Abstract

This Hewlett Packard Enterprise (HPE) manual provides information about planning and preparation for the installation of an HPE 3PAR StoreServ 20000 Storage system at the operating site. The described contents are intended for use by Hewlett Packard Enterprise customers, in conjunction with the advice and assistance of a Hewlett Packard Enterprise Sales Representative or Systems Engineer, to plan for a storage system installation.
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About HPE 3PAR StoreServ 20000 Storage systems

Hewlett Packard Enterprise continues to offer the highest performance and reliability with its fourth-generation product line, the HPE 3PAR StoreServ 20000 Storage system.

The chapter provides essential system details and specifications for planning purposes.

**NOTE:**
The illustrations are examples only and not intended to reflect a particular storage system configuration.

**StoreServ system components**

Due to the large number of possible configurations, standardized component placement and internal cabling are to simplify installation and maintenance. The HPE 3PAR StoreServ 20000 systems come installed in either a standard two meter (2M) EIA-standard compliant Hewlett Packard Enterprise rack or as individual boxes for installation in a third-party rack.

The system components are placed in the rack as outlined here, and are numbered according to their order and location in the rack.

**HPE 3PAR StoreServ 20000 Storage Systems**

Examples of system configurations are displayed in the following images:

- HPE 3PAR StoreServ 20450 (2 or 4 controller nodes)
- HPE 3PAR StoreServ 20800/20840/20850 (2, 4, 6 or 8 controller nodes)
- HPE 3PAR StoreServ 20800 R2/20840 R2/20850 R2 with 1200mm rack (2, 4, 6 or 8 controller nodes)
Figure 1: 20450 (left), 20800/20840/20850 (center), and 20800 R2/20840 R2/20850 R2 with 1200mm rack (right)

Table 1: 3PAR StoreServ 20000 Storage system components

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drive enclosures</td>
</tr>
<tr>
<td>2</td>
<td>Service processor</td>
</tr>
<tr>
<td>3</td>
<td>Power distribution units (PDU)</td>
</tr>
</tbody>
</table>

**NOTE:**

The PDUs are not displayed in the image for the 208xx R2 rack. Vertical PDUs are at the rear when 208xx R2 storage models are installed in a 42U 1200mm rack.

| 4    | Controller node enclosure                        |

Table Continued
### Controller node chassis

The controller node is a component of the storage system. The controller node caches and manages data in a system and provides the hosts with a coherent, virtualized view of the system. The controller nodes are located in the rear of the node chassis.

The HPE 3PAR StoreServ Storage 20000 Storage supports the following types of controller node chassis:

- HPE 3PAR StoreServ Storage 20450 provides four controller node compartments (8U) and supports 2 or 4 controller nodes.
- HPE 3PAR StoreServ Storage 20800/20840/20850 and 20800 R2/20840 R2/ 20850 R2 provides eight controller node compartments (16U) and supports 2, 4, 6 or 8 controller nodes.

The following figure illustrates the location and numbering of controller nodes in a four controller node system.

**Figure 2: 20450 controller node location and numbering**

The following figure shows the location and numbering of the controller nodes in an eight controller node system.
Figure 3: 20800/20840/20850 and 20800 R2/20840 R2/20850 R2 controller node location and numbering

Host ports/initiators

The following table lists the different types of HBAs supported on HPE 3PAR StoreServ 20000.

**Table 2: Host bus adapters**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12G SAS (Back-End)</td>
<td>4-12 ports/node</td>
</tr>
<tr>
<td>16Gb Fibre Channel (FC) (Hosts)</td>
<td>0-20 ports/node</td>
</tr>
<tr>
<td>10Gb/sec ISCSI and 10Gb/sec Converged Network Adapter (CNA) (Hosts)</td>
<td>0-10 ports/node</td>
</tr>
<tr>
<td>10GbE Network Ports for File Persona (Hosts)</td>
<td>0-4 ports/node</td>
</tr>
</tbody>
</table>

Storage drive enclosures

The HPE 12Gb SAS drive enclosures are available in two models:
• HPE 3PAR StoreServ 20000 LFF drive enclosure
The HPE 3PAR StoreServ 20000 LFF drive enclosure supports up to 12 Large Form Factor (LFF) SAS drives.

![Figure 4: HPE 3PAR StoreServ 20000 LFF drive enclosure](image)

• HPE 3PAR StoreServ 20000 SFF drive enclosure
The HPE 3PAR StoreServ 20000 SFF drive enclosure supports up to 24 Small Form Factor (SFF) SAS drives. The HPE 3PAR StoreServ 20000 SFF drive enclosure supports 12G SAS solid-state drives (SSD).

![Figure 5: HPE 3PAR StoreServ 20000 SFF drive enclosure](image)

NOTE: Each enclosure is shipped with a cosmetic bezel to cover the front.

Power Distribution Units for 20000 and 20000 R2 racked models

Power Distribution Units for 20450, 20800, 20840, and 20850 racked models

NOTE:
For more information on Power Distribution Units for the 20000 R2 models (20800 R2, 20840 R2, 20850 R2), see Power Distribution Units for 208xx R2 racked models on page 11.

Each rack may contain two or four power distribution units (PDU). Racks using Single-Phase PDUs include four PDUs per rack. Racks using Three-Phase power setup include either two or four PDUs.

**Single-Phase Power Distribution Unit (PDU)**

**Table 3: Single-Phase PDU**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Locale*</th>
<th>Number of PDUs</th>
<th>Single-Phase PDU</th>
<th>Single-Phase Plug**</th>
<th>Single-Phase Connector***</th>
<th>Single-Phase Receptacle***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base rack</td>
<td>International</td>
<td>4</td>
<td>252663-B33</td>
<td>IEC 60309 332P6</td>
<td>IEC 60309 332C6</td>
<td>IEC 60309 332R6</td>
</tr>
<tr>
<td>Expansion rack</td>
<td>International</td>
<td>4</td>
<td>H5M68A</td>
<td>IEC 60309 332P6</td>
<td>IEC 60309 332C6</td>
<td>IEC 60309 332R6</td>
</tr>
</tbody>
</table>

*Table Continued*
<table>
<thead>
<tr>
<th>Configuration</th>
<th>Locale*</th>
<th>Number of PDUs</th>
<th>Single-Phase PDU</th>
<th>Single-Phase Plug**</th>
<th>Single-Phase Connector***</th>
<th>Single-Phase Receptacle***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base rack</td>
<td>Domestic</td>
<td>4</td>
<td>252663-D74</td>
<td>NEMA L6-30P</td>
<td>NEMA L6-30C</td>
<td>NEMA L6-30R</td>
</tr>
<tr>
<td>Expansion rack</td>
<td>Domestic</td>
<td>4</td>
<td>H5M58A</td>
<td>NEMA L6-30P</td>
<td>NEMA L6-30C</td>
<td>NEMA L6-30R</td>
</tr>
</tbody>
</table>

*Domestic = North America/Japan

**Plug is the connector on the PDU side of the power interconnect.

***Connectors and Receptacles are options at the user-side of the electrical interconnect.

### Three-Phase PDU

**Table 4: Three-Phase PDU**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Locale*</th>
<th>Number of PDUs</th>
<th>Three-Phase PDU</th>
<th>Three-Phase Plug**</th>
<th>Three-Phase Connector***</th>
<th>Three-Phase Receptacle***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base rack</td>
<td>Interna]</td>
<td>2</td>
<td>AF513A</td>
<td>IEC60309 516P6W</td>
<td>IEC60309 516C6W</td>
<td>IEC60309 516R6W</td>
</tr>
<tr>
<td>Expansion rack</td>
<td>Interna]</td>
<td>2</td>
<td>H5M72A</td>
<td>IEC 60309 516P6W</td>
<td>IEC 60309 516C6W</td>
<td>IEC 60309 516R6W</td>
</tr>
<tr>
<td>Base rack</td>
<td>Domestic</td>
<td>4</td>
<td>AF512A</td>
<td>NEMA L15-30P</td>
<td>NEMA L15-30C</td>
<td>NEMA L15-30R</td>
</tr>
<tr>
<td>Expansion rack</td>
<td>Domestic</td>
<td>4</td>
<td>H5M61A</td>
<td>NEMA L15-30P</td>
<td>NEMA L15-30C</td>
<td>NEMA L15-30R</td>
</tr>
</tbody>
</table>

*Domestic = North America/Japan

**Plug is the connector on the PDU side of the power interconnect.

***Connectors and Receptacles are options at the user-side of the electrical interconnect.

⚠️ **WARNING:**

Do not connect non-StoreServ or unsupported components to PDUs.

### Power Distribution Units for 208xx R2 racked models

- Horizontal modular PDUs are used when HPE 3PAR 20800 R2, 20840 R2, and 20850 R2 storage systems are installed in a 42U 1075mm rack. A single rack can support up to 8 drive enclosures.
- Vertical PDUs are used when HPE 3PAR 20800 R2, 20840 R2, and 20850 R2 storage systems are installed in a 42U 1200mm rack. A single rack can support up to 12 drive enclosures.
- Expansion racks can support up to 20 drive enclosures.
<table>
<thead>
<tr>
<th>208xx R2</th>
<th>1075mm Node/ Base Rack</th>
<th>1200mm Node/ Base Rack</th>
<th>1075mm Expansion Rack</th>
<th>1200mm Expansion Rack</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 node + 8 drive enclosures</td>
<td>8 node + 12 drive enclosures</td>
<td>20 drive enclosures</td>
<td>20 drive enclosures</td>
</tr>
<tr>
<td>PDU Qty</td>
<td>PN / Type</td>
<td>PDU Qty</td>
<td>PN / Type</td>
<td>PDU Qty</td>
</tr>
<tr>
<td>US/JP 1-ph (NEMA L6-30P)</td>
<td>4 -- P9Q39A / Modular</td>
<td>6 -- P9Q41A /HH Vert LP</td>
<td>4 -- P9Q41A /HH Vert LP</td>
<td>N/A</td>
</tr>
<tr>
<td>US/JP 3-ph (NEMA L15-30P)</td>
<td>4 -- P9Q52A / Modular</td>
<td>4 -- P9Q54A /HH Vert LP</td>
<td>4 -- P9Q54A /HH Vert LP</td>
<td></td>
</tr>
<tr>
<td>INTL 1-ph (60309 32A 3-wire)</td>
<td>4 -- P9Q43A / Modular</td>
<td>4 -- P9Q45A /HH Vert LP</td>
<td>4 -- P9Q45A /HH Vert LP</td>
<td></td>
</tr>
<tr>
<td>INTL 3-ph (60309 16A 5-wire)</td>
<td>2 -- P9Q57A / Modular</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>11.04 KVA power capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTL 3-ph (60309 32A 5-wire)</td>
<td>N/A</td>
<td>2 P9Q64A /HH Side LP+3 of P9Q66A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 x 22.08.04 KVA power capacity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**
When INTL 3-ph PDUs are used in 1075mm node/base racks, the expansion rack must be 1075mm.

2 -- P9Q58A /MH Vert
11.04 KVA power capacity

**NOTE:**
When INTL 3-ph PDUs are used in 1200mm node/base racks, the expansion rack must be 1200mm.

2 P9Q64A /HH Side LP+3 of P9Q66A
1 x 22.08.04 KVA power capacity
WARNING:
Do not connect non-StoreServ or unsupported components to PDUs.

Service Processor
The HPE 3PAR StoreServ 20000 Storage system includes an HPE 3PAR Service Processor (SP).

Figure 6: Front view of Service Processor

HPE 3PAR StoreServ 20000 storage system specifications
The following sections describe the environmental specifications for operating a StoreServ system.

