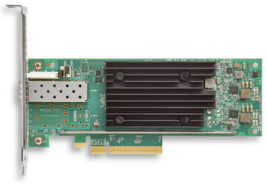
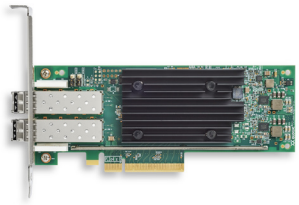
HPE® SN1610Q 32Gb Fibre Channel Host Bus Adapters

Enhanced 32GFC HBAs from Marvell® QLogic®



Single Port SN1610Q



Dual Port SN1610Q

- Secure firmware update backed by hardware Root of Trust
- Improve scale out NVMe efficiencies by delivering concurrent support for FCP-SCSI and FC-NVMe
- Industry leading performance of up to 2 million IOPS and 12,800MBps of aggregate throughput
- Universal SAN Congestion Mitigation (USCM) helps pinpoint and prevent SAN Congestion utilizing Fabric Performance Indication Notification (FPIN) technology
- Port isolation design delivers deterministic and scalable performance on each port along with enhanced reliability

The HPE® SN1610Q Host Bus Adapters (HBAs), based on Marvell QLogic technology, are Enhanced 32-Gigabit Fibre Channel (GFC) HBAs that secure mission critical data and protect against firmware corruption through hardware-based Root of Trust (RoT). In addition, support for FC-nonvolatile memory express (NVMe) provides improved performance on flash-based systems.

Leveraging over 16 years of market leadership, the HPE SN1610Q 32Gb FC HBAs are designed from the ground up for customers looking to accelerate databases, host more virtual machines (VMs), and reduce total cost of ownership (TCO), all while leveraging their investment in NVMe-based all flash arrays. HPE SN1610Q 32Gb FC HBAs provide full backward compatibility with 16GFC and 8GFC SANs.

NVMe® Over Fibre Channel (FC-NVMe)

Workloads that demand higher throughput, IOPS, and lower latency are moving to flash. The NVMe protocol has been designed from the ground up for flash and features deep parallelism, random access, and flash access over PCI Express® (PCIe®) to maximize bandwidth.

NVMe works best when coupled with a network that can provide reliable, resilient, lossless, low-latency, and high-performing transport. FC-NVMe extends these benefits over a Fibre Channel fabric.

The HPE SN1610Q 32Gb FC HBAs support low-latency access to scale out NVMe with full support for the FC-NVMe protocol. These adapters can simultaneously support FC-NVMe and FCP-SCSI storage traffic on the same physical port, enabling customers to migrate to NVMe at their own pace.

The SN1610Q 32Gb FC HBAs bring the best of both worlds by offering up to 2 million IOPS and line rate 32GFC performance, while delivering low-latency access to NVMe and SCSI storage over a Fibre Channel network.

Firmware Integrity Protection With Hardware Root of Trust

Security threats continue to evolve and increase, driving Chief Information Officers towards securing the server all the way down to the firmware at the lowest layers of the server platform, where attacks are the most difficult to detect. To address this issue, the HPE SN1610Q 32Gb FC HBAs incorporate a hardware RoT that keeps malicious firmware from hijacking the adapter. The SN1610Q's 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.

- Host more VMs and improve database transactional performance by up to 50 percent
- StorFusion™ technology simplifies deployment and troubleshooting

Fully Featured FC Technology

Marvell QLogic FC technology provides the industry's most fully featured Enhanced 32GFC adapter, designed to meet and exceed the requirements of modern SANs. Marvell's FC solution offers higher per-port performance (1 million IOPS) than previous generations; and its power-efficient, port-isolated design enables data centers to reduce their carbon footprint.

HPE SN1610Q 32Gb FC HBAs resolve data center complexities by enabling a storage network infrastructure that supports powerful virtualization features like N_Port ID virtualization (NPIV), Virtual Machine ID (VM-ID), and application-aware services with standards based quality of service (QoS), and simplified management.

Marvell StorFusion technology delivers streamlined provisioning and improved resiliency with built-in forward error correction (FEC), which addresses the needs of agile IT organizations that run hybrid cloud infrastructures and require mission-critical reliability, guaranteed network performance, and the ability to scale their SANs to business needs.

