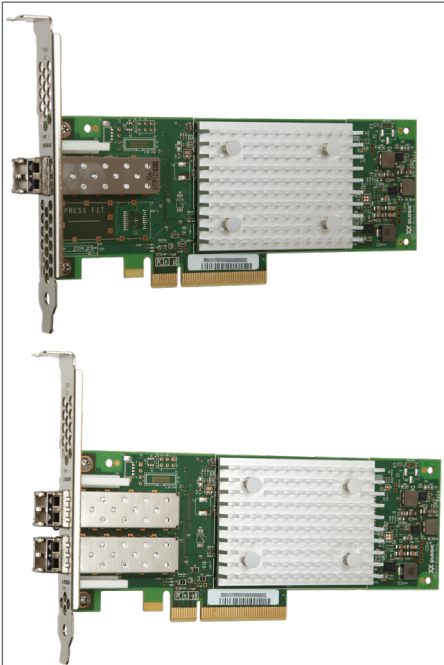


# Marvell® QLogic® QLE2690/2692

Single-port and Dual-port Enhanced 16GFC Fibre Channel Adapters



- The latest and most advanced 16GFC HBA from Marvell, available in single- and dual-port versions
- Up to 1.3 million IOPS fuel high performance in AFA and high-density virtualized environments
- Marvell StorFusion™ technology accelerates deployment, simplifies diagnostics, enhances reliability, and optimizes performance
- NVMe over Fibre Channel capability allows simultaneous access to NVMe and SCSI based Storage on the same port

The Marvell QLogic QLE2690 single-port and QLE2692 dual-port Enhanced 16Gb FC (16GFC) HBAs boast industry-leading native FC performance with extremely low CPU usage and full hardware offloads.

## Enhanced 16GFC

Compared to 16GFC, the Marvell QLogic Enhanced 16GFC solution offers higher per-port performance (up to 650K IOPS) with low power consumption. In addition, Marvell StorFusion technology delivers streamlined provisioning, QoS, and improved resiliency while addressing the needs of IT organizations that require reliability, integrated management, and guaranteed network performance.

Enhanced 16GFC technology resolves data center complexities by enabling a storage network infrastructure that supports powerful virtualization features, application-aware services, and simplified management. The QLE2690/2692 Adapters provide advanced storage networking features capable of supporting the most demanding virtualized and private cloud environments, while fully leveraging the capabilities of high-performance 16GFC and all-flash arrays (AFAs). Powerful management tools automate and simplify SAN provisioning to help reduce cost and complexity, while the unmatched 16GFC performance eliminates potential I/O bottlenecks in today's powerful multiprocessor, multicore servers.

## Superior Performance

The QLE2690/2692 Adapters can accelerate mission-critical enterprise applications by delivering up to 1.3 million IOPS for physical, virtual, and private cloud environments. Marvell QLogic adapters deliver the best storage application performance in virtualized and non-virtualized environments with support for up to 6,400MBps of aggregate throughput.

## NVMe® Over Fibre Channel (FC-NVME)

The QLE2690/2692 Adapters support the FC-NVMe-2 (NVMe over Fibre Channel) protocol. The QLE2690/2692 Adapters can simultaneously support FC-NVMe and FCP-SCSI storage traffic. NVMe storage offers exceptionally high performance at very low latencies. NVMe works best with a network that can provide lossless, low-latency, and high-performing transport. The 2600 Series Enhanced 16GFC Adapters bring the best of both worlds by offering the highest performance and lowest latency access to NVMe and SCSI storage over an FC network.

- Port isolation design offers deterministic and scalable performance on each port

## Virtualization Optimized

The QLE2690/2692 Adapters support standards-based virtualization features. Under VMware® ESXi 6.x and later, I/O requests and responses can be tagged with the virtual machine-ID (VM-ID) of the appropriate virtual machine, providing end-to-end visibility at the VM level. Support for N\_Port ID virtualization (NPIV) enables a single FC adapter port to provide multiple virtual ports for increased network scalability. In addition, the 16GFC line rate per physical port delivers unmatched storage performance to maximize the number of VMs per physical server.

## Marvell StorFusion Technology

Marvell QLogic Enhanced 16GFC Adapters, powered by StorFusion technology, include advanced capabilities that are enabled when deployed with supported Brocade® and Cisco® switches. By combining these industry-leading solutions, 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, Marvell's QLogic 2690 Series Adapters implement 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. QLogic 2690 Series 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. QLogic 2690 Series 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 switch that supports ClearLink®, administrators can quickly run a battery of automated diagnostic tests to assess the health of links and fabric components.

The QLE2690/2692 Adapters support link cable beacon (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.

Marvell technology includes the read diagnostic parameters (RDP) feature, 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.

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

### **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 the fabric-assigned port world wide 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 on site—eliminating 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)-based frame prioritization QoS, which helps alleviate network congestion. When Marvell QLogic adapters with StorFusion 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 to achieve optimized 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 re-sending the frames. FEC automatically detects and recovers from bit errors, which results in higher availability and performance.