Physical specifications

Table 5: HPE 3PAR StoreServ 20000 Storage rack physical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (height x depth x width)</td>
<td>79.00 x 44.30 x 23.54 in (200.66 x 125.52 x 59.79 cm)</td>
</tr>
<tr>
<td>Weight (approximate)</td>
<td>418 lb (190 kg) (not populated)</td>
</tr>
</tbody>
</table>

Table 6: HPE 3PAR StoreServ 20000 Storage controller node enclosure physical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (height x depth x width)</td>
<td>13.90 x 32.32 x 19.08 in (35.3 x 82.1 x 48.5 cm)</td>
</tr>
<tr>
<td>Weight (20000 4-way node chassis)</td>
<td>93 lb (42.3 kg)</td>
</tr>
</tbody>
</table>

Table Continued
<table>
<thead>
<tr>
<th>Power</th>
<th>Single Phase:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200-240 VAC 50-60Hz</td>
</tr>
<tr>
<td></td>
<td>1+1 Redundant Hot Swap Power Supply</td>
</tr>
<tr>
<td>Three Phase:</td>
<td>200-250 VAC 50-60Hz</td>
</tr>
<tr>
<td></td>
<td>1+1 Redundant Hot Swap Power Supply</td>
</tr>
</tbody>
</table>

| Air Flow | 112 CFM per node |
| Service Clearances | Front: 50 in. (127 cm), Sides: None, Rear: 50 in. (127 cm) |
| Cabling | Front: None |
|         | Rear: Data/Power |

**208xx and 208xx R2 controller node enclosure**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (height x depth x width)</td>
<td>27.88 x 32.32 x 19.06 in (35.3 x 82.1 x 48.4 cm)</td>
</tr>
<tr>
<td>Weight (20000 8-way node chassis)</td>
<td>173 lb (78.6 kg)</td>
</tr>
<tr>
<td>Power</td>
<td>Single Phase:</td>
</tr>
<tr>
<td></td>
<td>200-240 VAC 50-60Hz</td>
</tr>
<tr>
<td></td>
<td>1+1 Redundant Hot Swap Power Supply</td>
</tr>
<tr>
<td>Three Phase:</td>
<td>200-250 VAC 50-60Hz</td>
</tr>
<tr>
<td></td>
<td>1+1 Redundant Hot Swap Power Supply</td>
</tr>
<tr>
<td>Air Flow</td>
<td>112 CFM per node</td>
</tr>
<tr>
<td>Service Clearances</td>
<td>Front: 36 in. (91.44 cm), Sides: None, Rear: 30 in. (76.2 cm)</td>
</tr>
<tr>
<td>Cabling</td>
<td>Front: None</td>
</tr>
<tr>
<td></td>
<td>Rear: Data/Power</td>
</tr>
</tbody>
</table>

**20000 controller node**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>48.15 lb (21.8 kg)</td>
</tr>
</tbody>
</table>
### Table 7: HPE 3PAR StoreServ 20000 Storage drive enclosure physical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (height x depth x width)</td>
<td>HPE 3PAR 20000 2U LFF 3.44 x 23.54 x 17.64 in. (8.7 x 59.8 x 44.8 cm)</td>
</tr>
<tr>
<td></td>
<td>HPE 3PAR 20000 2U SFF 3.44 x 21.48 x 17.64 in. (8.7 x 54.6 x 44.8 cm)</td>
</tr>
<tr>
<td>Weight (approximate)</td>
<td>No disk drives: 38 lb (17.2 kg)</td>
</tr>
<tr>
<td></td>
<td>HPE 3PAR 20000 2U LFF fully populated with LFF disk drives: 60 lb (27.2 kg)</td>
</tr>
<tr>
<td></td>
<td>HPE 3PAR 20000 2U SFF fully populated with SFF disk drives: 54.90 lb (24.9 kg)</td>
</tr>
<tr>
<td>Power</td>
<td><strong>Single Phase:</strong> 200-240 VAC 50-60Hz</td>
</tr>
<tr>
<td></td>
<td>1+1 Redundant Hot Swap Power Supply</td>
</tr>
<tr>
<td></td>
<td><strong>Three Phase:</strong> 200-250 VAC 50-60Hz</td>
</tr>
<tr>
<td></td>
<td>1+1 Redundant Hot Swap Power Supply</td>
</tr>
<tr>
<td>2U SFF Airflow</td>
<td>105 CFM</td>
</tr>
<tr>
<td>2U LFF Airflow</td>
<td>109 CFM</td>
</tr>
<tr>
<td>Service Clearances</td>
<td>Front: 30”, Sides: None, Rear: 24”</td>
</tr>
<tr>
<td>Cabling</td>
<td>Front: None</td>
</tr>
<tr>
<td></td>
<td>Rear: Data/Power</td>
</tr>
</tbody>
</table>

### Table 8: HPE 3PAR Service Processor physical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (height x depth x width)</td>
<td>1.69 x 23.9 x 17.11 in (43.46 x 60.76 x 4.29 cm)</td>
</tr>
<tr>
<td>Weight (approximate)</td>
<td>19.82 lb (9 kg) (minimum) / 37.44 lb (17 kg) (maximum)</td>
</tr>
</tbody>
</table>
# Capacity specifications

Capacity specifications for 3PAR StoreServ 20450, 20800, 20850, and 20840 models

## Table 9: Capacity specifications for 3PAR StoreServ 20450, 20800, 20850, and 20840 models

<table>
<thead>
<tr>
<th>Summary</th>
<th>3PAR StoreServ 20450</th>
<th>3PAR StoreServ 20800</th>
<th>3PAR StoreServ 20850</th>
<th>3PAR StoreServ 20840</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Controller Nodes</td>
<td>2 or 4</td>
<td>2, 4, 6, or 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPE 3PAR Gen5 ASICs</td>
<td>4 or 8</td>
<td>4, 8, 12, or 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management Processors</td>
<td>4 - 8 Eight-Core 2.5 GHz</td>
<td>4 - 16 Six-Core 2.5 GHz</td>
<td>4 - 16 Eight-Core 2.5 GHz</td>
<td></td>
</tr>
<tr>
<td>Total Cache</td>
<td>0.9 - 1.8 TiB</td>
<td>0.4 - 33.8 TiB</td>
<td>0.9 - 3.6 TiB</td>
<td>0.9 – 51.3 TiB</td>
</tr>
<tr>
<td>Flash Cache (optional)</td>
<td>Not Applicable</td>
<td>0 - 32 TiB</td>
<td>Not Applicable</td>
<td>0 – 48 TiB</td>
</tr>
<tr>
<td>Max On-Node Cache</td>
<td>896 - 1792 GiB</td>
<td>448 - 1792 GiB</td>
<td>896 - 3584 GiB</td>
<td>896 – 3584 GiB</td>
</tr>
<tr>
<td>Maximum Host Ports</td>
<td>80 ports</td>
<td>160 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16Gb/s Fibre Channel Host Ports</td>
<td>0 - 80 ports</td>
<td>0 - 160 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10Gb/s iSCSI Host Ports²</td>
<td>0 - 40 ports</td>
<td>0 - 80 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10Gb/s FCoE HostPorts²</td>
<td>0 - 40 ports</td>
<td>0 - 80 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10GbE Network Ports³ for File Persona</td>
<td>0 - 24 ports</td>
<td>0 - 48 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Built-in Remote Copy (RCIP) Ports⁴</td>
<td>2 - 4 ports</td>
<td>2 - 8 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Hard Disk Drives</td>
<td>Not applicable</td>
<td>8 - 1920 drives</td>
<td>Not Applicable</td>
<td>8 – 1920 drives</td>
</tr>
</tbody>
</table>

*Table Continued*
### Summary

<table>
<thead>
<tr>
<th></th>
<th>3PAR StoreServ 20450</th>
<th>3PAR StoreServ 20800</th>
<th>3PAR StoreServ 20850</th>
<th>3PAR StoreServ 20840</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Solid State Drives</td>
<td>6 - 512</td>
<td>6 - 1024</td>
<td>6 - 1024</td>
<td>6 - 1024</td>
</tr>
<tr>
<td><strong>NOTE:</strong> The 20800 can support a minimum of 4 SSDs only if NL or SAS drives are already installed. If not, a minimum of 8 SSDs is required.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum usable file capacity</td>
<td>2 – 512 TiB</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Capacity details

<table>
<thead>
<tr>
<th>Feature</th>
<th>3PAR StoreServ 20450</th>
<th>3PAR StoreServ 20800</th>
<th>3PAR StoreServ 20850</th>
<th>3PAR StoreServ 20840</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID Levels</td>
<td>RAID 0, 1, 5, MP8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAID 5 Data to Parity Ratios</td>
<td>2:1 - 8:1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAID 6 Data to Parity Ratios</td>
<td>4:2, 6:2, 8:2, 10:2, 12:2, 14:2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive Capacities (SSDs)9</td>
<td>400GB SSD, 480GB nonAFC SSD, 920GB SSD, 480GB SSD, 1920GB SSD, 3840GB SSD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Drive Enclosures12</td>
<td>2 - 40 enclosures13</td>
<td>2 - 80 enclosures14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support for 3PAR StoreServ File Controller v3</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1 Each port is full bandwidth 16 Gbit/s Fibre Channel capable as applicable
2 Each port is full bandwidth 10 Gbit/s iSCSI or FCoE capable
3 Each port is full bandwidth 10 Gbit/s Ethernet designated for hosting File services and Object access protocols
4 Two built-in 10-GbE RCIP ports per node pair; maximum of 8 usable; RCFC works out of the FC Host ports
5 Minimum raw capacity currently supported based on minimum of 4 SSDs per array
6 For storage capacity, 1 GiB = 1,024 MiB and 1 TiB = 1,024 GiB
7 Usable file capacity supported for HPE 3PAR File Persona Software Suite
8 RAID MP is HPE 3PAR Fast RAID 6 Technology
9 SSDs are Solid State Drives
10 HDDs not applicable to HPE 3PAR StoreServ 20800 All-Flash Starter Kit
11 NL drives are Nearline (7.2k) Drives
12 Drive enclosures can be 24 x 2.5” drive 2U form factor or 12 x 3.5” drive 2U form factor
13 Recommended minimum is 4 drive enclosures per pair of controller nodes

Capacity specifications for 3PAR StoreServ 208xx R2 models

Table 10: Capacity specifications for 3PAR StoreServ 208xx R2 models

<table>
<thead>
<tr>
<th>Summary</th>
<th>3PAR StoreServ 20800 R2</th>
<th>3PAR StoreServ 20850 R2</th>
<th>3PAR StoreServ 20840 R2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of controller nodes</td>
<td>2, 4, 6, or 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPE 3PAR Gen5 ASICs</td>
<td>4, 8, 12, or 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management processors</td>
<td>4 - 16 Eight-Core 2.5 GHz</td>
<td>4 - 16 10-Core 2.5 GHz</td>
<td></td>
</tr>
<tr>
<td>Total cache</td>
<td>0.6 - 34.5 TiB</td>
<td>0.9 - 3.6 TiB</td>
<td>0.9 - 51.6 TiB</td>
</tr>
<tr>
<td>Flash cache (optional)</td>
<td>0 - 32 TiB</td>
<td>Not Applicable</td>
<td>0 – 48 TiB</td>
</tr>
<tr>
<td>Max on-node cache</td>
<td>640 - 2560 GiB</td>
<td>896 - 3584 GiB</td>
<td>896 – 3584 GiB</td>
</tr>
<tr>
<td>Maximum host ports</td>
<td>160 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16Gb/s fibre channel host ports¹</td>
<td>0 - 160 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10Gb/s iSCSI host ports²</td>
<td>0 - 80 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10GbE network ports³ for File Persona</td>
<td>0 - 48 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Built-in 10GbE ports ⁴</td>
<td>2 - 8 ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of hard disk drives</td>
<td>6 - 2304 drives</td>
<td>Not Applicable</td>
<td>6 - 2304 drives</td>
</tr>
</tbody>
</table>

Table Continued
<table>
<thead>
<tr>
<th>Summary</th>
<th>3PAR StoreServ 20800 R2</th>
<th>3PAR StoreServ 20850 R2</th>
<th>3PAR StoreServ 20840 R2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of solid state drives</td>
<td>6 - 1152</td>
<td>6 - 1152</td>
<td>6 - 1152</td>
</tr>
<tr>
<td>Raw capacity</td>
<td>1.925 - 6000 TiB⁶</td>
<td>1.925 - 3932 TiB⁶</td>
<td>1.925 - 6000 TiB⁶</td>
</tr>
<tr>
<td>Raw capacity (SSD only)</td>
<td>1.925 - 8043 TiB⁶</td>
<td>1.925 - 8043 TiB⁶</td>
<td>1.925 - 8043 TiB⁶</td>
</tr>
<tr>
<td>Maximum usable file capacity⁷</td>
<td>2-512⁶</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Capacity details**

<table>
<thead>
<tr>
<th>RAID levels</th>
<th>RAID 0, 1, 5, MP⁸</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID 5 data to parity ratios</td>
<td>2:1 - 8:1</td>
</tr>
<tr>
<td>RAID 6 data to parity ratios</td>
<td>4:2, 6:2, 8:2, 10:2, 12:2, 14:2</td>
</tr>
<tr>
<td>Drive capacities (SSDs)⁹</td>
<td>400GB SSD, 920GB SSD, 1920GB SSD, 3840GB SSD, 7680GB SSD, 15360GB SSD</td>
</tr>
<tr>
<td>Drive capacities (HDDs)</td>
<td>300 15K SAS¹⁰, 600 15K SAS¹¹, 600 10K SAS¹¹, 1200 10K SAS¹¹, 1800 10K SAS¹¹, 2000 7.2K SAS NL¹¹, 4000 7.2K SAS NL¹², 6000 7.2K SAS NL¹², 8000 7.2K SAS NL</td>
</tr>
<tr>
<td>Number of drive enclosures¹²</td>
<td>2 - 96 enclosures¹³</td>
</tr>
<tr>
<td>Support for 3PAR StoreServ File Controller v3</td>
<td>Yes</td>
</tr>
</tbody>
</table>