Innovations That Improve Business Productivity And Integrity

These HPE adapters from Marvell QLogic, powered by StorFusion technology, include advanced capabilities when deployed with supported Brocade® and Cisco® switches. By implementing these industry-leading solutions together, SAN administrators can take advantage of enhanced features that improve availability, accelerate deployment, and increase network performance.

Marvell Universal SAN Congestion Mitigation Technology (USCM)

SAN congestion, although rare, has the potential to quickly spread and significantly disrupt application performance leading to lost business. Modern SANs, specifically those with flash storage and mix of Fibre Channel endpoint speeds can be prone to congestion. SAN Congestion typically occurs when slower FC endpoints cannot accept responses generated by flash/NVMe storage, a condition referred to as oversubscription/over-utilization. Rarely, a misbehaving FC device can also lead to SAN congestion when it is unable to replenish credits which are key to reliable Fibre Channel transmissions, a condition referred to as slow-drain. SAN congestion when timely detected, can be isolated and decisive actions applied. A Fibre Channel standard, Fabric Performance Impact Notifications (FPINs) bring congestion awareness to FC endpoints.

Utilizing FPINs, HPE SN1610Q Adapters implement Marvell QLogic Universal SAN Congestion Mitigation Technology (USCM). USCM uniquely works both Brocade and Cisco SAN fabrics to keep applications running at peak performance by providing an in-band and zero touch SAN congestion detection, notification, and avoidance system. HPE SN1610Q HBAs interact with Cisco and Brocade SANs using both the more reliable FC primitive signaling as well as protocol events to bring awareness of the presence of congestion, peer congestion, link integrity, lost frames etc. HPE SN1610Q HBAs also have the ability to enable decisive actions such as fine-grained I/O throttling, automatic path failover, load balancing, and flow quarantining to ensure that SAN congestion is mitigated with minimum impact to application performance.

Marvell QLogic USCM technology, offered at no additional cost, brings strong awareness of SAN congestion and implements decisive actions to prevent application degradation. It is highly recommended for modern SANs.

Improved Total Cost of Ownership and Reliability

StorFusion technology delivers advanced link diagnostics, which improve availability and support for high-performance fabrics. Using the Diagnostics Port feature with a Brocade or Cisco switch that supports Fibre Channel diagnostics, administrators can quickly run a battery of automated diagnostic tests to assess the health of links and fabric components.

The HPE SN1610Q 32Gb FC HBAs support link cable beacon (LCB) technology, which enables administrators to visually identify both ends of a physical link.

Read diagnostic parameters (RDP) provide optics and media diagnostics while the link is in service, enabling identification of link-related errors and degrading conditions on the HBA-to-FC switch link.

Automatic buffer-to-buffer credit recovery (BB-CR) helps overcome performance degradation, congestion, and link resets caused by buffer credit loss, especially on longer distance and high-loss fiber connections.

Rapid Server Deployment and Orchestration

StorFusion technology includes fabric pre-provisioning services that enable servers to be quickly deployed, replaced, and moved across the SAN. By leveraging fabric-assigned port worldwide name (FA-WWN) and fabric-based boot LUN discovery (F-BLD) capabilities, the creation of zones, LUNs, SAN-based boot images, and other services can be completed before the servers arrive on site— eliminating time-consuming, manual tasks that typically delay server deployment.

Single-Pane-of-Glass Management for Simplified Management

The Marvell unified management application, QConvergeConsole® (QCC), provides single-pane-of-glass management across generations of Marvell QLogic FC and FastLinQ® Ethernet technology. In addition, Marvell provides powerful extensions for Windows® Admin Center and VMware® vCenter® Plug-in to manage generations of its FC HBAs while delivering features like topology maps and cluster wide firmware updates.

Unparalleled Insight and QoS for Virtualized Deployments

The HPE SN1610Q 32Gb FC HBAs support several standards-based virtualization features that optimize virtual server deployment, troubleshooting, and application performance.

