## Overview

### HPE SN1600 Series 32Gb Fibre Channel Host Bus Adapter

The HPE  32Gb Fibre Channel Host Bus Adapters are designed to support ProLiant Servers with PCI-Express I/O slots to connect to Hewlett Packard Enterprise Storage Arrays using the 32/16/8 Gb Fibre Channel protocol.

The HPE 32GFC Host Bus Adapters bring datacenter infrastructure components to a higher level of performance and efficiency with the ability to deliver twice the bandwidth performance of 16Gb HBAs at lower latency. A 32GFC HBA purchased today is backward compatible with 16Gb and 8Gb storage networks and will protect future investments. When using storage intensive applications, such as backup/restore, database transactions, virtualization, and rich media, the increased performance of the 32GFC infrastructure enables rapid storage and retrieval of critical information. Designed for environments with greater virtual machine density and bandwidth requirements, the 32GFC HBAs enable more applications and VMs to run on a single host server and Fibre Channel port, resulting in reduced cabling and a higher return on IT investment. Enhanced diagnostics and orchestration capabilities make 32Gb Fibre Channel adapters well suited for to deliver on SLA requirements and application performance.

## Models

| Description | SKU |
|---|---|
| **Single Port** | |
| **SN1610Q** | |
| HPE SN1610Q 32Gb 1-port Fibre Channel Host Bus Adapter | R2E08A |
| **SN1610E** | |
| HPE SN1610E 32Gb 1-port Fibre Channel Host Bus Adapter | R2J62A |
| **SN1600Q** | |
| HPE SN1600Q 32Gb Single Port Fibre Channel Host Bus Adapter | P9M75A |
| **SN1600E** | |
| HPE SN1600E 32Gb Single Port Fibre Channel Host Bus Adapter | Q0L11A |
| **Dual Port** | |
| **SN1610Q** | |
| HPE SN1610Q 32Gb 2-port Fibre Channel Host Bus Adapter | R2E09A |
| **SN1610E** | |
| HPE SN1610E 32Gb 2-port Fibre Channel Host Bus Adapter | R2J63A |
| **SN1600Q** | |
| HPE SN1600Q 32Gb Dual Port Fibre Channel Host Bus Adapter | P9M76A |
| **SN1600E** | |
| HPE SN1600E 32Gb Dual Port Fibre Channel Host Bus Adapter | Q0L12A |

## What's New

- FC-NVMe support in Windows, VMware and Linux OSes

## Standard Features

### Key Features and Benefits

#### Performance

Up to two ports of 32Gb FC delivers Up to 5 million IOPS and 12,800MBps bandwidth across two 32GFC ports. Enhanced reliability, diagnostics, and accelerated deployment powered by 32Gb Fibre Channel ASIC.

Advanced integration with HPE B-series 16Gb and 32Gb fabrics to speed SAN deployment and configuration, speed and simplify SAN diagnostics, improve SAN resiliency and Quality of Service.

Best combination of Fibre Channel IOPS, latency and throughput performance enables increased application and database transactions per second, enables faster large block transfers and increases the number of VMs that can be supported per server.

#### PCIe 4.0

The HPE SN1610Q & SN1610E HBAs are PCIe 4.0 ready

#### Support for greater Server Virtualization

Higher bandwidth and ability to virtualize physical ports with QoS in the adapter, make these adapters ideal for high density server virtualization environments for increased scalability. Enables more applications and VMs to run on a single server and Fibre Channel port, resulting in reduced cabling and a higher return on IT investment.

#### Connectivity to HPE Server and Storage

Provides an HPE-branded HBA solution which has undergone extensive HPE interoperability testing for connecting HPE ProLiant and Apollo servers into HPE Storage and networking environments.

#### LUN Prioritization and QoS

HPE 32Gb FC HBAs support Class Specific Control (CS_CTL) which allows prioritization and bandwidth allocation at the LUN level. In addition, the SN1610Q and SN1610E adapters support Virtual Machine ID (VM-ID) which further enhances prioritization and monitoring to the virtual machine within the SAN, providing a VM-aware storage network. These features are managed using the management software, downloadable from **HPE Software Downloads.**

#### FC-NVMe Ready

HPE 32Gb Fibre Channel Host Bus Adapters are NVMe-enabled to support emerging NVM Express (NVMe) over Fibre Channel storage networks. The HBAs are capable of running both SCSI protocol and NVME protocol on the same wire at the same time.