¹ Each port is full bandwidth 16 Gbit/s Fibre Channel capable as applicable
² Each port is full bandwidth 10 Gbit/s iSCSI capable
³ Each port is full bandwidth 10 Gbit/s Ethernet designated for hosting File services and Object access protocols
⁴ Two built-in 10-GbE RCIP ports per node pair; maximum of 8 usable; RCFC works out of the FC Host ports
⁵ Minimum raw capacity currently supported based on minimum of 4 SSDs per array
⁶ For storage capacity, 1 GiB = 1,024 MiB and 1 TiB = 1,024 GiB
⁷ Usable file capacity supported for HPE 3PAR File Persona
⁸ RAID MP is HPE 3PAR Fast RAID 6 Technology
⁹ SSDs are Solid State Drives
¹⁰ SAS drives are Serial Access SCSI drives
¹¹ NL drives are Nearline (7.2k) drives
¹² About HPE 3PAR StoreServ 20000 Storage systems 19
### Power and environmental specifications

#### Table 11: HPE 3PAR StoreServ 20000 Storage system power and environmental specifications

<table>
<thead>
<tr>
<th>HPE 3PAR 20450, 20800, 20840, 20850 system</th>
<th>Environmental Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature range</strong> (Temperature ratings shown are for sea level. An altitude rating of 1°C per 300 m (1.8°F per 1,000 ft) to 3,048 m (10,000 ft) is applicable. The upper limit is limited by the type and number of options installed.)</td>
<td>Operating</td>
<td>5-40° C (41–104° F) - Reduce rating by 1° C for each 300 m altitude (1.8° F for each 1,000 ft).</td>
</tr>
</tbody>
</table>

#### HPE 3PAR 20800 R2, 20840 R2, 20850 R2 system

<table>
<thead>
<tr>
<th>Environmental Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature range</strong> (Temperature ratings shown are for sea level. An altitude rating of 1°C per 300 m (1.8°F per 1,000 ft) to 3,048 m (10,000 ft) is applicable. The upper limit is limited by the type and number of options installed.)</td>
<td>Operating</td>
</tr>
</tbody>
</table>

#### Table 12: HPE 3PAR StoreServ 20000 Storage controller node enclosure power and environmental specifications

<table>
<thead>
<tr>
<th>HPE 3PAR 20000 controller node enclosure</th>
<th>Environmental Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature range</strong> (Temperature ratings shown are for sea level. An altitude rating of 1°C per 300 m (1.8°F per 1,000 ft) to 3,048 m (10,000 ft) is applicable. The upper limit is limited by the type and number of options installed.)</td>
<td>Operating</td>
<td>5-40° C (41–104° F) - Reduce rating by 1° C for each 300 m altitude (1.8° F for each 1,000 ft).</td>
</tr>
<tr>
<td></td>
<td>Non-operating</td>
<td>0-95° C (32–203° F)</td>
</tr>
<tr>
<td><strong>Relative humidity</strong> (Non-operating maximum humidity of 95% is based on a temperature of 45°C (113°F). Altitude maximum for storage corresponds to a pressure minimum of 70 KPa.)</td>
<td>Operating</td>
<td>10% to 90% relative humidity (Rh) non-condensing</td>
</tr>
<tr>
<td></td>
<td>Shipping</td>
<td>10% to 90% relative humidity (Rh) non-condensing</td>
</tr>
</tbody>
</table>

*Table Continued*
<table>
<thead>
<tr>
<th>Vibration</th>
<th>Operating</th>
<th>0.25 G, Sine, 5-500 Hz; 0.15 Grms Random, 5-100 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-operating</td>
<td>0.5G, Sine, 5-500 Hz</td>
</tr>
<tr>
<td>Shock</td>
<td>Operating</td>
<td>2 G, 11ms, half-sine</td>
</tr>
<tr>
<td></td>
<td>Non-operating</td>
<td>10 G, 11ms, half-sine</td>
</tr>
<tr>
<td>Air Flow</td>
<td></td>
<td>112 CFM per node</td>
</tr>
<tr>
<td>Altitude (Maximum allowable altitude change rate is 457 m/min (1,500 ft/min))</td>
<td>Operating</td>
<td>3,024 m/10,000 ft</td>
</tr>
<tr>
<td></td>
<td>Shipping</td>
<td>12,192 m/40,000 ft</td>
</tr>
<tr>
<td>Service Clearances</td>
<td>Front: 36 in. (91.44 cm), Sides: None, Rear: 30 in. (76.2 cm)</td>
<td></td>
</tr>
<tr>
<td>Input power</td>
<td>Input voltage</td>
<td>100 VAC to 240 VAC (Common-slot Power Supply Rear: Data/Power)</td>
</tr>
</tbody>
</table>

Table 13: HPE 3PAR StoreServ 20000 Storage drive enclosure power and environmental specifications

<table>
<thead>
<tr>
<th>HPE 3PAR 20000 2U LFF/SFF drive enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Specification</strong></td>
</tr>
</tbody>
</table>

| Temperature range                        | Operating                      | 50° to 104° F (10° to 40° C) |
| (Temperature ratings shown are for sea level. An altitude rating of 1°C per 300 m (1.8°F per 1,000 ft) to 3,048 m (10,000 ft) is applicable. The upper limit is limited by the type and number of options installed.) | Shipping                      | -30° to 65° C (-22° to 149° F) |

**NOTE:** Rated 1°C per 300 m of elevation to 3,048 m.

| Relative humidity (Non-operating maximum humidity of 95% is based on a temperature of 45°C (113°F). Altitude maximum for storage corresponds to a pressure minimum of 70 KPa.) | Operating | 10% to 90% relative humidity (Rh) |
|                                                                                                                                  | Non-operating | 0% to 95% relative humidity (Rh) |

| Shock | Operating | 5 G, 11ms, half-sine |
|       | Non-operating | 10 G, 11ms, half-sine |

Table Continued
<table>
<thead>
<tr>
<th>Maximum wet bulb temperature</th>
<th>Long-term storage (operating)</th>
<th>82.4° F (28° C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short-term storage (non-operating)</td>
<td>101.6° F (38.7° C)</td>
</tr>
<tr>
<td><strong>Altitude</strong> (Maximum allowable altitude change rate is 457 m/min (1500 ft/min))</td>
<td>Operating</td>
<td>3,048 m (10,000 ft) This value is limited by the type and number of options installed.</td>
</tr>
<tr>
<td></td>
<td>Non-operating</td>
<td>9,144 m (30,000 ft)</td>
</tr>
<tr>
<td><strong>Service Clearances</strong></td>
<td>Front: 50 in. (127 cm), Sides: None, Rear: 50 in. (127 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>Input power</strong> (Input Power and Heat Dissipation specifications are maximum values and apply to worst-case conditions at full rated power supply load. The power/heat dissipation for your installation will vary depending on the equipment configuration.)</td>
<td>Input voltage</td>
<td>100 VAC to 240 VAC (Common-slot Power Supply) Rear: Data/Power</td>
</tr>
</tbody>
</table>

**StoreServ storage security feature**

HPE 3PAR Data Encryption security feature allows you to encrypt all hard drives on the storage system with an authentication key and the use of Self Encrypting Drives (SEDs).

**Enhancing security with data encryption**

When a Data Encryption license is registered, you must manually enable the encryption feature on the system. When the encryption feature is enabled successfully, all the drives in the system become automatically set in an encrypted state. You can review the encryption status of individual hard disk drives within the system Summary tab of the HPE 3PAR StoreServ Management Console (SSMC).

This feature allows you to perform the following encryption-related tasks:

- Check encryption status.
- Enable encryption.
- Back up an authentication key.
- Restore an authentication key.
- Generate a new key.
- Recover a key.

**NOTE:**

When the system is enabled with the security feature, you must use self-encrypting storage drives. Non-encrypted storage drives are not supported.

For more information about enabling the feature, see the latest version of the *HPE 3PAR StoreServ Management Console User Guide*. 
General site planning

Before you begin installing an HPE 3PAR StoreServ 20000 Storage system, plan and coordinate the installation process with an authorized HPE representative or partner. Proper planning provides a more efficient installation process and leads to greater availability, reliability, and serviceability of the system.

This chapter provides general recommendations for physical planning and site preparation for the storage system installation.

Responsibilities of the user

Establish the following responsibilities when planning and preparing for the system installation:

- Arrange ample space for unpacking, installing, and operating the storage system.
- Maintain the proper environmental conditions for the storage system.
- Provide an optimal power facility for the storage system.
- Supply the network connections and external cabling required by the storage system.
- Establish an appropriate HPE 3PAR remote support strategy.

Planning for installation

To maintain the highest performance at a specific location, a storage system requires controlled environmental conditions. It can be achieved through raised flooring and under-floor air conditioning. The customer is responsible for constantly monitoring the operating environment to maintain the optimal system performance based on the recommended environmental specifications. Refer to Structural/environmental considerations on page 26 for specific information about establishing proper operating environments.

A proper amount of electrical power is required for the electronic equipment during the installation and to operate reliably. The customer is responsible for procuring, installing, and maintaining the proper amount power for the storage system. Refer to Power requirements on page 34 for details about electrical power and grounding requirements.

It is recommended that the following site planning tasks are completed before receiving the delivery and installing the storage system:

- Prepare a preliminary layout of the storage installation.
- Review the electrical power, ventilation, and air-conditioning (HVAC) requirements.
- Order any additional support equipment indicated by the electrical power and HVAC review.
- Coordinate with the appropriate HPE representative to ensure all system units and cables of the required length in the specified configuration have been ordered.
- Establish a final plan and layout of the system installation and review the details with the assigned HPE representative.
- Select key personnel and arrange for training with the assigned HPE representative.
- Verify that the electrical service wiring installation is complete at the predetermined location before installing the storage system. Refer to the product specifications for details of requirements.
- Verify that any additional support equipment is installed and operating properly.
Prior to installing the storage system:

- Review the system packaging list or receipt and reconcile with received shipment.
- Inspect entire shipment for any tampering of packaging. If tampering is visible, immediately report the incident to the assigned HPE representative.
- Account for all contents in each package and reconcile with packaging slip or receipt. All component SKUs on packaging are listed on the packaging slip.
- Prepare and reconcile the following checkpoints with the assigned HPE sales representative or systems engineer:
  - Contact information for HPE technical sales, support, and service personnel
  - Project implementation plan
  - Configuration information for the storage system to be installed, including system configuration diagrams
  - Shipping and delivery details and requirements
  - Management workstation, SP, and network information
  - Description of the environment
  - Volume and RAID level planning information
  - Additional notes and comments about installation
  - Current support matrix
  - System technical specifications
  - Systems Acceptance Certificate

**IMPORTANT:**
After initial storage system installation, any HPE 3PAR StoreServ 20000 Storage system with LFF HDDs that will be physically relocated must have all LFF HDDs removed from the cages/enclosures prior to the move. The HDDs must be properly labeled and packaged because they must be reinstalled in the exact same locations after the move is complete. As a best practice, back up the storage system data before any relocation.

Providing sufficient access space for unpacking

An HPE 3PAR StoreServ 20000 Storage system is packaged and shipped in two different methods:

- Fully assembled in an HPE rack
- Multiple boxes for installation into a third-party rack

Unpacking the storage system and its components requires a specific amount of space for mobility and clearance. Verify that there is sufficient spacing in both the loading/unloading area, ramp, and destination room before unpacking the system and boxes.

See **Providing for service access to the rack** on page 30 for more information about placing the storage system and reserving access space for servicing activities.
NOTE:
Always examine the delivered packages for obvious damage or signs of tampering. If applicable, photograph the damages or tampered items and notify both HPE and the delivery carrier of any known issues.

The measurements of the packaging:

- Rack crate (height x depth x width): 85.35 x 50.87 x 35.43 inch (216.80 x 129.20 x 90 cm)
  Approximate shipping weight: 1606 lb (728 kg)
- Drive enclosure box (height x depth x width): 13 inch (33.1 cm) x 11 inch (28 cm) x 27 inch (68.6 cm)
  Approximate shipping weight: 33.8 lb (15.4 kg)
- Drive box (height x depth x width): 38 inch (96.5 cm) x 29 inch (73.6 cm) x 34 inch (86.4 cm)
  Approximate shipping weight: 392 lb (177.8 kg)
- 4-Node enclosure box (height x depth x width): 30 inch (76.2 cm) x 35 inch (88.9 cm) x 45 inch (114.3 cm)
  Approximate shipping weight: 618 lb (280.3 kg)
- 8-Node enclosure box (height x depth x width): 30 inch (76.2 cm) x 35 inch (88.9 cm) x 45 inch (114.3 cm)
  Approximate shipping weight: 618 lb (280.3 kg)

Acclimatization

Storage systems shipped or stored at extreme temperatures may require time to adjust to operating temperatures before startup. The maximum acceptable rate of temperature change for a non-operating system is 36° F/hour (20° C/hour). The storage system requires time to acclimatize to new environmental conditions before powering on. During the acclimatization period, you can proceed with the physical installation of the storage system. However, the storage system may need at least 24 hours to acclimatize to a new environment prior to completing the full system installation. If condensation is present even after the 24-hour acclimatization period, continue to wait until all condensation is evaporated before proceeding with the power-on sequence.
Structural/environmental considerations

Consider the following when choosing or designing your facilities for the storage system:

- Equipment location and layout that allows efficient use, easy maintenance, and future expansion.
- Facility construction that provides a suitable operating environment, sufficient power, and adequate protection from fire, contamination, or other hazards.
- Suitable temperatures and appropriate air quality that is free from environmental contaminants.

