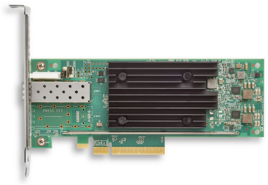
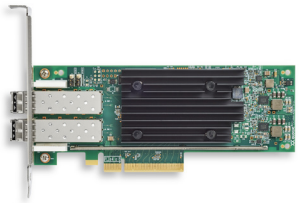
Marvell® QLogic® 2780 Series

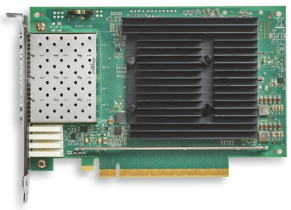
Enhanced 32GFC Fibre Channel Adapters with StorCryption™ (Encryption)



Single Port: QLE2780



Dual Port: QLE2782



Quad Port: QLE2784

- StorCryption offloads encryption of data in flight to ensure secure data transfers across the fabric between initiators and targets
- Hardware Root of Trust ensures SAN Integrity with Cryptographically Secured Firmware
- Improve scale-out NVMe efficiencies by delivering concurrent support for FCP and FC-NVMe
- Universal SAN Congestion Mitigation (USCM) helps pinpoint and prevent SAN Congestion utilizing Fabric Performance Indication Notification (FPIN) technology

The Marvell QLogic 2780 Series Adapters are Enhanced 32-Gigabit Fibre Channel (GFC) Host Bus Adapters (HBAs) that secure mission critical data with StorCryption capabilities and hardware-based Root of Trust (RoT). The adapters are available in single, dual, and quad ports across standard form factors.

Leveraging over 20 years of Fibre Channel expertise, the 2780 Series 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), while leveraging their investment in nonvolatile memory express (NVMe®)-based all flash arrays.
Marvell QLogic 2780 Series FC (32GFC) HBAs provide full backward compatibility with 16GFC and 8GFC SANs.

STORCRYPTION—ENCRYPTING DATA IN FLIGHT

The 2780 Series Adapters offer StorCryption, which encrypts user data in flight between initiator and target end points across a standard FC SAN. These adapters seamlessly encrypt before endpoint transmission and decrypt all data after endpoint reception by transforming FC frames into the IPsec encapsulating security payload (ESP) format, compliant with the FC-SP-2 standard. These adapters utilize symmetric key encryption between an initiator and target to securely conceal all data in flight, while providing message integrity. The 2780 Series Adapters encrypt/decrypt operations are applied to user data while keeping FC frame headers in the clear, thereby making these StorCryption operations independent of the underlying FC SAN infrastructure. Therefore, StorCryption can secure data in flight independent of switch-based ISL encryption and/or storage encryption of data at rest. StorCryption secures the wire between initiators and targets, thereby providing Defense in Depth to the SAN.

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 Marvell QLogic 2780 Series Adapters incorporate a hardware RoT that prevents malicious firmware from hijacking the FC HBA. The 2780 Series RoT enables both integrity and authenticity during adapter firmware updates by both validating firmware signatures with hardware keys to ensure that only bonafide firmware executes, and protecting firmware updates that are applied over public networks.

- Performance of up to 4 million IOPS and 25,600MBps of aggregate throughput
- Port isolation design delivers deterministic and scalable performance on each port
- Marvell StorFusion™ technology accelerates deployment, simplifies diagnostics, enhances reliability, and optimizes performance
- Improve database transactional performance, enable faster business decisions with up to 2x faster data mining, and host more VMs
- Supports PCIe 4.0 systems
- Available in single, dual, and quad-port versions

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 lossless, low-latency, and high-performing transport. FC-NVMe extends these benefits over a Fibre Channel fabric.

The 2780 Series Adapters support low-latency access to scale out NVMe with full support for the FC-NVMe-2 protocol. The 2780 Series 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 2780 Series FC Adapters bring the best of both worlds by offering up to 4 million IOPS and line rate 32GFC performance, while delivering low-latency access to NVMe and SCSI storage over a Fibre Channel network.

Fully Featured FC Technology

Marvell QLogic FC technology provides the industry's most fully featured 32GFC adapter, designed to meet and exceed the requirements of modern SANs. Marvell's FC solution offers 50-percent 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.

Marvell QLogic 2780 Series FC HBAs resolve data center complexities by enabling a storage network infrastructure that supports powerful virtualization features like N_Port ID virtualization (NPIV), application-aware services with standards based quality of service (QoS), and simplified management.

Marvell StorFusion technology delivers streamlined provisioning, improved resiliency with built-in forward error correction (FEC). These features address 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

Marvell QLogic FC Adapters 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.

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 Marvell QLogic 2780 Series Adapters 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.