- FC-NVMe support in Windows Server 2016 / 2019 with Native Multipathing (Asymmetric namespace access (ANA)) and Boot from SAN (BFS) for SN1600Q, SN1610Q adapters
- FC-NVMe support for ESX 7.0 U1, RHEL 8.3, RHEL 7.9, SLES 15 SP2 for SN1600Q, SN1610Q adapters
- Supports FC-NVMe-2 Sequence Level Error Recovery (SLER)

#### Active Health System

All HPE 32GFC adapters support HPE ProLiant Active Health System integration. This helps administrators accurately troubleshoot and resolves problem within the server faster.

#### Smart SAN support

Smart SAN is a protocol agnostic application embedded in SAN components that enables the 3PAR to orchestrate configuration, settings and policies in a SAN. HPE Smart SAN's Target Driven Zoning enables you to configure zones accurately in minutes and not in hours and its automatic discovery mechanism creates a powerful platform which would enable real-time diagnostics with self-healing in the near future.

## Standard Features

### Secure Firmware download
The SN1610Q and SN1610E delivers enhanced security via the new secure firmware update feature which protects and ensures the authenticity of device firmware.

### T10 Protection Information (T10-PI)
HPE 32GFC adapters support T10-PI for enhanced data integrity when connected to T10-PI enabled arrays like HPE 3PAR StoreServ.

### Forward error correction (FEC)
FEC is enabled and improved at 32GFC as required by the FC Specification, automatically correcting transmission errors and improving network performance and resiliency.

### Link cable beaconing (LCB)
LED beaconing for ports on both ends of a physical link simplifies cable identification and management.

### D-Port Diagnostics
Quickly run automated diagnostic tests in a single step, across multiple adapters, servers, and fabric components to assess connectivity. Optics and cable problems are identified and resolved.

### FDMI
Quickly check connectivity to SAN devices and query the switch management server for in-depth details on connected devices.

### Read Diagnostic Parameters (RDP)
Identify the source of network and media errors like cyclic redundancy check (CRC) and loss of sync (LOS) by remotely accessing diagnostic information from anywhere in the fabric.

### Fabric-assigned Port Worldwide Name (FA_WWN)
Administrators can preconfigure WWN settings at the switch port allowing Fibre Channel adapter to acquire port WWN address from the 16Gb or 32GFCfabric. This allows SAN administrator to configure SAN zoning without need for servers to be present.

### Firmware Integrity Protection With Hardware Root of Trust
The HPE SN1610Q & SN1610E 32Gb FC HBAs incorporate a hardware RoT that keeps malicious firmware from hijacking the adapter. The adapters RoT enables both integrity and authenticity during adapter firmware updates by both validating firmware embedded signatures with hardware embedded keys to ensure that only bona fide firmware executes, and protecting firmware updates that are applied over public networks.

## Standard Features

### Brocade Port Trunking

SN1610E port aggregation capability (also known as trunking) provides a method to aggregate physical ports together to form a single logical port. Aggregating physical ports to make a single high-bandwidth data path increases the logical connection bandwidth for applications that need it, such as data warehousing and virtual machine migration.

### Universal SAN Congestion Mitigation (UCSM)

USCM support (Fabric Performance Impact Notifications, FPIN) for SN1600Q, SN1610Q in the following tools & OS distros:

- QCC CLI, ESX CLI, Windows / Linux / ESX drivers
- USCM I/O Throttling mitigation support

## Service and Support

### HPE Pointnext - Service and Support

**Get the most from your HPE Products.** Get the expertise you need at every step of your IT journey with **HPE Pointnext Services**. We help you lower your risks and overall costs using automation and methodologies that have been tested and refined by HPE experts through thousands of deployments globally. HPE Pointnext **Advisory Services**, focus on your business outcomes and goals, partnering with you to design your transformation and build a roadmap tuned to your unique challenges. Our **Professional** and **Operational Services** can be leveraged to speed up time-to-production, boost performance and accelerate your business. HPE Pointnext specializes in flawless and on-time implementation, on-budget execution, and creative configurations that get the most out of software and hardware alike.

### Recommended Services

Support for this adapter is at the level of server it is a part of. Please check the QuickSpecs of the server.