The customer is responsible for maintaining the room environment according to the recommended specifications. Environmental conditions for the room and under the floor must be maintained within the acceptable limits to prevent any adverse impact on performance and reliability. To ensure continued conformance to recommended environmental specifications, monitor the installation environment on a regular basis. The customer may request assistance from an HPE 3PAR representative for help with analyzing the site location and environment to make appropriate recommendations.

For information on rack requirements and considerations, see the Best practices for HPE Intelligent Series Rack Family white paper.

Establishing the proper foundation

As with any electronic equipment that generates heat, the HPE 3PAR storage systems must be housed in a cool environment. Common techniques for maintaining an optimal operating environment generally incorporate the use of raised flooring and alternating hot and cold aisle layouts.

Benefits of raised floors

Although it is not a requirement, the storage system can be installed on raised floors with under the floor air cooling. Raised floors will allow cables to be located safely beneath the floor. If the facility does not have raised floors and under the floor air cooling, temperature and airflow must be in compliance with the recommended specifications.

HPE recommends that the raised floor system consists of removable panels or panels on a stringer grid system, supported by adjustable steel pedestal assemblies. The raised floor can be constructed of steel, aluminum, or fire-retardant wood. The purpose of the raised floor system is to:

- Supply cool air to the equipment.
- Support the total weight of the system and service area loading.
- Protect interconnecting cables and power receptacles.
- Allow for future layout changes with minimum cost.
- Provide safety for personnel.

Raised floor requirements

There are structural considerations when installing storage systems in environments with raised flooring.

NOTE:

This section assumes a standard raised floor construction consisting of the following: 24 in. (61 cm) square or 24 in. (61 cm) X 36- in. (91.5 cm) panels, steel or aluminum stringers, and pedestal supports attached to an underlying concrete slab or steel deck.
Prior to installation, verify that the raised flooring at the operating site meets the specifications described in the following table.

Placing each across two floor tiles is recommended. It is also recommended a floor tile that is vented is placed in front of each.

Table 14: Raised Floor Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flatness tolerance</td>
<td></td>
</tr>
<tr>
<td>Per 10 ft (3 m) span</td>
<td>Less than 0.06 in. (1.5 mm)</td>
</tr>
<tr>
<td>Overall</td>
<td>Less than 0.10 in. (2.5 mm)</td>
</tr>
<tr>
<td>Deflection</td>
<td></td>
</tr>
<tr>
<td>Dynamic</td>
<td>Less than 0.15 in. (3.8 mm)</td>
</tr>
<tr>
<td>Permanent</td>
<td>Less than 0.02 in. (0.5 mm)</td>
</tr>
<tr>
<td>Pedestal assembly load</td>
<td></td>
</tr>
<tr>
<td>Axial</td>
<td>At least 5,000 lb (2,268 kg)</td>
</tr>
<tr>
<td>Side</td>
<td>At least 30 ft-lb (40.7 N-m)</td>
</tr>
</tbody>
</table>

More Flooring Recommendations

Consider the following recommendations for raised floor installations:

- The flooring is high enough to allow under the floor routing of cables and specified airflow to system air intakes. The recommended minimum floor clearance is 30.5 cm (12 in). Allow an additional 7.6 cm (3 in) for cables and connectors. A floor clearance of 46 cm (18 in) is recommended for new construction.

  Extra panel support may be required. Extra panel support restores the structural integrity of a raised floor panel that has been cut for air opening, cable entry, and other reasons. Raised floors without stringers may also require lateral support to prevent floor tile movement.

  The finished floor-to-ceiling height is a minimum of 2.44 meters (8 feet).

- The subfloor must have adequate drainage to prevent flooding and trapping of water beneath the raised floor. To prevent the formation of particulates, seal the cement.

- To avoid an electrical hazard when using a metallic floor, do not expose metal or conductive material to the walking surface.

- Sharp edges must be eliminated on all floor cutouts where cables pass. For wood or similar core material, all cut edges must be covered with metal or plastic clips or grommets. By covering all the cut edges, none of the core is exposed (see NFPA 75 requirements).

- Asphalt tiles are not recommended because they produce dust that may cause equipment malfunction.

- Carpeting is not recommended because it produces and holds dust, and can contribute to the buildup of electrostatic charges on people and equipment.

- Most raised floors are composed of 60 cm (International/Metric) or 24 in. (Domestic/American Standard) square floor tiles. Do not exceed a maximum panel size of 60 by 90 cm (International/Metric) or 24 by 36 in. (Domestic/American Standard). It is recommended that the panels have a flame
spread rating of 15 or better when tested according to the American Society for Testing and Materials (ASTM) Standard E 84.

- The floor covering can contribute to a buildup of high static electrical charge. To minimize static charge:
  - Provide a conductive path to ground from the metallic raised floor structure through the metallic supporting structure or separately from each tile.
  - Ensure that the maximum resistance for floor surface material is 20 gigaohms, measured between the floor surface and building ground.
  - The resistance between adjacent tiles must not be less than 150 kilohms when measured between any points on the floor, spaced 36 in. (91.44 cm) apart.
  - Perform maintenance of anti-static floor covering according to the recommendations of the supplier.

**Weight and pressure loads**

Depending on the configuration, a storage system can weigh up to 2,000 lb (907 kg). *Table 15: Maximum weights and pressure loads* on page 28 provides maximum weights and pressure loads per leveling foot for storage system racks. Use these values to approximate the structural support required by a storage system rack.

Verify that the floor panels can tolerate the weight and pressure loads. Do the verification before placing storage system racks on floor tiles shared with other storage system racks or equipment. Maximum weight and pressure loads for storage systems are provided in *Table 15: Maximum weights and pressure loads* on page 28.

When placing storage system racks with their weight shared by the same panels, verify if each panel can tolerate the maximum weight calculation:

\[
\text{weight cabinet } x + \text{weight cabinet } y \quad \frac{1}{2}
\]

In the calculation, \(x\) and \(y\) are storage system racks or equipment resting partially on the same floor panel.

**NOTE:**

*Table 15: Maximum weights and pressure loads* on page 28 uses nominal numbers to simplify calculations.

<table>
<thead>
<tr>
<th>Size</th>
<th>Maximum weight</th>
<th>Maximum weight per leveling foot</th>
<th>Maximum load per leveling foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>2M (42U)</td>
<td>2,000 lb (907.2 kg)</td>
<td>500 lb (226.8 kg)</td>
<td>161 lb/sq in. (73 kg/sq cm)</td>
</tr>
</tbody>
</table>

**Hot-aisle/cold-aisle cooling layout**

Air flows through the storage systems from the front to the rear. When installing multiple storage systems in the same room, consider facing each pair of systems in a front to rear configuration. This configuration allows cool air to be circulated through the rows in the front of the systems and exhausted through rows in
back. This layout is referred to as a hot-aisle/cold-aisle layout. This layout eliminates the direct transfer of hot exhaust air from one system into the intake air of another as shown in Figure 7: Hot-aisle/cold-aisle layout on page 29.

Figure 7: Hot-aisle/cold-aisle layout

Form rows of racks perpendicular to air conditioners. This formation facilitates an unobstructed flow of heated air down the aisles to the air conditioner return ducts. Do not force heated air to travel over or between the racks to get to the air conditioner return ducts. Doing so could heat the air in the cold aisles. Ensure that any free-standing equipment does not allow air to flow between the hot and cold aisles.

A cold aisle has perforated floor tiles or grates that enable cold air to rise from the raised floor. The hot aisle has no tiles or grates so that hot air and cold air do not mix. Seal cable cutouts in both hot aisles and cold aisles to increase under the floor pressure and to eliminate cold or hot air redirection. To optimize the
airflow in hot and cold aisles, install blanking panels at the front of all unused spaces. This way, hot air does not recirculate to the cold air inlet of the system.

**Anchoring dimensions**

Some installations require the storage systems to be anchored to the floor for better stability, especially in active seismic locations. The HPE Tie Down Option Kit enables you to anchor an Intelligent Series Rack to the floor in geographical areas that are prone to seismic activity. Anchoring an Intelligent Series Rack in this way meets international building code guidelines. This product provides a solution to help avoid damage or serious injury if there is building or floor movement.

**NOTE:**
For information on options available for the Intelligent Series Rack, refer to the Rack Options Catalog at [www.hpe.com/go/rackandpower](http://www.hpe.com/go/rackandpower).

For information on rack requirements and considerations, see the Best practices for HPE Intelligent Series Rack Family white paper.

### Providing for service access to the rack

The storage system is housed in 2M (40-42U) racks that measure 79.00 (h) x 44.30 (d) x 23.54 (w) in (200.66 x 112.52 x 59.79 cm). The racks feature locking rear doors and removable side panels to improve access while installing, cabling, and servicing components.

When establishing an operating site for a storage system, provide for adequate access to the racks by following the access area recommendations in the following table.

**NOTE:**
The storage systems have circuit breakers at the rear of the system.

**Table 16: Recommended access areas for HPE 3PAR StoreServ 20000 Storage systems**

<table>
<thead>
<tr>
<th>Surface</th>
<th>Access Area During Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front</td>
<td>127 cm (50 in)</td>
</tr>
<tr>
<td>Rear</td>
<td>127 cm (50 in)</td>
</tr>
<tr>
<td>Left and right sides</td>
<td>None</td>
</tr>
</tbody>
</table>

**NOTE:**
HPE 3PAR racks do not require side access during operation. However, during installation, one side of the rack must be removed to access the PDU power cords.

### Meeting environmental conditions

It is recommended that you maintain a controlled environment requiring a high degree of cleanliness, close control of temperature and humidity, and infrequent personnel access.
CAUTION:

The storage system operating environment must be free from continuous vibration and from dust and other environmental contaminants.

In addition, the operating site must comply with the following environmental specifications:

### Table 17: Environmental specifications for HPE 3PAR Storage systems

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Altitude</strong></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>0 –10,000 ft (3,048 m)</td>
</tr>
<tr>
<td>Non-operating</td>
<td>0 –40,000 ft (12,192 m)</td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>20450, 20800, 20840 and 20850 systems: 41 –104° F (5–40° C)</td>
</tr>
<tr>
<td></td>
<td>20800 R2, 20840 R2, 20850 R2 systems: 41 – 95° F (5–35° C)</td>
</tr>
<tr>
<td></td>
<td>0–3,000 ft (914.4 m)</td>
</tr>
<tr>
<td></td>
<td>50 –95° F (10 –35° C)</td>
</tr>
<tr>
<td></td>
<td>3,000–10,000 ft (914–3,048 m)</td>
</tr>
<tr>
<td>Non-operating</td>
<td>–40 –203° F (–40– 95° C)</td>
</tr>
<tr>
<td></td>
<td>0–40,000 ft (0–12,192 m)</td>
</tr>
<tr>
<td><strong>Temperature gradient</strong></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>18° F/hr (10° C/hr)</td>
</tr>
<tr>
<td>Non-operating</td>
<td>18° F/hr (10° C/hr)</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 – 80 percent non-condensing, maximum gradient</td>
</tr>
<tr>
<td></td>
<td>10 percent per hour</td>
</tr>
</tbody>
</table>

**Maintaining the optimal temperature**

The level of cooling required for the HPE 3PAR Storage systems is different from the air-conditioning used in offices. Comfort air-conditioning systems are designed for the lower heat and higher moisture generated by the human body. In contrast, equipment has high heat output that is moisture-free (sensible heat). In comfort systems, sensible heat normally produces 60 to 70 percent of the load. The dry heat of electronic equipment produces a sensible heat ratio of over 95 percent.

Prior to installation, verify that the operating site has a cooling system that can support all thermal emissions. To estimate the cooling requirements for a storage system based on a specific system configuration, use the values in **Table 18: Thermal emissions of storage system components** on page 32. Use the average and maximum thermal emissions of storage server components.
Proper site layout is critical to ensure the ambient temperature near the intake of the system does not rise beyond the system specifications. Exceeding the maximum ambient temperature for any period negatively affects the reliability and performance of the system. Continued operation for extended periods under these conditions can cause the system to shut down.

⚠️ CAUTION:

Heated air from nearby equipment must not exhaust into the front of the storage system.