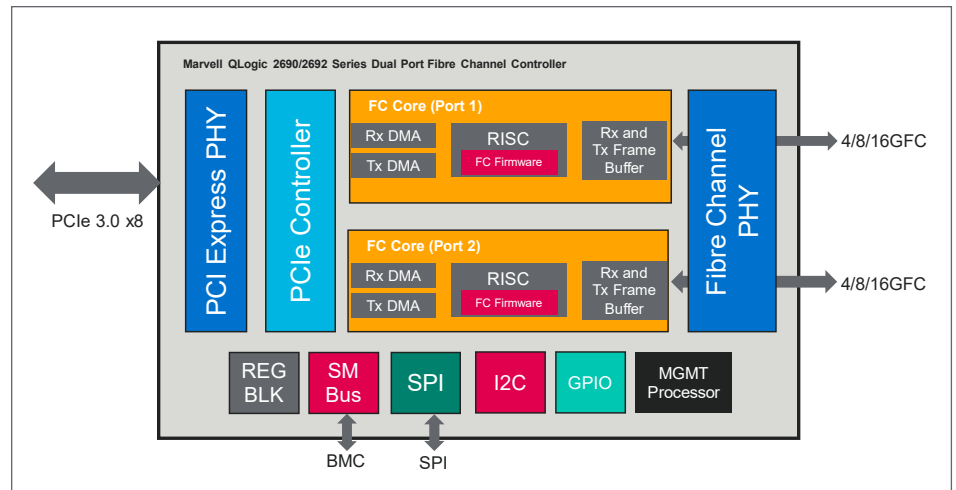
Automatic buffer-to-buffer credit recovery (BB-CR) helps overcome performance degradation, congestion, and link resets caused by buffer credit loss, especially on longer distance and high-loss fiber connections.

## 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™ and Brocade Network Advisor.

## High Availability and Reliability

Marvell QLogic Enhanced 16GFC 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. QLE2690/2692 Adapters Block Diagram**

In addition, overlapping protection domains (OPDs) ensure the highest level of reliability as data moves to and from the PCI® bus and FC network.

The QLE2690/2692 Adapters also provide end-to-end data integrity with support for T10 Performance 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 QLE2690/2692 Adapters are compatible with the same FC software driver stack that has been tested and validated across all major hardware platforms and all major hypervisors and OSes. The adapters are backward compatible with existing 4GFC and 8GFC infrastructure, leveraging existing SAN investments.

Marvell technology makes it the undisputed leader in FC adapters, with over 20 years of experience, more than 20 million ports shipped, and multiple generations of FC products that have been the leading choice of Marvell customers. 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

- QLE2690/2692 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*
- *PCI Hot Plug Specification, Rev 1.1*

## Fibre Channel Specifications

### Throughput

- 3,200Mbps 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 Physical Interface 5 (FC-PI5)*
- *Fibre Channel Tape (FC-TAPE) Profile*
- *SCSI Fibre Channel Protocol-4 (FCP-4)*
- *SCSI-3 Fibre Channel Protocol (SCSI-FCP)*
- *Second Generation Fibre Channel Generic Services (FC-GS-2)*
- *Third Generation Fibre Channel Generic Services (FC-GS-3)*
- *Fibre Channel-NVMe-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

### Boot Support

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

## Tools and Utilities (continued)

### APIs

- SNIA HBA API V2
- SMI-S

### Operating System Support

- For the latest applicable operating system information, see [www.marvell.com](http://www.marvell.com)

## End-to-End Provisioning and Management Features

**The following features require a supported Brocade or Cisco switch.**

### Performance

- QoS CS\_CTL
- FEC
- BB-CR: automatic buffer credit loss detection and recovery
- FPIN for 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

- QLE2690: single-port, 16GFC
- QLE2692: dual-port, 16GFC

### Form Factor

- Low-profile PCIe card (6.6 inches x 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)
- Storage: -20°C to 70°C (-4°F to 158°F)

### Humidity

- Operating: 10% to 90%
- Storage: 5% to 95%

## Environment and Equipment Specifications (continued)

### Maximum Cable Distances

- Multimode optic:

Rate	Cable and Distance (m)			
	OM1	OM2	OM3	OM4
4GFC	17	150	380	400
8GFC	21	50	150	190
16GFC	Note 1	35	100	125

1. Not supported

## 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

- EN55022
- EN55024
- EN61000-3-2
- EN61000-3-3

### Japan

- VCCI: Class A

### New Zealand and Australia

- AS/NZS: Class A

### Korea

- KC-RRR Class A

### Taiwan

- BSMI CNS 13438

#### Ordering Information

##### QLE2690-SR-CK (Single Port)

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

##### QLE2690-SR-BK (Single Port)

- Ships with a standard-height bracket installed
- Ships with SR optical transceiver installed
- Minimum Order Quantity (MOQ): 20 units

##### QLE2692-SR-CK (Dual Port)

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

##### QLE2692-SR-BK (Dual Port)

- Ships with a standard-height bracket installed
- Ships with SR optical transceivers installed
- Minimum Order Quantity (MOQ): 20 units



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.

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