Marvell QLogic virtual machine ID (VM-ID) technology seamlessly integrates with Brocade's VM Insight to allow customers to effectively monitor and manage their Fibre Channel storage networks, load balancing VM clusters with storage to ensure efficient use of the storage resources. Supported for VMware ESXi 6.0 and later, I/O requests and responses can be tagged with the VM-ID of the appropriate virtual machine, providing end-to-end visibility at the VM level.

Additionally, support for NPIV enables a single FC adapter port to provide multiple virtual ports for increased network scalability. Standard class-specific control (CS_CTL)-based QoS technology per NPIV port allows multi-level bandwidth controls and guarantees per VM. As a result, mission-critical workloads can be assigned a higher priority than less time-sensitive storage traffic for optimized performance.

High Availability and Reliability

HPE SN1610Q 32Gb FC HBAs provide complete port-level isolation across the FC controller architecture. This unique architecture provides an independent protocol handing function, transmit/receive buffers, an on-chip CPU, DMA channels, and a firmware image for each port. Complete port-level isolation prevents errors and firmware crashes from propagating across all ports and provides predictable and scalable performance across all ports. See Figure 1.

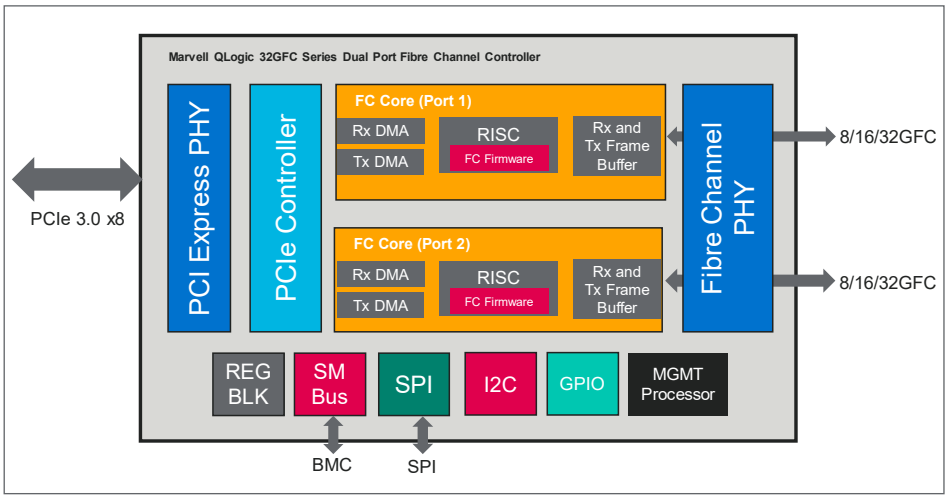


Figure 1. HPE SN1610Q 32Gb FC HBAs Block Diagram

The HPE SN1610Q 32Gb FC HBAs also provide end-to-end data integrity with support for T10 Protection Information (T10 PI), which prevents the risk of silent data corruption in environments running Oracle® Linux® with the Unbreakable Enterprise Kernel.

Leadership, Confidence, and Trust

The HPE SN1610Q 32Gb FC HBAs are compatible with the same FC software driver stack that has been tested and validated across all major hardware platforms, all major hypervisors, and operating systems. Operating at 32GFC, these adapters are backward compatible with existing 16GFC infrastructure, leveraging existing SAN investments.

Marvell QLogic is the undisputed leader in FC adapters, with over 20 years in business and over 20 million ports shipped, with multiple generations of FC products that have been qualified by all major server OEMs. Marvell owns the most established, proven FC stack in the industry with more FC ports shipped than any other vendor.

Host Bus Interface Specifications

Bus Interface

- SN1610Q: PCIe 4.0 ×8 (single- and dual-port)

Host Interrupts

- INTx and MSI-X

Compliance

- *PCIe Base Specification*, rev. 4.0
- *PCIe Card Electromechanical Specification*, rev. 3.0
- *PCIe Card Electromechanical Specification*, rev. 4.0 draft 0.9
- *PCI Bus Power Management Interface Specification*, rev. 1.2
- *PCI Hot Plug Specification*, rev. 1.1