**Table 18: Thermal emissions of storage system components**

<table>
<thead>
<tr>
<th>Component (Fully Populated)</th>
<th>Average Thermal Emissions</th>
<th>Maximum Thermal Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller node (pair)</td>
<td>2,164 BTU/hr (545.3 Kcal/hr)</td>
<td>3,004 BTU/hr (757 Kcal/hr)</td>
</tr>
<tr>
<td>Drive chassis (single)</td>
<td>3,657 BTU/hr (921.6 Kcal/hr)</td>
<td>4,973 BTU/hr (1,253.2 Kcal/hr)</td>
</tr>
<tr>
<td>Drive chassis (pair)</td>
<td>7,314 BTU/hr (1,843.2 Kcal/hr)</td>
<td>9,946 BTU/hr (2,506.4 Kcal/hr)</td>
</tr>
</tbody>
</table>

If the specified guidelines are understood and followed, storage systems can tolerate temperature and humidity fluctuations. Exposure to conditions outside the specified ranges may damage the system or its components.

Before a system is powered on, the air entering the subsystem must be clean and within the ranges specified for temperatures and humidity. The room humidity must be kept sufficiently low to prevent condensation on or within the subsystem. It must never exceed the limit specified in the subsystem environmental requirements tables, including transients. Never expose the system to conditions that could cause internal condensation to occur within the subsystem.

It is recommended that the air-conditioning units have controls monitoring under the floor output that respond to 1° C (2° F) and 5 percent relative humidity. Humidification is normally required to replace moisture removed during the cooling process. Set the relative humidity for a subsystem equipment room at 40 percent. This level is sufficient to suppress electromagnetic charge buildup, and low enough to avoid the risk of corrosion and condensation. To avoid air contamination from the humidifier, water treatment may be necessary in areas with high mineral content.

**Air supply and flow**

The air flow capacity of the facility where the storage systems are installed must be sufficient to remove the heat generated by the equipment. In addition, the air handlers must provide the airflow volume required by the units being cooled. To ensure this airflow, the facility must have a positive under the floor air pressure (if the facility has raised floors). Make airflow checks when conditions within the computer room are changed (new units are added, the computer system is moved).

Keep the amount of outside (make-up) air to the minimum required to create a slight positive pressure within the room. Do not exceed the industry recommendations of 0.3 cubic meter/minute (10 cubic feet/minute) per person stationed in the equipment room. Recommendations for outside air in comfort air-conditioning are 10 to 15 percent of the airflow. If outside air is kept under 1 percent of the airflow, the computer room environment is cleaner and operates more efficiently. Cooling/heating and humidification needs are reduced, and a minimum of contaminated building air is introduced into the installation area.

**Air cleanliness**

Air contaminants can cause equipment malfunction and can damage storage systems. It is essential that steps be taken to prevent air contaminants from entering or being generated within the server room environment. Contaminants include metal particles, solvent vapors, corrosive gases, soot, airborne fibers, or salt.
Use a high-efficiency air filter on each air inlet for outside air to stop dust at the point of entry to the installation site. Special additional filtering is necessary where the environment is exposed to salt air, corrosive gases, or unusual dust/dirt conditions. Electronic equipment is sensitive to air contaminants such as:

- Excessive amounts of soot particles
- Condensate particulates such as carbonates
- Concrete particulates from unsealed concrete
- Metal flakes or filings, such as those produced by sawing, filing, or drilling
- Floor-cleaning solutions with high ammonia content.
- Deteriorating/decomposing building materials, including floor tiles, fabrics, sheetrock, insulation, and acoustical tiles
- Pollutants generated by any servicing performed in and around the computer room
- Paper chaff, dust, and toners from printers within the computer room
- Processing chemicals from reproduction equipment such as microfiche processors.

In electronic equipment, contaminants cause connector contact and motor-bearing degradation. They also cause electrical leakage, shorting paths between integrated circuit leads and between printed wiring traces on printed circuit boards.

Ideally, air supplied to and circulated within the server room and under the floor plenums must pass through mechanical or electrostatic filters. Keep HVAC ducts and plenums and sub-floor areas clean, including cable raceway openings where used. To avoid becoming dust/dirt traps or potential sources of rust, remove all unused cables, hardware, and debris from under the floor area.

During major changes in the server room environment, special considerations must be taken whenever any drilling, sawing, welding, brazing, and so on, is performed.

Precautions must be taken to prevent material particles (concrete or metal particles, and so on) from becoming airborne. Power down storage systems during construction that requires any drilling, sawing, welding, brazing, and so on. In addition, all debris must be removed before powering up one or more systems. Maximum concentrations of corrosive gases and solvent vapors must also be considered.
Power requirements

Read this chapter to help you understand and plan for the necessary electrical power required to operate the HPE 3PAR StoreServ 20000 Storage system.

Electrical requirements and limitations

Before physically installing a storage system, verify if the operating site has the necessary electrical circuitry. For proper redundant power protection, power must be supplied from two or more power sources. Use the approximate requirements for storage system components listed in Power and heat specifications on page 34 to estimate the current, power, and heat requirements for a specific system configuration.

Power quality

The quality of the input power is critical to the performance and reliability of the system. Variations in the input power can cause a power failure or malfunction. Many of the causes of transient signals and noise on commercial power lines are difficult to locate or are beyond the control of the customer. To reduce the impact of the irregularities, some form of power conditioning may be needed. Consult your electrician for assistance.

Voltage and frequency tolerance

Steady state voltage must be maintained within 10% of the normal rated voltage, measured (under load) at the power input terminal of the specified server. The frequency must be maintained at (50-60 HZ), 1 phase 50/60 +2%, -4%.

When there is a possibility of brownouts or other marginal voltage conditions, installing a voltage monitor is advisable.

Systems are tested to comply with the IEC/EN 61000–4–5 standard.

HPE recommends installing a lightning protection device on the server room power source when the following conditions exist:

- The primary power is supplied by an overhead power service.
- The utility company installs lightning protectors on the primary power source.
- The area is subject to electrical storms or equivalent types of power surges.

Power and heat specifications

NOTE:
Refer to the HPE Power Advisor online tool for power consumption, heat loading, and circuit sizing information available at https://paonline56.itcs.hpe.com.

All measurements listed are based on testing conducted at 208 VAC.
### Table 19: Storage system power requirements

<table>
<thead>
<tr>
<th>Cabinet</th>
<th>Input Voltage (VAC)</th>
<th>Frequency (Hz)</th>
<th>Power Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Transactional¹ (watts/BTU/h)</td>
</tr>
<tr>
<td>Single Phase PDU</td>
<td>200 - 240</td>
<td>50 - 60</td>
<td></td>
</tr>
<tr>
<td>3-Phase PDU (North America/Japan)</td>
<td>208-240 p-p</td>
<td>50 - 60</td>
<td></td>
</tr>
<tr>
<td>3-Phase PDU (International)</td>
<td>220-240 p-n; 380-415 p-p</td>
<td>50 - 60</td>
<td></td>
</tr>
<tr>
<td><strong>Power Usage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>480–GB MLC SSD Drive</td>
<td>7.8/26.61</td>
<td>4.5/15.35</td>
<td></td>
</tr>
<tr>
<td>920–GB MLC SSD Encryption Drive</td>
<td>7.9/26.96</td>
<td>4.5/15.35</td>
<td></td>
</tr>
<tr>
<td>480–GB cMLC SSD Drive</td>
<td>7.1/24.23</td>
<td>3.2/10.92</td>
<td></td>
</tr>
<tr>
<td>1920–GB cMLC SSD Drive</td>
<td>8.9/30.37</td>
<td>3.5/11.94</td>
<td></td>
</tr>
<tr>
<td>3840–GB cMLC SSD Drive</td>
<td>11/37.53</td>
<td>3.4/11.6</td>
<td></td>
</tr>
<tr>
<td>300–GB 15K SFF SAS Drive</td>
<td>7/23.88</td>
<td>6.8/23.2</td>
<td></td>
</tr>
<tr>
<td>600–GB 15K SFF SAS/Encryption Drive</td>
<td>7.3/24.91</td>
<td>7/23.88</td>
<td></td>
</tr>
<tr>
<td>600–GB 10K SFF SAS/Encryption Drive</td>
<td>6.5/22.18</td>
<td>6.3/21.5</td>
<td></td>
</tr>
<tr>
<td>1.2–TB 10K SFF SAS Drive</td>
<td>8.2/27.98</td>
<td>6.5/22.18</td>
<td></td>
</tr>
<tr>
<td>1.8–TB 10K SFF SAS Drive</td>
<td>7.5/25.59</td>
<td>7.3/24.91</td>
<td></td>
</tr>
<tr>
<td>2–TB 7.2K SFF SAS Drive</td>
<td>6/20.47</td>
<td>4.6/15.7</td>
<td></td>
</tr>
<tr>
<td>2–TB 7.2K LFF SAS Drive</td>
<td>11.6/39.58</td>
<td>6.6/22.52</td>
<td></td>
</tr>
<tr>
<td>4–TB 7.2K LFF SAS Drive</td>
<td>13.1/44.70</td>
<td>9.1/31.05</td>
<td></td>
</tr>
</tbody>
</table>

*Table Continued*
<table>
<thead>
<tr>
<th>Description</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>6– TB 7.2K LFF SAS/ Encryption Drive</td>
<td>14.3</td>
<td>48.79</td>
</tr>
<tr>
<td>20800/20800 R2 Controller Node Pair</td>
<td>621</td>
<td>2116</td>
</tr>
<tr>
<td>20450 Controller Node Pair</td>
<td>696</td>
<td>2371</td>
</tr>
<tr>
<td>20840/20840 R2 Controller Node Pair</td>
<td>696</td>
<td>2371</td>
</tr>
<tr>
<td>20850/20850 R2 Controller Node Pair</td>
<td>696</td>
<td>2371</td>
</tr>
<tr>
<td>SFF Drive Enclosure (No drives)</td>
<td>152.6</td>
<td>520.69</td>
</tr>
<tr>
<td>LFF Drive Enclosure (No drives)</td>
<td>149.3</td>
<td>509.43</td>
</tr>
<tr>
<td>Service Processor</td>
<td>78.77</td>
<td>268.7</td>
</tr>
<tr>
<td>Example Full Cabinet Configuration (4–Node 20800; 6 Drive Enclosures and 144 600– GB 10K SAS drives)</td>
<td>4335.6</td>
<td>14782.06</td>
</tr>
</tbody>
</table>

\[1 \text{ Under maximum load}\]

**NOTE:**

Some hard drives with smaller capacities may consume more power due to prior generation of manufacturer design and configuration variables. The total system peak inrush current on system startup can vary depending on the system configuration. It is mitigated through a staggered (sequenced) drive spin-up and by distributing the load equally unless there is a failure on a given line.

**Electrostatic discharge**

Storage systems are susceptible to failure due to Electrostatic Discharge (ESD). Electrostatic charges can accumulate on people and furniture because of direct contact with floor coverings or movement while in contact with furniture coverings. Discharge of static electricity to a metal surface on server racks can interfere with the system operation and cause discomfort to anyone who comes in contact with it.

Some factors contributing to electrostatic discharge are the following:

- High-resistance floor covering
- Carpeting without antistatic properties
- Low humidity (less than 20%)

The system is tested to comply with the IEC/EN 61000–4–2 standard.
Branch circuits

Protect the individual panel branch circuits using suitable circuit breakers properly rated according to manufacturer specifications and applicable codes. Label each circuit breaker to identify the branch circuit it is controlling. Also label the receptacle.

Emergency power control

As a safety precaution, you might consider providing emergency power-off controls for disconnecting the main service wiring that supplies storage systems. Install these controls at a convenient place for the operators and next to the main exit doors of the room after checking local electrical codes for further guidelines.

Power Distribution Units

The HPE-integrated PDUs are intended to be used only by 20000 storage system components.

⚠️ WARNING:

To avoid possible injury, damage to storage system equipment, and potential loss of data, do not use the surplus power outlets in the storage system PDUs. Never use outlets in the PDUs to power components that do not belong to the storage system or to power storage system components that reside in other racks. See Power Distribution Units for 20000 and 20000 R2 racked models on page 10 for these requirements.

Power cord connections

Factory-integrated storage systems arrive with all internal power cords configured. Each PDU AC cord connects to the customer-provided outlet and supplies power to the node and drive enclosure power supplies. The power can be routed from the top or bottom of the rack.

Redundant power

The storage system supports redundant power through the use of PDUs and power supplies.

⚠️ WARNING:

To avoid possible injury, damage to storage system equipment, and potential loss of data, do not use the surplus power outlets in the storage system PDUs. Never use outlets in the PDUs to power components that do not belong to the storage system or to power storage system components that reside in other racks.

To support redundant power:

- The power supplies in each enclosure must connect to separate PDUs.
- Each PDU in the system must connect to an independent AC circuit.
Network, cabling, and connectivity requirements

This chapter provides information about determining the best network configuration, including the necessary connections and cable routing options, for the HPE 3PAR Storage system at your site.

NOTE:
The information that follows assumes an established network and discusses how to connect a storage system to that network.

Planning network access

Ensure all external Ethernet and Fibre Channel (FC) cable connections are established and ready to connect before you begin to install the system.