### Parts and Materials

Hewlett Packard Enterprise will provide HPE-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements.

Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product QuickSpecs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services.

#### Defective Media Retention

An option available with HPE Pointnext Complete Care and HPE Pointnext Tech Care and applies only to Disk or eligible SSD/Flash Drives replaced by HPE due to malfunction.

### HPE Support Center - AI Powered and Digitally Enabled Support

Achieve faster time to resolution with access to product-specific resources and expertise through a brand-new digital and data driven customer experience. Sign-in to the all-new customer engagement platform, featuring reimagined digital case management— simplified for easy case creation and management with inline knowledge recommendations. A personalized task panel shows cases awaiting action, expiring support and more. New virtual agent — powerful AI-driven troubleshooting with seamless transition to live agent with conversation history included and the ability to verify contract, warranty, and case status. And Enhanced, intelligent search – Machine Learning tailors content easily and instantly as it's used.

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- Customers purchasing from a commercial reseller can find HPE Support Services at **https://ssc.hpe.com/portal/site/ssc/**

## Service and Support

### Warranty

3-0-0 Three-year parts exchange warranty. Additional warranty protection can be purchased.

HPE Global Services provides a three-year, limited warranty, fully supported by a worldwide network of resellers and service providers and toll-free 7 x 24 hardware technical phone support for the duration of the warranty. In addition, available service offerings include a full range of HPE Pointnext operational packaged hardware and software services.

**Notes:** Certain restrictions and exclusions apply. Consult the HPE Customer Support Center for details.

# Technical Specifications

## Family Information

| | R2E08A | R2E09A | R2J62A | R2J63A |
|---|---|---|---|---|
| **Number of channels** | Single | Dual | Single | Dual |
| **Port Speed** | 32GFC | 32GFC | 32GFC | 32GFC |
| **OS Supported** | **Notes:** Always refer to the HPE Single Point of Connectivity Knowledge for HPE Storage Products at: **http://www.hpe.com/storage/spock** for specific product support information and specific OS versions supported. | | | |
| **Microsoft Windows Server 2019/2016 & HyperV** | x64 | x64 | x64 | x64 |
| **RHEL 8.x, 7.x** | x64 | x64 | x64 | x64 |
| **VMware ESX/ESXi 7.0,6.7, 6.5** | x64 | x64 | x64 | x64 |
| **SLES 15.x, 12.x** | x64 | x64 | x64 | x64 |
| **Servers Supported** | Select HPE ProLiant and Apollo Gen10 servers<br>**Notes:** Refer to server Quick Specs for details regarding supported options. | | | |
| **Array Platforms Supported** | Refer to **http://www.hpe.com/storage/spock** for specific product support information | | | |
| **What's Included in the Box?** | 32 Gbps HBA with standard bracket, one 32 Gbps SFP+ transceiver, low-profile bracket, documentation | 32 Gbps HBA with standard bracket, two 32 Gbps SFP+ transceiver, low-profile bracket, documentation | 32 Gbps HBA with standard bracket, one 32 Gbps SFP+ transceiver, low-profile bracket, documentation | 32 Gbps HBA with standard bracket, two 32 Gbps SFP+ transceiver, low-profile bracket, documentation |
| **Environmental Operating Temperature** | 32° F to 131° F<br>0° C to 55° C | | 32° F to 131° F<br>0° C to 55° C | |
| **Environmental Storage Temperature** | -4° F to 158° F<br>(-20° C to 70° C) | | -4° F to 185° F<br>(-20° C to 85° C) | |
| **Environmental Relative Humidity Operating** | 10% to 90% RH at 40° C (non-condensing) | | 5% to 95% (non-condensing) | |
| **Product Dimensions (W x D x H)** | 6.6 x 0.49 x 2.73 in<br>(167.64 x 12.44 x 69.34mm) | | 6.6 x 0.43 x 2.71 in<br>(167.64 x 10.92 x 68.83mm) | |
| **Media** | Multi-mode Optic (SFP+) | | Multi-mode Optic (SFP+) | |
| **Connector** | Short wave laser with LC type connector | | Short wave laser with LC type connector | |
| **PCIe Connector** | PCIe 4.0 x8 | | PCIe 4.0 x8 | |
| **Auto-negotiation** | 32/16/8 Gbps | | 32/16/8 Gbps | |

