



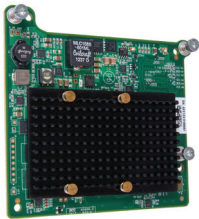
HPE 16Gb Fibre Channel Host Bus Adapters

Fibre Channel (FC) remains the protocol of choice for connecting servers to shared storage over a SAN. Hewlett Packard Enterprise offers a variety of 16 Gb FC Host Bus Adapters (HBAs) based on industry-leading QLogic Gen 5 FC technology. These include each of the following adapters: HPE StoreFabric SN1000Q/SN1100Q 16Gb FC HBAs, HPE QMH2672 16Gb FC HBA for HPE BladeSystem c-Class, and HPE Synergy 3830C 16Gb FC HBA. These high performance adapters help resolve data center complexities by enabling a storage network infrastructure that supports

powerful virtualization features, application-aware services, and simplified management. Our portfolio of 16 Gb FC HBAs provides advanced storage networking features capable of supporting one of the most demanding virtualized and private cloud environments while fully leveraging the capabilities of high-performance 16 Gb FC HBAs and all-flash arrays (AFAs). Powerful management tools automate and simplify SAN provisioning to help reduce cost and complexity, while the unmatched 16 Gbps performance mitigates potential I/O bottlenecks in today's powerful multiprocessor, multicore servers.

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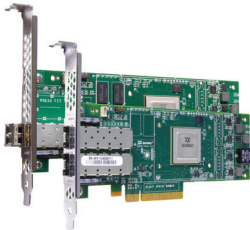
Model	Part number
HPE QMH2672 16Gb FC HBA for BladeSystem c-Class	710608-B21
HPE Synergy 3830C 16Gb FC HBA	777452-B21
HPE StoreFabric SN1000Q 16Gb 1-port PCIe FC HBA	QW971A
HPE StoreFabric SN1000Q 16Gb 2-port PCIe FC HBA	QW972A
HPE StoreFabric SN1100Q 16Gb Single Port FC HBA	P9D93A
HPE StoreFabric SN1100Q 16Gb Dual Port FC HBA	P9D94A



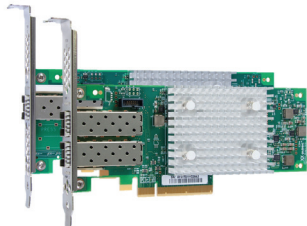
HPE QMH2672



HPE Synergy 3830C



HPE StoreFabric SN1000Q



HPE StoreFabric SN1100Q

Superior performance

The HPE 16Gb FC HBAs can accelerate mission-critical enterprise applications by delivering up to 1.3 million IOPS for physical, virtual, and private cloud environments. These HPE 16Gb FC HBAs from QLogic deliver superior storage application performance in virtualized and non-virtualized environments compared to 8 Gb FC offerings, with support for over 650,000 I/O transactions per second per port. This along with reduced latency of Gen 5 16 Gb FC SAN infrastructure makes 16 Gb FC HBA ideal for shared connectivity to flash storage arrays.

Virtualization optimized

The HPE 16Gb FC HBAs support standards-based virtualization features. Support for N_Port ID Virtualization (NPIV) enables a single FC adapter port to provide multiple virtual ports for increased network scalability. These HPE adapters also support class-specific control (CS_CTL) with Brocade fabrics to provide quality of service (QoS) within the fabric across the virtual ports. In addition, the 16 Gbps line rate per physical port delivers unmatched storage performance to increase the number of virtual machines (VMs) per physical server.

Enhanced capability with Brocade Gen 5 16Gb FC technology

HPE 16Gb FC HBAs are designed to provide enhanced capability and management when working in a Brocade Gen 5 16Gb FC SAN environments. They are also optimized to work with HPE 3PAR StoreServ Storage with support for Express Writes, T10 Protection Information (T10-PI), and HPE Smart SAN for HPE 3PAR. Enhanced features integrate with HPE 3PAR StoreServ Management Console software to enable storage administrators to zone the fabric, map, and mask servers to LUNs, and run diagnostics, all from the HPE 3PAR StoreServ Management Console, saving IT administrators' time and resources.

In addition, the HPE 16Gb FC HBAs include advanced capabilities that are enabled when deployed with supported HPE B-series 16Gb FC Switches and Directors. By combining these industry-leading solutions, SAN administrators can take advantage of enhanced features that improve availability, accelerate deployment, and increase network performance.