NOTE:
Unless indicated, the customer provides all the networking equipment, including all necessary switches, hubs, and cables.

Establishing the external connections are necessary for:

- Setting up connections between the controller nodes and host computer or computers
- Connecting the storage system to the network, enabling storage system management through the HPE 3PAR StoreServ Management Console and HPE 3PAR OS Command Line Interface (CLI)
- Enabling access to storage system equipment from a Service Processor (SP)
- Facilitating HPE Customer Services personnel to monitor and service the storage system remotely or locally

Supported network topologies for storage systems

Depending on operating site policies and requirements, there are a variety of network topologies to connect the storage system to the local area network. The two supported topologies are shared and private.

Shared networks

With a shared network topology, the storage system and service processor share the internal customer network.

A shared topology requires:

- A static IP address and system name for the storage system
- Minimum of two Ethernet connections from a switch or hub to the storage system controller nodes
- A static IP address for the SP
- One Ethernet connection from a switch or hub to the SP
Private networks

With a private network topology, both the storage system and service processor are on the same private network segment of the customer local area network. All management workstations used to administer the system must also be on the same private network segment.

A private topology requires:

- A static IP address for the storage system
- A minimum of two Ethernet connections from the storage system to a private network segment
- One Ethernet connection from the SP to the private network segment
- A static IP address for the SP
- At least one management station on the private network segment

TCP/IP port assignments

The following table describes the TCP/IP port assignments for communication between various components:
### Table 20: TCP/IP port usage table

<table>
<thead>
<tr>
<th>Port</th>
<th>Usage</th>
<th>Flow of Traffic</th>
</tr>
</thead>
</table>
| 22: The Secure Shell (SSH) Protocol | Used for storage system monitoring and configuration through SSH connections by the following components:  
- HPE 3PAR Service Processor  
- HPE 3PAR OS CLI Client  
- HPE 3PAR Connection Portal | HPE 3PAR Service Processor SSH Client --  
> HPE 3PAR Storage System  
3rd Party SSH Client <--  
> HPE 3PAR Service Processor  
3rd Party SSH Client <--  
> HPE 3PAR CLI Client |
| 80: World Wide Web HTTP | Used by the following component to communicate using the HTTP protocol:  
HPE 3PAR Service Processor | WWW --> HPE 3PAR Service Processor |
| 161: SNMP  | Used for storage system monitoring and configuration by third-party SNMP Manager applications by the following component:  
HPE 3PAR SNMP Agent | 3rd Party SNMP Manager <--  
--> HPE 3PAR SNMP agent |
| 162: SNMPTRAP | Used by the HPE 3PAR SNMP agent to send unsolicited alerts as SNMPv2c traps for 3rd party SNMP Manager applications by the following component:  
HPE 3PAR SNMP Agent | 3rd Party SNMP Manager <--  
--> HPE 3PAR SNMP agent |
| 427: Service Location Protocol (SLP) | Used by the HPE 3PAR CIM API to provide CIM Server location information by the following component:  
HPE 3PAR CIM Server | 3rd Party CIM Client <--  
--> HPE 3PAR CIM Server |

Table Continued
<table>
<thead>
<tr>
<th>Port</th>
<th>Usage</th>
<th>Flow of Traffic</th>
</tr>
</thead>
</table>
| 5781: 3PAR Event Reporting Service | Passes unsolicited events from the storage system and is used by the following components:  
  - HPE 3PAR Service Processor  
  - RM VASA event handling  
  This port was used for IMC events prior to OS version 2.3.1. This port is not used with OS version 3.3.1 and later. | Service Processor <---> HPE 3PAR Event Service |
| 5782: 3PAR Management Service (unsecured) | Used for storage system monitoring and configuration over an unsecured channel by the following components:  
  - HPE 3PAR OS Management Console  
  - HPE 3PAR OS CLI  
  - HPE 3PAR Recovery Manager  
  - HPE 3PAR System Reporter  
  - HPE 3PAR Service Processor | HPE 3PAR SSMC <---> HPE 3PAR CLI Server  
HPE 3PAR CLI <---> HPE 3PAR CLI Server  
Recovery Manager <---> HPE 3PAR CLI Server  
HPE 3PAR System Reporter <---> HPE 3PAR CLI Server  
HPE 3PAR Service Processor --> HPE 3PAR CLI Server |
<table>
<thead>
<tr>
<th>Port</th>
<th>Usage</th>
<th>Flow of Traffic</th>
</tr>
</thead>
</table>
| 5783: 3PAR Management Service with SSL (secured) | Used for storage system monitoring and configuration over a secured channel by the following components:  
  • HPE 3PAR OS Management Console  
  • HPE 3PAR OS CLI  
  • HPE 3PAR Recovery Manager  
  • HPE 3PAR System Reporter | HPE 3PAR SSMC --> HPE 3PAR CLI Server  
HPE 3PAR CLI --> HPE 3PAR CLI Server  
Recovery Manager --> HPE 3PAR CLI Server  
HPE 3PAR System Reporter --> HPE 3PAR CLI Server |
| 5785: 3PAR OS Remote Copy | Used by the Remote Copy Software to receive remote replication storage data sent by the Remote Copy service from another HPE 3PAR Storage Array.  
HPE 3PAR Remote Copy Software  
Unsecured port used by the Remote Copy application to transport data (it does not exist on the management LAN and is only visible/active on RCIP network segments) | HPE 3PAR Remote Copy Software on the HPE 3PAR Storage System <-- 3PAR Remote Copy on HPE 3PAR Storage System  
(A dynamic port is allocated for sending data from the Remote Copy Software on the HPE 3PAR Storage System.) |
### Required cables

The quantities and lengths of the cables required for storage system installation vary according to the specific storage system and network configuration. Fibre Channel cables are used externally to connect the controller node to the fabric switches. SAS cables are used to connect the controller node to the drive chassis (inter- or to).

HPE does not provide any networking cables or equipment with the HPE 3PAR system.

**NOTE:**

For Ethernet and Fibre Channel cables that connect the storage system to the network and hosts, reserve approximately 7 feet (2 meters) of each cable for internal routing within the storage server.

### External cable connections

The following table includes specific guidelines for connecting the controller nodes to the network and to host computers. Refer to Supported network topologies for storage systems on page 38 for descriptions of the supported network topologies.

**Table 21: External controller node connections**

<table>
<thead>
<tr>
<th>Connection Type</th>
<th>Minimum Configuration</th>
<th>Recommended Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet</td>
<td>Connection from the Ethernet switch or hub to two controller nodes</td>
<td>See Supported network topologies for storage systems on page 38.</td>
</tr>
<tr>
<td>Fiber Channel</td>
<td>Connection from a host computer to controller nodes</td>
<td>Separate connections from host computers to each node, through a switch, with connections distributed evenly across all nodes</td>
</tr>
</tbody>
</table>
### Table 22: Link distance with speed and fiber type (meters)

<table>
<thead>
<tr>
<th>Speed</th>
<th>OM1 link distance 62.5 μm core 200 MHz*km</th>
<th>OM2 link distance 50 μm core 500 MHz*km</th>
<th>OM3 link distance 50 μm core 2000 MHz*km</th>
<th>OM4 link distance 50 μm core 4700 MHz*km</th>
<th>OS1 link distance 9 μm core ~infinite MHz*km</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 GFC</td>
<td>300</td>
<td>500</td>
<td>860</td>
<td>*</td>
<td>10000</td>
</tr>
<tr>
<td>2 GFC</td>
<td>150</td>
<td>300</td>
<td>500</td>
<td>*</td>
<td>10000</td>
</tr>
<tr>
<td>4 GFC</td>
<td>50</td>
<td>150</td>
<td>380</td>
<td>400</td>
<td>10000</td>
</tr>
<tr>
<td>8 GFC</td>
<td>21</td>
<td>50</td>
<td>150</td>
<td>190</td>
<td>10000</td>
</tr>
<tr>
<td>10 GFC</td>
<td>33</td>
<td>82</td>
<td>300</td>
<td>*</td>
<td>10000</td>
</tr>
<tr>
<td>16 GFC</td>
<td>15</td>
<td>35</td>
<td>100</td>
<td>125</td>
<td>10000</td>
</tr>
</tbody>
</table>

**NOTE:**
The symbol (*) denotes the link distance on OM4 fiber has not been defined for these speeds.

### Internal cable connections

For storage systems housed in single racks, internal system Fibre Channel cabling is complete upon arrival. For multiple-rack configurations, the installation technician completes connections between the controller node rack and the drive chassis or s.
The following table shows the typical Fiber Channel cable lengths required for a given type of connection:

### Table 23: Fiber channel cable usage guidelines

<table>
<thead>
<tr>
<th>Cable Length</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 meter</td>
<td>Drive chassis to controller node connections in the same.</td>
</tr>
<tr>
<td>10, 25, 100 meter</td>
<td>Cabling between racks. Always round up to the next longest size.</td>
</tr>
</tbody>
</table>

### Service Processor functionality and connectivity

Each StoreServ system requires a service processor (SP). The SP provides remote monitoring and reports system errors, and performs diagnostic and maintenance activities involving the storage system.

**NOTE:**
For more information about SP security and connectivity, see the HPE 3PAR Secure Service Architecture white paper.

When a new HPE 3PAR storage system is installed at a customer location, the SP is also included with the system. If the system is delivered in an HPE rack, the SP is pre-installed in the rack. If the storage system is being installed in a third-party rack, the SP must be installed in the same location as the StoreServ.

HPE uses the data collected by the SP to maintain, troubleshoot, and upgrade the StoreServ system at the customer site. To perform these activities, the SP must communicate with HPE. The connection between the SP and HPE or a local service provider can be made using the customer network and the Internet. Connections using the customer network pass through the customer firewall. The customer can connect to the SP and block external communications at any time.

The following table summarizes the connectivity options for both data transfer and remote operations. Data transfer involves external communications between the SP and HPE. Remote operations include problem solving and diagnostics performed from a remote location. HPE recommends that both data transfer and remote operations occur through the customer network whenever possible.

### Table 24: Service Processor connectivity options

<table>
<thead>
<tr>
<th>Connection Type</th>
<th>Data Transfer / Remote Ops</th>
<th>Software Update Method</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network / Network</td>
<td>Remote update capability</td>
<td>This option is the preferred method of SP connectivity.</td>
<td></td>
</tr>
<tr>
<td>Network / Blocked</td>
<td>Locally by CD</td>
<td>When remote operations are not allowed</td>
<td></td>
</tr>
</tbody>
</table>

### Network and firewall support access

Before performing the Service Processor (SP) connection setup, ensure that there are no customer firewall restrictions to the existing HP servers and new HPE servers on port 443. Firewall and proxy server configuration must be updated to allow outbound connections from the Service Processor to the existing HP servers and new HPE servers.
For a list of HP and HPE server host names and IP addresses, see Firewall and proxy server configuration on page 46.

**Firewall and proxy server configuration**

Firewall and proxy server configuration must be updated on the customer network to allow outbound connections from the Service Processor to the existing HP servers and new HPE servers.

HP and HPE server host names and IP addresses:

- **HPE Remote Support Connectivity Collector Servers:**
  - [https://storage-support.glb.itcs.hpe.com](https://storage-support.glb.itcs.hpe.com) (16.248.72.63)
  - [https://storage-support2.itcs.hpe.com](https://storage-support2.itcs.hpe.com) (16.250.72.82)

- **HPE Remote Support Connectivity Global Access Servers:**
  - [https://c4t18808.itcs.hpe.com](https://c4t18808.itcs.hpe.com) (16.249.3.18)
  - [https://c4t18809.itcs.hpe.com](https://c4t18809.itcs.hpe.com) (16.249.3.14)
  - [https://c9t18806.itcs.hpe.com](https://c9t18806.itcs.hpe.com) (16.251.3.82)
  - [https://c9t18807.itcs.hpe.com](https://c9t18807.itcs.hpe.com) (16.251.4.224)

- **HP Remote Support Connectivity Global Access Servers:**
  - [https://g4t2481g.houston.hp.com](https://g4t2481g.houston.hp.com) (15.201.200.205)
  - [https://g4t2482g.houston.hp.com](https://g4t2482g.houston.hp.com) (15.201.200.206)
  - [https://g9t1615g.houston.hp.com](https://g9t1615g.houston.hp.com) (15.240.0.73)
  - [https://g9t1616g.houston.hp.com](https://g9t1616g.houston.hp.com) (15.240.0.74)

- **HPE RDA Midway Servers:**
  - [https://midway5v6.houston.hpe.com](https://midway5v6.houston.hpe.com) (2620:0:a13:100::105)
  - [https://midway6v6.houston.hpe.com](https://midway6v6.houston.hpe.com) (2620:0:a12:100::106)
  - [https://s54t0109g.sdc.ext.hpe.com](https://s54t0109g.sdc.ext.hpe.com) (15.203.174.94)
  - [https://s54t0108g.sdc.ext.hpe.com](https://s54t0108g.sdc.ext.hpe.com) (15.203.174.95)
  - [https://s54t0107g.sdc.ext.hpe.com](https://s54t0107g.sdc.ext.hpe.com) (15.203.174.96)
  - [https://g4t8660g.houston.hpe.com](https://g4t8660g.houston.hpe.com) (15.241.136.80)
  - [https://s79t0166g.sgp.ext.hpe.com](https://s79t0166g.sgp.ext.hpe.com) (15.211.158.65)
  - [https://s79t0165g.sgp.ext.hpe.com](https://s79t0165g.sgp.ext.hpe.com) (15.211.158.66)
  - [https://g9t6659g.houston.hpe.com](https://g9t6659g.houston.hpe.com) (15.241.48.100)

- **HPE StoreFront Remote Servers:**
- [https://sfrm-production-llb-austin1.itcs.hpe.com](https://sfrm-production-llb-austin1.itcs.hpe.com) (16.252.64.51)

- For communication between the Service Processor and the HPE 3PAR StoreServ Storage system, the customer network must allow access to the following ports on the storage system:
  - Port 22 (SSH)
  - Port 5781 (Event Monitor)
  - Port 5783 (CLI)

- For communication between the browser and the Service Processor, the customer network must allow access to port 8443 on the SP.
Third-party rack mounting

Some installations may want to use third-party racks to house the HPE 3PAR Storage system components supplied by HPE. Only install system components into a four-post rack. Two post-racks are not supported. The rack must have the appropriate Power Distribution Units (PDUs) or power receptacles. It must have access to an adequate power source that provides the recommended level of redundancy.

