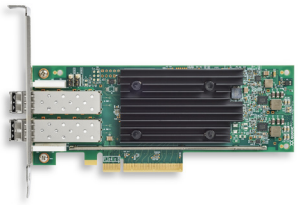
Marvell® QLogic® QLE2872-CSC

64GFC Fibre Channel Adapter, PCIe® Gen 4.0



QLE2872-CSC

- Improve scale out NVMe efficiencies by delivering concurrent support for FCP and FC-NVMe™
- Performance of over 2 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
- Virtual Lanes enable prioritization and segregation of the traffic as low, medium, or high priority
- Supports PCIe 4.0 systems

The Marvell QLogic QLE2872-CSC Adapter is a 64-Gigabit Fibre Channel (GFC) HBA that secures mission critical data with hardware-based Root of Trust (RoT). This dual-port adapter is available in a standard form factor.

Leveraging over 20 years of Fibre Channel experience, the QLE2872-CSC 64GFC HBA is intrinsically 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. The Marvell QLogic QLE2872-CSC (64GFC) HBA provides full backward compatibility with 32GFC and 16GFC SANs.

64GFC 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 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 QLE2872-CSC Adapter incorporates a hardware RoT that prevents malicious firmware from hijacking the FC HBA. The QLE2872-CSC 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.

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 QLE2872-CSC Adapter supports low-latency access to scale out NVMe with full support for the FC-NVMe protocol. The QLE2872-CSC Adapter 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 QLE2872-CSC Adapter brings the best of both worlds by offering over 2 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 the industry's most fully featured 64GFC 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 QLE2872-CSC 64GFC 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.

The 64GFC QLE2872-CSC Adapter also incorporates a secure hardware-based RoT to protect against rogue firmware.

Innovations that Improve Business Productivity and Integrity

Marvell QLogic FC Adapters powered by StorFusion technology include advanced capabilities when deployed with 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 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 QLE2872-CSC Adapter supports 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. 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 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 QLogic Adapters' USCM Technology works both independently and in coordination with Cisco FC fabrics to avoid SAN congestion by enabling congestion detection, notification, and avoidance. QLogic 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 HBA is also capable of receiving FC primitive signaling in cases when the FPIN notifications cannot be delivered due to heavy congestion.

Examples of Key Decisive Actions

USCM utilizes two key SAN congestion mitigation techniques: throttling the bandwidth of slow-drain flows to and from the SAN, and quarantining congested flows to slower virtual lanes. Both techniques integrate seamlessly with Cisco switches.

For example, when there is congestion, the driver switches the session associated with the slow storage device to a slow virtual lane. If that storage device continues to be congested, then the host may throttle requests to that device.

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 QLE2872-CSC Adapter supports 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 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 FC Adapters provide complete port-level isolation across the FC controller architecture. This unique architecture provides an independent protocol handling 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 QLE2872-CSC Adapter also provides 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 QLE2872-CSC Adapter is 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 undisputed leader in FC adapters, with over 20 years of FC history 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

- QLE2872-CSC: PCIe 4.0 ×8 (dual-port)

Host Interrupts

- INTx and MSI-X

Compliance

- *PCIe Base Specification*, rev. 4.0
- *PCIe Card Electromechanical Specification*, rev. 4.0
- *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 Link Services 4 (FC-LS-4)*
- *Fibre Channel Framing and Signaling-4 (FC-FS-4)*
- *Fibre Channel-NVMe (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

Boot Support

- Unified Extensible Firmware Interface (UEFI)

Tools and Utilities (continued)

APIs

- SNIA HBA API V2
- SMI-S

Operating Systems

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

SAN Congestion Mitigation (USCM)

Features

- FPIN ELS: CN, PN, LI, DN
- FPIN hardware primitive signals
- FPIN-LI/MPIO
- I/O Throttling Profiles (FPIN-CN, -PN)
- Virtual Links (NX-OS v9.3.2)

End-to-End Provisioning and Management Features

The following features require a supported Cisco switch running NX-OS v9.3.2.

Performance

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

- FC ping
- FC traceroute
- VM-ID
- Fabric device management interface (FDMI) enhancements

Physical Specifications

Ports

- QLE2872-CSC: dual-port 64GFC

Form Factor

- 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)

Environment and Equipment Specifications (continued)

Humidity

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

Cable Distances

- Multimode optic:

Table 1. Cable Distance

Rate	Cable and Distance (m)		
	OM2	OM3	OM4/ OM5
16GFC	35	100	125
32GFC	20	70	100
64GFC	N/A	70	100

Interoperability

Optical Module

- Ships with Marvell 64Gb optical module, part number AFBR-57H5MZ-QM1

Switches

The QLE2872-CSC has been tested with the following Cisco switch models:

- Cisco MDS 9148V 64G FC switch
- Cisco MDS 9124V 64G FC switch
- Cisco MDS 9710 Multilayer Director with 64G FC line card

Agency Approvals—Safety

US and Canada

- UL 60950-1
- CSA C22.2

Europe

- TUV EN60950-1
- TUV IEC 60950-1
- TUV IEC62368 2nd and 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

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

Japan

- VCCI: Class A

New Zealand and Australia

- AS/NZS: Class A

Korea

- KC-RRA Class A

Taiwan

- BSMI CNS 13438

Table 2. Ordering Information

Marvell QLogic Model Number	Cisco Part Number (PID)	Description	Server Compatibility
QLE2872-CSC	UCSC-P-Q7D64GF UCSC-P-Q7D64GF =	Dual Port, 64GFC, PCIe Gen 4 x8 Adapter, multimode SR SFP and standard height bracket installed. A low profile bracket is also included.	C220 M7, C240 M7[1]

Ships in an individually packed box with a standard-height bracket installed. A low profile bracket is also included.
Ships with 64GFC optical transceivers installed
Form factor: low profile PCIe
1. Current list at the time of publication. For the most current list of supported servers, see the Cisco compatibility page at https://ucshcltool.cloudapps.cisco.com/public/
2. This version of the Marvell Adapter is released directly by Cisco with a Cisco PID. The drivers and firmware must be updated with the Cisco software releases and HUU utility.

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.

Copyright © 2023 Marvell. All rights reserved. Marvell and the Marvell logo are trademarks of Marvell or its affiliates. Please visit www.marvell.com for a complete list of Marvell trademarks. Other names and brands may be claimed as the property of others.