Improved TCO and reliability

Each of the HPE 16Gb FC HBAs delivers advanced link diagnostics, which improve availability and support for high performance fabrics. Using the ClearLink Diagnostic Port (D_Port), administrators can quickly run a battery of automated diagnostic tests to assess the health of links and fabric components.

The HPE 16Gb FC HBAs support link cable beaconing (LCB), which enables administrators to visually identify both ends of a physical link. In a large data center with hundreds of ports and cables to manage, a simple command turns on port LED beacons on both ends of a link cable connection. Administrators can use LCB to quickly identify connection peer ports without tracing the cable.

HPE 16Gb FC HBAs also include expanded support for the read diagnostic parameters (RDP) command, which provides detailed port, media, and optics diagnostics. From any point in the fabric, an administrator can use RDP to easily discover and diagnose link-related errors and degrading conditions on any N_Port-to-F_Port link. Support for vendor-specific fabric device management interface (FDMI) commands are also integrated into these HPE adapters to provide information on host, target, and I/O statistics, and allow for key information to be passed from the adapter through the fabric to management applications like HPE Smart SAN or Brocade Network Advisor.

The HPE adapters from QLogic also support FC Ping and FC Trace Route, which are enabled in conjunction with QLogic QConvergeConsole (QCC) management utilities. These commands help SAN administrators verify connectivity between host and target, and identify the data path across the topology map displayed in QCC.

The extensive suite of diagnostic tools increases uptime and performance, allowing organizations to address problems before they impact operations.

Rapid server deployment and orchestration

QLogic technology includes fabric pre-provisioning services that enable servers to be quickly deployed, replaced, and moved across the SAN. By leveraging the fabric-assigned port worldwide name

(FA-WWN) and fabric-based boot LUN discovery (F-BLD) capabilities, the creation of zones, LUNs, and other services can be completed before the servers arrive onsite mitigating time consuming, manual tasks that typically delay server deployment.

Performance SLA enforcement with VM-level QoS

Network performance can be dramatically improved by implementing the industry-standard class-specific control (CS_CTL) frame prioritization QoS, which helps alleviate network congestion. When HPE adapters from QLogic with Smart SAN-optimized technology are connected to supported SAN fabrics, traffic is classified as it arrives at the switch, and is then processed on the basis of configured priorities. Traffic can be prioritized for delivery or subjected to limited delivery options. As a result, mission-critical workloads can be assigned a higher priority than less time-sensitive network traffic for enhanced performance.

Higher resiliency and performance with automatic error recovery

Forward error correction (FEC) improves performance and link integrity to support higher end-to-end data rates by automatically recovering from many transmission errors without resending the frames. FEC automatically detects and recovers from bit errors, which results in higher availability and performance.

In addition to FEC, HPE 16Gb FC HBAs support T10-PI, which provides end-to-end data integrity validation capability. T10-PI support prevents the risk of silent data corruption in environments running HPE 3PAR StoreServ arrays and Oracle's Linux® with the Unbreakable Enterprise Kernel.

Simplified management

The QLogic unified management application, QCC, provides single-pane-of-glass management across generations of HPE FC adapters from QLogic. In addition, QLogic supports all major application program interfaces (APIs) for deployment flexibility and integration with third-party management tools, including the VMware® vCenter™ and Brocade Network Advisor.

High availability and reliability

HPE 16Gb FC HBAs continue the tradition of providing complete port-level isolation across their FC controller architecture. This architecture provides independent function, transmit, and receive buffers, an on-chip CPU, DMA channels, and a firmware image for each physical port on the adapter. These features enable complete port-level isolation, prevent errors and firmware crashes from propagating across ports, and provide

predictable and scalable performance across adapter ports. The architecture delivers ultimate reliability to meet the needs of mission-critical enterprise applications with lower power and fewer CPU cycles, all while maintaining peak performance.

In addition, Overlapping Protection Domains (OPDs) helps achieve the highest level of reliability as data moves to and from the PCI bus and FC network.

Leadership, confidence, and trust

The HPE 16Gb FC HBAs are compatible with the same FC software driver stack that has been tested and validated across most major hardware platforms and most major hypervisors and OSs. The HBAs are backward compatible with existing 4 Gb FC and 8 Gb FC infrastructure, leveraging existing SAN investments.

