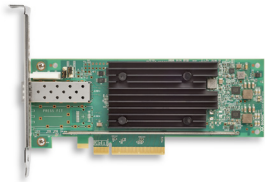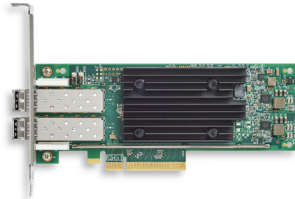# Marvell® QLogic® 2870 Series
64GFC Fibre Channel Adapters

Single Port: QLE2870

Dual Port: QLE2872

Quad Port: QLE2874

- Hardware Root of Trust ensures SAN Integrity with Cryptographically Secured Firmware

- Universal SAN Congestion Mitigation (USCM) helps pinpoint and prevent SAN Congestion utilizing Fabric Performance Indication Notification (FPIN) technology

- Improve scale out NVMe efficiencies by delivering concurrent support for FCP and FC-NVMe

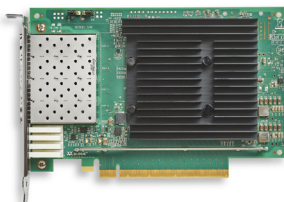The Marvell QLogic 2870 Series Adapters are PCIe® 4.0, 64-Gigabit Fibre Channel (GFC) Host Bus Adapters (HBAs) that secure mission critical data with hardware-based Root of Trust (RoT). The adapters are available in single, dual, and quad ports across PCIe standard and Open Compete Project (OCP) 3.0 form factors.

Leveraging over 20 years of Fibre Channel (FC) expertise, the 2870 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 2870 Series FC (64GFC) HBAs provide full backward compatibility with 32GFC and 16GFC SANs.

64Gb Fibre Channel Technology

Standardized by the INCITS T11 committee in 2018, the *Fibre Channel Physical Interface (FC-PI-7)* specification for 64GFC creates the fastest single-lane Fibre Channel networking speed, delivering real world storage performance of up to 12,800MBps full duplex over a single lane serial SFP+ cable interface. Marvell QLogic's 2870 Series of 64GFC HBAs deliver standards compliant line rate performance for connecting NVMe, flash, and legacy disk storage to business critical applications running in the private cloud, telco, and mega data center.

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 2870 Series Adapters incorporate a hardware RoT that prevents malicious firmware from hijacking the FC HBA. The 2870 Series RoT enables both integrity and authenticity during adapter firmware updates by both validating firmware embedded signatures with hardware embedded keys to ensure that only trusted firmware executes, and protecting firmware updates that are applied over public networks.

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.

- Greater than 4 million IOPS and 51,200MBps (50GBps) through-put of total full duplex performance

- Port isolation design delivers deterministic and scalable performance on each port while improving reliability

- 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

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 2870 Series Adapters support low-latency access to scale out NVMe with full support for the FC-NVMe protocol. The 2870 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 2870 Series FC Adapters bring the best of both worlds by offering up to 4 million IOPS and line rate 64GFC 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 a featured 64GFC adapter product line, 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 2870 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 2870 Series Adapters support link cable beacon (LCB) technology, which enables administrators to visually identify both ends of a physical link to troubleshoot connectivity issues.

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. 32GFC and 64GFC upgrades are added to original 8GFC and 16GFC investments to form diverse heterogeneous 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 over-subscription, over-utilization, or slow-drain. It is critical that SAN congestion is quickly 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 2870 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 mitigation. Marvell QLogic 2870 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 2870 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 the VMware vCenter™.

Unparalleled Insight and QoS for Virtualized Deployments

The Marvell 2870 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 QoS in their Fibre Channel storage networks; for example, 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 FC Adapters 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.

The 2870 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 2870 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 64GFC, these adapters are backward compatible with existing 32/16GFC infrastructure, leveraging existing SAN investments.

Marvell QLogic is the leader in FC adapters, with over 16 years of market share leadership, over 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

- QLE2870: PCIe 4.0 ×8 (single-port)
- QLE2872: PCIe 4.0 ×8 (dual-port)
- QLE2874: 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

- 12,800MBps 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-Physical Interface-7 (FC-PI-7)*
- *Fibre Channel Link Services 4 (FC-LS-4)*
- *Fibre Channel Framing and Signaling-5 (FC-FS-5)*
- *Fibre Channel-Non Volatile Memory Express-2 (FC-NVMe-2)*

Tools and Utilities

Management Tools and Device Utilities

- QConvergeConsole: a unified management tool (CLI) for networking that spans generations of Marvell FC Adapters

Boot Support

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

Tools and Utilities (continued)

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 either a supported Brocade or Cisco switch.

Performance

- QoS CS_CTL
- FEC for 64GFC/32GFC/16GFC
- 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

- QLE2870: single-port FC
- QLE2872: dual-port FC
- QLE2874: 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
16GFC	35	100	125
32GFC	20	70	100
64GFC	N/A	70	100

Agency Approvals—Safety

US and Canada

- UL 60950-1
- CSA C22.2

Europe

- TUV EN60950-1
- TUV IEC 60950-1
- EN IEC 62368 2nd, 3rd Edition
- 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
- EN55035
- EN61000-3-2
- EN61000-3-3

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
- BS DoC

Ordering Information

QLE2870-SR-SP (Single Port)

- Ships in an individually packed box with a standard-height bracket installed
- Ships with 64GFC SR optical transceiver installed

QLE2872-SR-SP (Dual Port)

- Ships in an individually packed box with a standard-height bracket installed
- Ships with 64GFC SR optical transceivers installed

QLE2874-SR-SP (Quad Port)

- Ships in an individually packed box with a standard-height bracket installed
- Ships with 64GFC SR optical transceivers installed

MARVELL™