## Technical Specifications

| | P9M75A | P9M76A | Q0L11A | Q0L12A |
|---|---|---|---|---|
| **Number of channels** | Single | Dual | Single | Dual |
| **Port Speed** | 32GFC | 32GFC | 32GFC | 32GFC |
| **OS Supported** | **Notes:** Always refer to the HPE Single Point of Connectivity Knowledge for HPE Storage Products at: **http://www.hpe.com/storage/spock** for specific product support information and specific OS versions supported. | | | |
| **Microsoft Windows Server 2019/2016/2012/2012 R2 & HyperV** | x64 | x64 | x64 | x64 |
| **RHEL 8.x, 7.x, 6.x** | x64 | x64 | x64 | x64 |
| **VMware ESX/ESXi 7.0, 6.5, 6.0** | x64 | x64 | x64 | x64 |
| **SLES 15.x,12.x, 11.x** | x64 | x64 | x64 | x64 |
| **Servers Supported** | Select HPE ProLiant and Apollo Gen10 & Gen10 plus servers<br>**Notes:** Refer to server Quick Specs for details regarding supported options. | | | |
| **Array Platforms Supported** | Refer to **http://www.hpe.com/storage/spock** for specific product support information | | | |
| **What's Included in the Box?** | 32 Gbps HBA with standard bracket, one 32 Gbps SFP+ transceiver, low-profile bracket, documentation | 32 Gbps HBA with standard bracket, two 32 Gbps SFP+ transceiver, low-profile bracket, documentation | 32 Gbps HBA with standard bracket, one 32 Gbps SFP+ transceiver, low-profile bracket, documentation | 32 Gbps HBA with standard bracket, two 32 Gbps SFP+ transceiver, low-profile bracket, documentation |
| **Environmental Operating Temperature** | 32° F to 131° F<br>0° C to 55° C<br>110 LFPM at 55° C | | 32 F to 131° F<br>0° C to 55° C | |
| **Environmental Storage Temperature** | -4° F to 158° F<br>(-20° C to 70° C) | | -4° F to 185° F<br>(-20° C to 85° C) | |
| **Environmental Relative Humidity Operating** | 10% to 90% RH at 40° C (non-condensing) | | 10% to 90% RH at 40° C (non-condensing) | |
| **Product Dimensions (W x D x H)** | 6.59 x 0.49 x 4.38 in<br>(12.34x167.51x111.25mm) | | 6.6 x 0.69 x 2.71 in<br>(167.6 x 17.5 x 68.9 mm) | |
| **Media** | Multi-mode Optic (SFP+) | | Multi-mode Optic (SFP+) | |
| **Connector** | Short wave laser with LC type connector | | Short wave laser with LC type connector | |
| **PCIe Connector** | PCIe 3.0 x8 | | | |
| **Auto-negotiation** | 32/16/8 Gbps | | | |

## Summary of Changes

| Date | Version History | Action | Description of Change |
|---|---|---|---|
| 07-Sep-2021 | Version 14 | Changed | Removed some of the deprecated features |
| 04-May-2021 | Version 13 | Changed | Added FC-NVMe OS support |
| 03-Aug-2020 | Version 12 | Changed | Added SN1610E details |
| 15-Jun-2020 | Version 11 | Changed | Overview and Technical Specifications sections were updated. |
| 02-Dec-2019 | Version 10 | Changed | Standard Features section was updated. |
| 21-Oct-2019 | Version 9 | Changed | Standard Features section was updated. |
| 07-Oct-2019 | Version 8 | Changed | SN1610Q adapters |
| 07-Jan-2019 | Version 7 | Changed | Feature information edited with latest information<br>Overview and Service and Support sections were updated |
| 18-Dec-2017 | Version 6 | Changed | Overview section was revised. |
| 07-Aug-2017 | Version 5 | Changed | Added Gen10 server support |
| 08-May-2017 | Version 4 | Changed | Changes made throughout the document |
| 24-Feb-2017 | Version 3 | Changed | Feature and table of specifications are cleaned up with latest information |
| 28-Nov-2016 | Version 2 | Changed | 32Gb SN1600E Single Port and Dual Port adapters added |
| 26-Sep-2016 | Version 1 | New | New QuickSpecs |

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