Technical specifications**Bus interface specifications**

Bus interface	PCI Express (PCIe) 3.0 x8
Host interrupts	INTx and MSI-X
Compliance	PCI Express Base Specification, Rev. 3.1 PCI Express Card Electromechanical Specification, Rev. 3.0 PCI Bus Power Management Interface Specification, Rev. 1.2

Fibre Channel specifications

Throughput	16 Gbps line rate per port (maximum)
Logins	Support for 2,048 concurrent logins and 2,048 active exchanges
Port virtualization	NPIV
Compliance	SCSI-3 Fibre Channel Protocol (SCSI-FCP) Fibre Channel Tape (FC-TAPE) Profile SCSI Fibre Channel Protocol-2 (FCP-2) Second Generation Fibre Channel Generic Services (FC-GS-2) Third Generation Fibre Channel Generic Services (FC-GS-3) Fibre Channel Physical Interface 5 (FC-PI5)

Tools and utilities

Management tools and device utilities	QConvergeConsole: a unified management tool (GUI and CLI) that spans generations of QLogic FC adapters
Boot support	BIOS, Unified Extensible Firmware Interface (UEFI), Forth Code (FCode)
APIs	Storage Networking Industry Association (SNIA) HBA API v2 Storage Management Initiative Specification (SMI-S)
Operating systems	For the latest applicable operating system information, see the HPE Single Point of Connectivity Knowledge (SPOCK) portal at hpe.com/storage/spock .

End-to-end provisioning and management features.

These features require a supported Brocade switch running Fabric OS version 7.3.0a or later.

Performance and resiliency	CS_CTL QoS FEC T10-PI
Diagnostics	ClearLink Diagnostics (D_Port) LCB RDP FDMI FC Ping FC Trace Route
Deployment and management	FA-WWN F-BLD

Physical specifications

Ports	1 Port—HPE StoreFabric SN1000Q 16Gb 1-port PCIe FC HBA (QW971A) 2 Port—HPE StoreFabric SN1000Q 16Gb 2-port PCIe FC HBA (QW972A) 1 Port—HPE StoreFabric SN1100Q 16Gb Single Port FC HBA (P9D93A) 2 Port—HPE StoreFabric SN1100Q 16Gb Dual Port FC HBA (P9D94A) 2 Port—HPE QMH2672 16Gb FC HBA for BladeSystem c-Class (710608-B21) 2 Port—HPE Synergy 3830C 16Gb FC HBA (777452-B21)
Form factor	Low profile PCIe card (6.6 inches × 2.731 inches) Custom form factors are also available

Environment and equipment specifications

Temperature	Operating: 0°C to 55°C (32°F to 131°F) with air flow at 110 LFPM at 50°C Storage: -20°C to 70°C (-4°F to 158°F)
Humidity	Operating: 10% to 90% Storage: 5% to 95%

Maximum cable distances

Fiber optic speed	OM2 style cable	OM3 style cable	OM4 style cable (HPE PremierFlex)
2 Gb	300 m	500 m	> 500 m
4 Gb	150 m	270 m	400 m
8 Gb	50 m	250 m	190 m
16 Gb	35 m	100 m	125 m

Agency approvals—safety

U.S./Canada	UL 60950-1; CSA C22.2
Europe	TUV EN60950-1; TUV IEC 60950-1; CB Certified

Agency approvals—EMI and EMC (Class A)

U.S./Canada	FCC Rules, CFR Title 47, Part 15, Subpart Class A; Industry Canada, ICES-003: Class A
Europe	EN55022; EN55024; EN61000-3-2; EN61000-3-3
Japan	VCCI Class A
New Zealand/Australia	AS/NZS Class A
Korea	KC-RRA Class A
Taiwan	BSMI CNS 13438

Ordering information

HPE StoreFabric SN1000Q/SN1100Q 16Gb Single Port FC HBA (part number QW971A/P9D93A)	Ships in an individually packed box with SW optical transceivers and a standard height bracket installed. Half height bracket also included.
HPE StoreFabric SN1000Q/SN1100Q 16Gb Dual Port FC HBA (part number QW972A/P9D94A)	Ships in an individually packed box with SW optical transceivers and a standard height bracket installed. Half height bracket also included.
HPE QMH2672 16Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class (part number 710608-B21)	Ships in an individually packed box with quick install card and a product warranty statement.
HPE Synergy 3830C 16Gb Fibre Channel Host Bus Adapter (part number 777452-B21)	Ships in an individually packed box with quick install card and a product warranty statement.

Learn more at
hpe.com/us/en/storage/networking.html



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