For sites choosing to mount HPE 3PAR Storage system components in third-party racks, third-party kits are available for all models of the controller node enclosures.

Service installation prerequisites

Location of the rack

- Place the rack in its final location.
- Make sure the operational power, with the correct connectors, exists in the proposed location of the rack. The system will operate in 200-240VAC 50/60Hz and requires 200-240 VAC PDUs or power strips. Each controller node and drive enclosure requires two C13/C14 connections. The SP also requires two C13/C14 connections.
- At least 40 inches (101.6 cm) of service clearance is required directly in front of the rack. This clearance is required due to the depth of the enclosure and potential to damage to other equipment that is in front of the rack/enclosure.
- At least 40 inches (101.6 cm) of service clearance is required on both sides of the front of the rack. This clearance is required because two people must lift the enclosure and set into the rack. The allocated space is necessary on each side for the person to stand and maneuver the enclosure.
- At least 40 inches (101.6 cm) of unobstructed clearance is required directly behind the enclosure to service the nodes. For example, do not attach PDUs, power-strips, power cord routing, and other components to the back of the rack. There must be unobstructed clearance directly behind the node enclosure to remove or install components.

Rack requirements

- The rack is operational and has enough space for the installation. HPE installation and upgrade services do not include building a new rack, reracking, or moving existing components. The quantity of StoreServ Storage and drive enclosures in the system defines the required contiguous rack space. There must be 8U of rack space for the StoreServ 20450 Storage enclosure. There must be 16U of rack space for the StoreServ 20800/20840/20850 and the 20800 R2/20840 R2/20850 R2 Storage enclosure. 2U of rack space is required for each SAS drive enclosure and 1U of rack space is required for the service processor. HPE also recommends having an open rack space above and below the installed storage system components for drive enclosure upgrades.
- Only use a 4-post rack for an installation. Using any other types of racks is prohibited. The vertical RETMA rails must have square holes.
- Customer cabling (power, FC, SAS, and Ethernet) must be routed in an organized path so it does not restrict the removal of StoreServ system components or obstruct the servicing area.
- The rail kits for the 20000 series node and drive enclosures have a supported depth range of 28.5 inch to 32.75 inches. This measurement is between the inside of the RETMA rails from front to back. Shipment of the units installed in the third-party racks is NOT supported.
Enclosure installation

If a mechanical lift is not available, use at least two people to lift the controller node chassis during any installation or servicing purposes.

Service limitations (Also applicable to third-party rack installations)

HPE will not perform the following tasks:

- Assemble the rack from components.
- Configure the rack hardware.
- Position the rack.
- Perform any extensive racking, reracking, or cabling activities, including cabling activities involving conduits, raceways, patch panels, and movement or configuration of computer room floor panels.
- Complete a full site inspection. A full site inspection includes a comprehensive analysis of power, cooling and humidity, airborne contaminants, and vibration. It also includes sufficient structural capability of the raised floor in the data center to accommodate the weight of the array to be installed.

Dimensional requirements

If you are installing any HPE equipment in a four-post rack, the rack must comply with the minimum and maximum specifications. A clear path between the front and rear vertical (RETMA) rails must be established. There must not be any obstructions to the area when installing the rails and enclosures.

Refer to Physical specifications on page 13 for physical specifications of the enclosures.

Rack space considerations

HPE highly recommends installing enclosures in contiguous rack space because it ensures that the copper SAS cables reach the connecting ports, and provides consistency for servicing and installation. When additional drive enclosures are added, HPE recommends placing the additional enclosures adjacent to the existing ones.

Your site configuration should also specify an area of contiguous space within the rack for installing HPE equipment, such as the top, bottom, or middle part of the rack. HPE recommends considering an area closest to the location of the sourced host cables when you are determining an installation area.

Build the rack from bottom to top.

Maintaining minimum clearances

Maintain proper clearances for all mounted installations to allow for proper ventilation, cabling, and access for maintenance.
Table 25: Minimum clearances

<table>
<thead>
<tr>
<th>Service</th>
<th>Front: At least 40 inches (101.6 cm)</th>
<th>Rear: At least 40 inches (101.6 cm) unobstructed clearance directly behind the enclosure. Sides: n/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilation</td>
<td>Front: 12 inch (30.5 cm)</td>
<td>Rear: 12 inch (30.5 cm)</td>
</tr>
<tr>
<td></td>
<td>Sides: n/a</td>
<td>Neither vented floor tiles nor raised flooring are required.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doors: rack doors must be at least 1.5 inch (3.81 cm) away from the front and rear of the enclosures and be perforated with a minimum 50% open pattern across the entire surface.</td>
</tr>
<tr>
<td>Cabling</td>
<td>Front: n/a</td>
<td>Rear: 30 inch (76.2 cm) total clearance</td>
</tr>
<tr>
<td></td>
<td>Sides: n/a</td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

Rack mounting kits

Table 26: Mounting kits

<table>
<thead>
<tr>
<th>Controller node and drive chassis</th>
<th>Service Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>782418-001 4 or 8-way chassis rail kit</td>
<td>683811-001 Processor 1U mounting kit</td>
</tr>
<tr>
<td>697305-001 2U drive chassis rail kit</td>
<td></td>
</tr>
</tbody>
</table>

Four-post shelf kit

The four-post shelf kits allow the drive enclosure and components to be mounted in a variety of four-post racks. Each enclosure or component requires its own mounting kit.

**NOTE:**
Do not stack the enclosures on top of another one.

Four-post shelves are mounted to the front and rear rails of a four-post rack. Each side requires two shelf halves and the corresponding mounting hardware. The shelf halves are expandable to fit racks of different depths. Front shelf halves have left and right pieces, while the rear shelf half can be used on either side of the rack. When the installation is complete on both the left and right sides, the equipment can be placed on the shelves and secured to the RETMA rails.

Redundant power requirements

Each storage system component is supplied with redundant power supplies. The controller nodes and drive enclosure are designed to continue operating even when AC power is lost to one of the power supplies. For this feature to operate properly, each power supply line cord within an enclosure must be attached to an independent electrical source, each controlled and protected by its own circuit breaker.
Multiple outlets in a power distribution unit or power strip do not constitute an independent electrical source.

Additionally, each line cord must be plugged into an outlet that can support the entire load of its enclosure.

⚠️ **CAUTION:**

The PDUs are not provided with the installation kit. Verify the PDUs meet the minimum power requirements before powering on the system. Special consideration must be given to this requirement. If a power supply fails, overloading of the branch circuit may result. The power failure can shut down the storage system or cause similar failures in all the equipment connected to the branch circuit.

⚠️ **CAUTION:**

AC line cords must be securely attached to the customer PDUs and outlets with cord-retention mechanisms to prevent accidental disconnection during service activities. HPE provides cord retention mechanisms on HPE power supplies but does not supply retention devices for connection to the customer PDUs or outlets.

**NOTE:**

See [Power requirements](#) on page 34 for complete details about power requirements.
Websites

General websites

- Hewlett Packard Enterprise Information Library
  www.hpe.com/info/EIL
- Single Point of Connectivity Knowledge (SPOCK) Storage compatibility matrix
  www.hpe.com/storage/spock
- Storage white papers and analyst reports
  www.hpe.com/storage/whitepapers

For additional websites, see Support and other resources.
Support and other Resources

Support and other resources

Accessing Hewlett Packard Enterprise Support

- For live assistance, go to the Contact Hewlett Packard Enterprise Worldwide website:
  http://www.hpe.com/assistance
- To access documentation and support services, go to the Hewlett Packard Enterprise Support Center website:
  http://www.hpe.com/support/hpesc

Information to collect

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Accessing updates

- Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.
- To download product updates:
  Hewlett Packard Enterprise Support Center
  www.hpe.com/support/hpesc
  Hewlett Packard Enterprise Support Center: Software downloads
  www.hpe.com/support/downloads
  Software Depot
  www.hpe.com/support/softwaredepot
- To subscribe to eNewsletters and alerts:
  www.hpe.com/support/e-updates
- To view and update your entitlements, and to link your contracts and warranties with your profile, go to the Hewlett Packard Enterprise Support Center More Information on Access to Support Materials page:
  www.hpe.com/support/AccessToSupportMaterials
IMPORTANT:
Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HPE Passport set up with relevant entitlements.

Customer self repair
Hewlett Packard Enterprise customer self repair (CSR) programs allow you to repair your product. If a CSR part needs to be replaced, it will be shipped directly to you so that you can install it at your convenience. Some parts do not qualify for CSR. Your Hewlett Packard Enterprise authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider or go to the CSR website:
http://www.hpe.com/support/selfrepair

Remote support
Remote support is available with supported devices as part of your warranty or contractual support agreement. It provides intelligent event diagnosis, and automatic, secure submission of hardware event notifications to Hewlett Packard Enterprise, which will initiate a fast and accurate resolution based on your product's service level. Hewlett Packard Enterprise strongly recommends that you register your device for remote support.

If your product includes additional remote support details, use search to locate that information.

Remote support and Proactive Care information
HPE Get Connected
www.hpe.com/services/getconnected
HPE Proactive Care services
www.hpe.com/services/proactivecare
HPE Proactive Care service: Supported products list
www.hpe.com/services/proactivecaresupportedproducts
HPE Proactive Care advanced service: Supported products list
www.hpe.com/services/proactivecareadvancedsupportedproducts

Proactive Care customer information
Proactive Care central
www.hpe.com/services/proactivecarecentral
Proactive Care service activation
www.hpe.com/services/proactivecarecentralgetstarted

Warranty information
To view the warranty for your product or to view the Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products reference document, go to the Enterprise Safety and Compliance website:
www.hpe.com/support/Safety-Compliance-EnterpriseProducts

Additional warranty information
HPE ProLiant and x86 Servers and Options
www.hpe.com/support/ProLiantServers-Warranties
Regulatory information

To view the regulatory information for your product, view the Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products, available at the Hewlett Packard Enterprise Support Center:

www.hpe.com/support/Safety-Compliance-EnterpriseProducts

Additional regulatory information

Hewlett Packard Enterprise is committed to providing our customers with information about the chemical substances in our products as needed to comply with legal requirements such as REACH (Regulation EC No 1907/2006 of the European Parliament and the Council). A chemical information report for this product can be found at:

www.hpe.com/info/reach

For Hewlett Packard Enterprise product environmental and safety information and compliance data, including RoHS and REACH, see:

www.hpe.com/info/ecodata

For Hewlett Packard Enterprise environmental information, including company programs, product recycling, and energy efficiency, see:

www.hpe.com/info/environment

Documentation feedback

Hewlett Packard Enterprise is committed to providing documentation that meets your needs. To help us improve the documentation, send any errors, suggestions, or comments to Documentation Feedback (docsfeedback@hpe.com). When submitting your feedback, include the document title, part number, edition, and publication date located on the front cover of the document. For online help content, include the product name, product version, help edition, and publication date located on the legal notices page.
Regulatory information


Regulatory model numbers

For the purpose of regulatory compliance certifications and identification, this product has been assigned a unique regulatory model number (RMN).

The regulatory model number can be found on the product nameplate label, along with all required approval markings and information.

When requesting compliance information for this product, always refer to the regulatory model number. The regulatory model number is not the marketing name or model number of the product.

Products covered by this manual: Regulatory Model Number (RMN) 3PARA-SV1431.

NOTE:
All options and models of the HPE 3PAR StoreServ 20000 Storage family are covered by this manual.