Fibre Channel Specifications

Throughput

- 6,400MBps full duplex line rate per port

Logins

- Support for 2,048 concurrent logins and 2,048 active exchanges per port

Port Virtualization

- NPIV

Compliance

- *SCSI Fibre Channel Protocol 4 (FCP-4)*
- *Fibre Channel Tape (FC-TAPE) Profile*
- *Fibre Channel Generation Services 8 (FC-GS-8)*
- *Fibre Channel-Physical Interface-5 (FC-PI-5)*
- *Fibre Channel-Physical Interface-6 (FC-PI-6)*
- *Fibre Channel Link Services 4 (FC-LS-4)*
- *Fibre Channel Framing and Signaling 4 (FC-FS-4)*
- *Fibre Channel - Non-volatile Memory Express - 2 (FC-NVMe-2)*

Tools and Utilities

Management Tools and Device Utilities

- QConvergeConsole CLI: a unified management tool that supports multiple generations of MarvellFC adapters
- MCTP/PLDM
- ESXCLI Plug-in for vSphere
- MRVLFC PowerKit (cmdlets for Windows PowerShell)
- QCC Plug-ins for vSphere
- Marvell QLogic FC QCC Extension for Windows Admin Center

Tools and Utilities (continued)

Boot Support

- BIOS
- Unified Extensible Firmware Interface (UEFI)
- Forth code (FCode)

APIs

- SNIA HBA API V2
- SMI-S

Operating Systems

- For the latest applicable operating system information, see https://www.hpe.com/Storage/Spock/

End-to-End Provisioning and Management Features

The following features require a supported Brocade or Cisco switch.

Performance

- QoS CS_CTL
- FEC for 16GFC
- BB-CR: automatic buffer credit loss detection and recovery
- FPIN and hardware signaling for Congestion Management

Diagnostics

- Diagnostics Port
- LCB
- RDP

Deployment and Management

- FA-WWN
- F-BLD
- VM-ID
- Fabric device management interface (FDMI) enhancements

Physical Specifications

Ports

- SN1610Q: 32GFC, single-port FC HBA
- SN1610Q: 32GFC, dual-port FC HBA

Form Factor

- Single port: low profile PCIe card (6.6 inches × 2.731 inches)
- Dual port: low profile PCIe card (6.6 inches × 2.731 inches)

Environment and Equipment Specifications

Temperature

- Operating: 0°C to 55°C (32°F to 131°F)
- Storage: –20°C to 70°C (–4°F to 158°F)

Humidity

- Relative (noncondensing): 10% to 90%
- Storage: 5% to 95%

Cable Distances

- Multimode optic:

Rate	Cable and Distance (m)		
	OM2	OM3	OM4/ OM5
8GFC	50	150	190
16GFC	35	100	125
32GFC	20	70	100

Agency Approvals—Safety

US and Canada

- UL 60950-1
- CSA C22.2

Europe

- TUV EN60950-1
- TUV IEC 60950-1
- CB Certified
- EN/IEC 62368 2nd, 3rd Edition

Agency Approvals—EMI and EMC (Class A)

US and Canada

- FCC Rules, CFR Title 47, Part 15, Subpart Class A
- Industry Canada, ICES-003: Class A

Europe

- EN55032
- EN55024
- EN61000-3-2
- EN61000-3-3
- CISPR 32 Class A

Japan

- VCCI: Class A

New Zealand and Australia

- AS/NZS: Class A

Korea

- KC-RRA Class A

Agency Approvals—EMI and EMC (Class A) (continued)

Taiwan

- BSMI CNS 13438

UK

- UKCA

Ordering Information

SN1610Q (Single Port)
Part number R2E08A

- Ships in an bulk packed box with standard-height bracket installed
- Ships with 32GFC SR optical transceiver installed

SN1610Q (Dual Port)
Part number R2E09A

- Ships in an bulk packed box with standard-height bracket installed
- Ships with 32GFC SR optical transceivers installed

To deliver the data infrastructure technology that connects the world, we're building solutions on the most powerful foundation: our partnerships with our customers. Trusted by the world's leading technology companies over 25 years, we move, store, process and secure the world's data with semiconductor solutions designed for our customers' current needs and future ambitions. Through a process of deep collaboration and transparency, we're ultimately changing the way tomorrow's enterprise, cloud, automotive, and carrier architectures transform—for the better.

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