing cable to the motherboard.
5. Power on the node and confirm that the new fan is working properly and the **Info** LED has stopped blinking red.
6. Install the top chassis cover.

To Replace a DIMM

Your Supermicro 1114S chassis has 16 DIMM slots (8 × 16 GB DIMMs for a total 128 GB of memory).

To identify which DIMM failed, you must use the baseboard management controller (BMC) on the node or another hardware monitoring solution.

> **Caution**
>
> - Use extreme caution when handling DIMMs. Don't touch their metal contacts.
> - Never force a DIMM into a slot. Each DIMM has a keyed notch which lets you insert the module in only one way.
> - DIMMs aren't hot-swappable. You must power off the node to replace a DIMM.

- For optimal air circulation, you must always reinstall the top chassis cover. You must never run the node for an extended period of time with the top chassis cover removed.

1. Power off the node, remove the top chassis cover, and disconnect the power cords from both PSUs.
2. Remove the existing DIMM.

   The following is the DIMM slot mapping. In this diagram, the CPU socket mounting bracket and power headers are at the bottom.

Slot	1	2	3	4	5	6	7	8	CPU Socket	9	10	11	12	13	14	15	16
DIMM	D2	D1	C2	C1	B2	B1	A2	A1	Bracket at bot-tom	E1	E2	F1	F2	G1	G2	H1	H2

3. To remove the existing DIMM, press both DIMM slot release tabs outwards. When the module is loose, remove it from the slot.
4. To insert a new DIMM, align the keyed notch on the DIMM with the receptive points on the DIMM slot.
5. Push in both ends of the DIMM straight down until it clicks into place.
6. Press both DIMM slot release tabs inwards.
7. Install the top chassis cover.
8. Power on the node.

Supermicro A+ WIO 1114S-WN10RT Technical Specifications

This section provides technical specifications for Supermicro 1114S nodes.

	Supermicro 1114S 153 TB	Supermicro 1114S 76 TB	Supermicro 1114S 30 TB
Connectivity Ports (NIC)	4 × 100 GbE (2 x Mellanox CX-6 NICs)		
Management Ports (BMC)	1 × 1 GbE Base-T (RJ45)		
Solid State Storage Media	10 × 15.36 TB NVMe drives	10 × 7.68 TB NVMe drives	8 × 3.84 TB NVMe drives
Boot Drive	1 TB M.2 NVMe drive		
CPU	AMD EPYC 7402P 24-Core Processor		
Memory	128 GB (16 GB × 8)		
Power Supply	2 × 750 W Power Supplies		
Dimensions (H × W × D)	1.7" × 17.2" × 23.5" (43 mm × 437 mm × 597 mm)		
Weight	46 lbs (20.9 kg)		
Power Requirements	100–240 V, 50/60Hz		
Typical Power Consumption	265 W	230 W	230 W
Typical Thermal Rating	904 BTU/hr	785 BTU/hr	785 BTU/hr
Maximum Power Consumption	460 W	415 W	384 W
Maximum Thermal Rating	1569 BTU/hr	1416 BTU/hr	1310 BTU/hr
Operating Temperature	50°F–95°F (10°C–35°C)		
Non-Operating Temperature	40°F–158°F (-40°C–70°C)		

	Supermicro 1114S 153 TB	Supermicro 1114S 76 TB	Supermicro 1114S 30 TB
Operating Relative Humidity	8%–90% (non-condensing)		
Non-Operating Relative Humidity	5%–95% (non-condensing)		