Safety precautions

Retain and follow all product safety and operating instructions. Always refer to the documentation (printed or electronic) supplied with your product. If there is a conflict between this document and the product documentation, the product documentation takes precedence. To reduce the risk of bodily injury, electric shock, fire, and damage to the equipment, observe all warnings on the product and in the operating instructions.

General precautions

⚠️ CAUTION:
Qualified personnel must install and maintain the products.

If the product sustains damage requiring service, disconnect the product from the AC OR DC electrical outlet and refer servicing to an HPE authorized service provider. Examples of damage requiring service include:

- The power cord, extension cord, or plug has been damaged.
- Liquid has been spilled on the product or an object has fallen into the product.
- The product has been exposed to rain or water.
- The product has been dropped or damaged.
- The product does not operate normally when you follow the operating instructions.

To reduce the risk of personal injury or damage to the product:
• Place the product away from radiators, heat registers, stoves, amplifiers, or other products that produce heat.
• Never use the product in a wet location.
• Avoid inserting foreign objects through openings in the product.
• Move products with casters carefully. Avoid quick stops and uneven surfaces.

Symbols on equipment
The following symbols may be placed on equipment to indicate the presence of potentially hazardous conditions:

- **WARNING:** To reduce the risk of injury from a hot surface or a hot component, allow the surface or component to cool before touching.

- **WARNING:** To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades, and servicing to qualified personnel.

- **WARNING:** To reduce the risk of injury, do not access areas displaying this symbol. Refer all maintenance, upgrades, and servicing to qualified personnel.

- **WARNING:** To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manual material handling.

Precautions for maintaining and servicing products
To reduce the risk of electric shock or damage to the equipment when installing, maintaining, or servicing products, observe the following precautions:

- Some products contain power supplies that can produce hazardous energy levels. To determine whether it contains these power supplies, refer to the documentation included with your product. Individuals who are knowledgeable about the procedures, precautions, and hazards associated with equipment containing hazardous energy levels must install the internal options and routine maintenance and service of this product.

- Allow the product to cool before removing covers and touching internal components.

- Do not use conductive tools that could bridge live parts.
- Remove all watches, rings, or loose jewelry when working in hot-plug areas of an energized server and storage products.

- Where provided, do not attempt to defeat safety interlocks.

- Some products have covers or doors to access hot-plug components and may allow access to hazardous energy circuits or moving fans:
  - Lock the doors during normal operation.
  - OR
  - Install the product in a controlled access location where only qualified personnel have access to the product.

- Power down the equipment and disconnect all AC OR DC power cords before removing any access covers for non-hot-plug areas.

- Do not replace non-hot-plug components while power is applied to the product. First, shut down the product and disconnect all AC OR DC power cords.

- Do not exceed the level of repair specified in the procedures in the product documentation. All troubleshooting and repair procedures are detailed to allow only subassembly or module-level repair. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.

- Verify that the AC OR DC power supply branch circuit that provides power to the rack is not overloaded. This will reduce the risk of personal injury, fire, or damage to the equipment. The total rack load should not exceed 80 percent of the branch circuit rating. Consult the electrical authority having jurisdiction over your facility wiring and installation requirements.

**Power cords**

To reduce the risk of electric shock or damage to the equipment:

- Use an approved AC OR DC or DC power cord, as appropriate. If you have questions about the type of power cord to use, contact your HPE authorized service provider.

- If you have not been provided with a power cord for your product or for any AC-powered option intended for your product, purchase a power cord that is approved for use in your country.

- Use a power cord rated for your product and for the voltage and current marked on the electrical ratings label of the product. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.

- Do not place objects on power cords or cables. Arrange them so that no one may accidentally step on or trip over them.

- Do not pull on a cord or cable. When unplugging from the electrical outlet, grasp the cord by the plug.

- Make sure that the total ampere rating of all products plugged into an extension cord or power strip does not exceed 80 percent of the ampere ratings limit for the extension cord or power strip.

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.

- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times, or connect to an approved DC source.
Batteries

⚠️ WARNING:
Some HPE products may contain internal replaceable battery cells or battery packs. There is risk of fire and burns if the battery pack is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not disassemble, crush, puncture, short external contacts, or dispose of the battery in fire or water.
- Replace only with the HPE spare battery designated for this product. Dispose of used batteries according to the instructions from the manufacturer and local disposal requirements.
- For battery holders (for example, coin cells), observe the correct polarity when changing the battery/cell. There is a danger of explosion if the battery is installed incorrectly.

Power supplies
Hot-plug power supplies are not designed to be removed or installed with AC or DC power connected to the power supply. To reduce the risk of electric shock or damage to the equipment when handling hot-plug power supplies:

- Install the power supply before connecting the power cord to the power supply.
- Disconnect the power cord before removing the power supply from the product.
- If the system has multiple sources of power, you must disconnect all AC or DC power cords from the power supplies to disconnect power from the system.

Verify that the external power source connected to your product matches the type of power source indicated on the electrical ratings label. If you are not sure of the type of power source required, consult your HPE authorized service provider or local power company.

Regulatory compliance notices

United States of America

Federal Communications Commission Notice
Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into the two classes of Class A and Class B, depending upon their intended installation.

Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

FCC Class A Rating Label
The FCC rating label on the device shows the classification of the equipment (Class A). Class A devices do not have an FCC logo or ID on the label.
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

**Declaration of Conformity**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding this product, contact us by mail or telephone: Hewlett-Packard Company P. O. Box 692000, Mail Stop 530113 Houston, Texas 77269-2000, 1-800-HP-INVENT (1-800-474-6836).

For questions regarding this FCC declaration, contact us by mail or telephone: Hewlett-Packard Company P. O. Box 692000, Mail Stop 510101 Houston, Texas 77269-2000, 1-281-514-3333.

To identify the product, refer to the part, series, or model number found on the product.

For continuous quality improvement, calls may be recorded or monitored.

**Modifications**

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company could void the user's authority to operate the equipment.

**Cables**

When provided, connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

**Canadian Class A Notice (Avis Canadien)**

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la class A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Such compliance is denoted on the product rating label by “CAN ICES-3 (A) / NMB-3 (A)”.

**European Union Notices**

This compliance is indicated by the following conformity marking placed on the product:

![CE Mark](image)

This product complies with the following EU directives:

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC
- RoHS Directive 2011/65/EU
Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.

Certificates can be obtained from [http://www.hp.com/eu/certificates](http://www.hp.com/eu/certificates).

Hewlett-Packard GmbH, HQ-TRE, Herrenberger Strasse 140, 71034 Boeblingen, Germany.

**Japan**

**Japanese VCCI-A notice**

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合、使用者が適切な対策を講ずるよう要求されることがあります。VCCI-A

**Japanese power cord statement**

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

**South Korea**

**Class A Equipment Notice**

A급기기 (업무용 방송통신기기)

이 기기는 업무용(A급)으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외의 지역에서 사용하는 것을 목적으로 합니다.

**Taiwan**

**Class A Equipment Notice**

警告使用者:

這是甲類的資訊產品，在居住的環境中 使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

**EAC: Belarus, Kazakhstan, Russia**

Compliance with the safety and Electromagnetic Compatibility (EMC) requirements of the EuroAsian Economic Commission (EAC, formerly the Customs Union) is indicated by the EAC OR DC logo.

**EAC**

Manufacturer and Local Representative Information

Manufacturer’s information:

Hewlett-Packard Company, 3000 Hanover Street, Palo Alto, California 94304, U.S.

Local Representative information Russian:

- HP Russia
Environmental notices

HPE is committed to providing our customers with information about the chemical substances in our products to comply with legal requirements such as REACH (Regulation EC No 1907/2006 of the European Parliament and the Council). A chemical information report for this product can be found at http://www.hp.com/go/reach.

For HPE product environmental and safety information and compliance data, including RoHS and REACH, see http://www.hp.com/go/ecodata.

For HPE environmental information, including company programs, product recycling, and energy efficiency, see http://www.hp.com/environment.

Waste Electrical and Electronic Equipment (WEEE) Statements

Disposal of Waste Equipment by Users in Private Households in the European Union

This symbol means do not dispose of your product with your other household waste. Instead, you should protect human health and the environment by handing over your waste equipment to a designated collection point for the recycling of waste electrical and electronic equipment. For more information, please contact your household waste disposal service.

English notice

Изхвърляне на отпадъчно оборудване от потребители в частни домакинства в Европейския съюз

Този символ върху продукта или опаковката му показва, че продуктът не трябва да се изхвърля заедно с другите битови отпадъци. Вместо това, трябва да зададете човешкото здраве и околната среда, като предоставите отпадъчното оборудване в предназначен за събирането му пункт за рециклиране на неизползвано електрическо и електронно оборудване. За допълнителна информация се свържете с фирмата по чистота, чиито услуги използвате.

Bulgarian notice

Likvidace zařízení v domácnostech v Evropské unii

Tento symbol znamená, že nesmíte tento produkt likvidovat spolu s jiným domovním odpadem. Místo toho byste měli chránit lidské zdraví a životní prostředí tím, že jej předáte na k tomu určené sběrné místnosti, kde se zabývají recyklaci elektrického a elektronického vybavení. Pro více informací kontaktujte společnost zabývající se sbírem a svozem domovního odpadu.

Czech notice

Bortskaffelse af brugt udstyr hos brugere i private hjem i EU

Dette symbol betyder, at produktet ikke må bortskaffes sammen med andet husholdningsaffald. Du skal i stedet den menneskelige sundhed og miljø ved at aflægge dit brugte udstyr på et dertil beregnet inddenslingssted for brugt, elektrisk og elektronisk udstyr. Kontakt nærmeste renovationsafdeling for yderligere oplysninger.

Danish notice

Inzameling van afgedankte apparatuur van particuliere huishoudens in de Europese Unie

Dit symbool betekent dat het product niet mag worden gedeponeerd bij het overige huishoudelijke afval. Bescherm de gezondheid en het milieu door afgedankte apparatuur in te leveren bij een hiervoor bestemd inzamelpunt voor recycling van afgedankte elektrische en elektronische apparatuur. Neem voor meer informatie contact op met uw gemeenteninigingsdienst.

Dutch notice
Regulatory information

Estonian notice

Aravisatavate seadmete likvideerimine Euroopa Liidu eramajapidamistes

Finnish notice

Kotitalousjätteiden hävittäminen Euroopan unionin alueella
Tämä symboli merkitsee, että laitetta ei saa hävittää muiden kotitalousjätteiden mukana. Sen sijaan sinua on sujattava ihmisten terveyttä ja ympäristöä toimittamalla käytöstä poistettu laite sähkö- tai elektroniikkajätteen kierrätyspisteeseen. Lisätietoja saat jättehuoltoyhtiöltä.

French notice

Mise au rebut d'équipement par les utilisateurs privés dans l'Union Européenne
Ce symbole indique que vous ne devez pas jeter votre produit avec les ordures ménagères. Il est de votre responsabilité de protéger la santé et l'environnement et de vous débarrasser de votre équipement en le remettant à une déchetterie effectuant le recyclage des équipements électriques et électroniques. Pour de plus amples informations, prenez contact avec votre service d'élimination des ordures ménagères.

German notice

Entsorgung von Altgeräten von Benutzern in privaten Haushalten in der EU

Greek notice

Απόρριψη άχρηστου εξοπλισμού από ιδιώτες χρήστες στην Ευρωπαϊκή Ένωση
Αυτό το σύμβολο σημαίνει ότι δεν πρέπει να απορρίπτετε το προϊόν με τα λοιπά οικιακά απορρίμματα. Αντίθετα, πρέπει να προστατεύσετε την ανθρώπινη υγεία και το περιβάλλον παραδίδοντας τον άχρηστο εξοπλισμό σας σε εξοπλισμό εξοπλισμό για την ανακύκλωση περιβάλλοντας ηλεκτρικού και ηλεκτρονικού εξοπλισμού. Για περισσότερες πληροφορίες, επικοινωνήστε με την υπηρεσία απόρριψης απορριμάτων της περιοχής σας.
RoHS Material Content Declarations

China RoHS Material Content Declaration


India RoHS Material Content Declaration

This product complies with the "India E-waste (Management and Handling) Rule 2011" and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers in concentrations exceeding 0.1 weight % and 0.01 weight % for cadmium, except for the exemptions set in Schedule 2 of the Rule.

Turkey RoHS Material Content Declaration

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

Ukraine RoHS Material Content Declaration

Обладнання відповідає вимогам Технічного регламенту щодо обмеження використання деяких небезпечних речовин в електричному та електронному обладнанні, затвердженого постановою Кабінету Міністрів України від 3 грудня 2008 № 1057.
Warranty information

HPE ProLiant Servers
http://www.hpe.com/support/ProLiantServers-Warranties

HPE Enterprise Servers
http://www.hpe.com/support/EnterpriseServers-Warranties

HPE Storage Products
http://www.hpe.com/support/Storage-Warranties

HPE Networking Products
http://www.hpe.com/support/Networking-Warranties