Marvell Universal SAN Congestion Mitigation Technology (USCM)

Modern SANs are observing unprecedented data growth in several different vectors. 16GFC and 32GFC upgrades are added to original 4GFC and 8GFC investments to form diverse heterogenous SANs. Mission critical applications that rely on SANs are expected to run at full capacity and capability 24x7, 365 days a year, while increasingly being accelerated by flash storage technology. Meanwhile, modern and legacy applications are consolidated to increase utilization while new workloads and VMs are added to improve CapEx and OpEx. These conditions have the potential to create congestion in the SAN, which can significantly impact application performance. SAN congestion typically occurs and quickly spreads when older, slower FC endpoints cannot accept frames at the rate generated by the source, referred to as oversubscription or slow-drain. It is critical that SAN congestion is timely detected, other components are made aware, and decisive action is taken to isolate the problem.

Implementing industry standard Fabric Performance Impact Notifications (FPINs), Marvell's QLogic 2780 Series Adapters' USCM Technology works both independently and in coordination with Brocade and Cisco FC fabrics to avoid SAN congestion by enabling congestion detection, notification, and avoidance. Marvell QLogic 2780 Series HBAs can poll the status of buffer credits at various configurable intervals to detect credit starvation, notify and get notified by upstream and downstream switches of congestion points and facilitate decisive actions such as transmit throttling, multi-path failover, load balancing, or flow quarantining. As a fallback mechanism, the 2780 Series HBAs are also capable of receiving FC primitive signaling in cases when the FPIN notifications cannot be delivered due to heavy congestion.

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 adapters. In addition, Marvell supports all major APIs for deployment flexibility and integration with third-party management tools, including Microsoft Windows Admin Center, PowerShell, VMware vCenter™, and Brocade® SANnav™.

Unparalleled Insight and QoS for Virtualized Deployments

The Marvell 2780 Series Adapters 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 and Cisco switches 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.x 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

Marvell QLogic Enhanced 32GFC Adapters continue the tradition of complete port-level isolation across the FC controller architecture. This architecture, unlike other vendor solutions, provides independent function, transmit and receive buffers, an on-chip CPU, DMA channels, and a firmware image for each port. These features enable complete port-level isolation, prevent errors and firmware crashes from propagating across all ports, and provide predictable and scalable performance across all ports. The Marvell 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. See Figure 1.

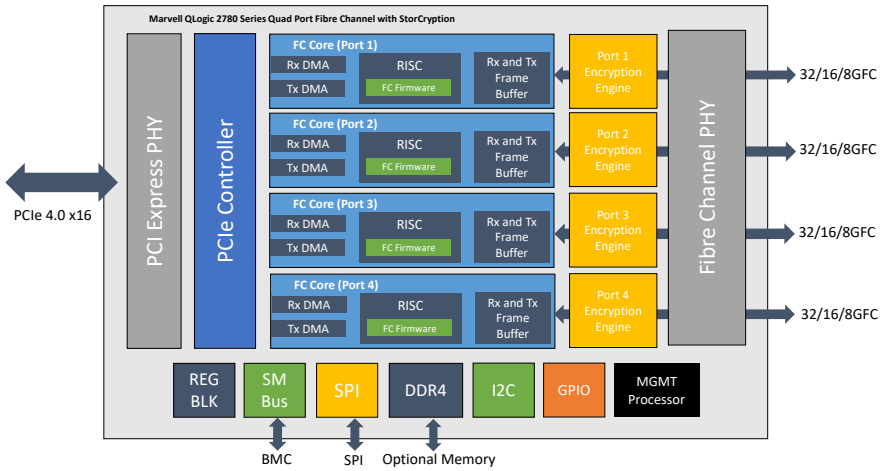


Figure 1. 2780 Series Adapters Block Diagram

The 2780 Series Adapters 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 Marvell 2780 Series Adapters 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 16/8GFC infrastructure, leveraging existing SAN investments.

Marvell QLogic is the undisputed leader in FC adapters, with over 20 years of market share leadership and more than 20 million ports shipped, and 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

- QLE2780: PCIe 4.0 ×8 (single-port)
- QLE2782: PCIe 4.0 ×8 (dual-port)
- QLE2784: PCIe 4.0 ×16 (quad-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

- *Fibre Channel Security Protocols-2 (FC-SP-2)*
- *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 Signalling-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 Marvell FC 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

Encryption Algorithm

- AES 128, 256 bits

APIs

- SNIA HBA API V2
- SMI-S

Operating Systems

- For the latest applicable operating system information, see Marvell.com

End-to-End Provisioning and Management Features

The following features require a supported Brocade or Cisco switch.

Performance

- QoS CS_CTL
- FEC for 16GFC and 32GFC
- BB-CR: automatic buffer credit loss detection and recovery
- FPIN and hardware signaling for Universal SAN Congestion Mitigation

Diagnostics

- Diagnostics Port
- LCB
- RDP

Deployment and Management

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

Physical Specifications

Ports

- QLE2780: single-port FC
- QLE2782: dual-port FC
- QLE2784: quad-port FC

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)
- Quad port: standard height PCIe card (6.6 inches × 4.38 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

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

Japan

- VCCI: Class A

New Zealand and Australia

- AS/NZS: Class A

Korea

- KC-RRA Class A

Taiwan

- BSMI CNS 13438

Ordering Information

QLE2780-SR-SP (Single Port)

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

QLE2782-SR-SP (Dual Port)

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

QLE2784-SR-SP (Quad Port)

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

MARVELL

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 for 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.