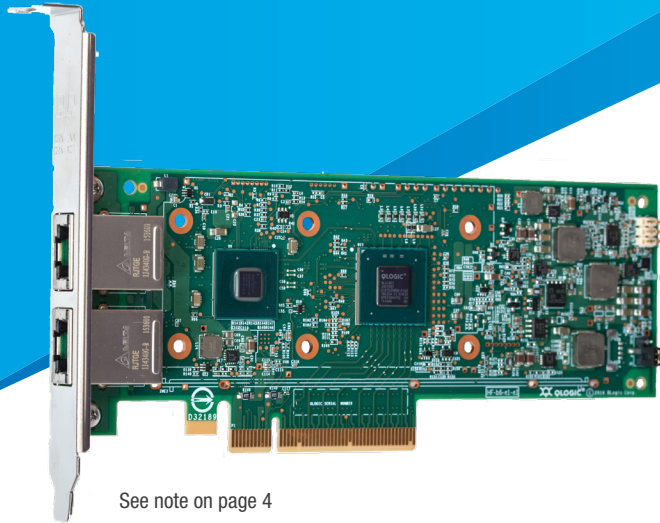


# FastLinQ QL41162HLRJ

## 8th Generation 10Gb Converged Network Adapter with iSCSI, FCoE, and Universal RDMA



See note on page 4

- Delivers full line-rate 10GbE performance across both ports
- Universal RDMA—Delivers choice and flexibility with concurrent support for RoCE, RoCEv2, and iWARP technologies
- Secure firmware update process with private/public key encryption technology prevents hackers from altering adapter
- Enables provisioning of 10GbE ports for greater deployment flexibility through switch-independent NIC partitioning
- Boosts host CPU efficiency with hardware offloads for GRE, NVGRE, and VXLAN tunnels
- 10GBASE-T version provides low-cost and easy-to-install RJ45 connectivity that is compatible with existing 1GbE

## OVERVIEW

The FastLinQ® QL41162HLRJ 10Gb Ethernet (10GbE) Converged Network Adapters (CNA) with Universal Remote Direct Memory Access (RDMA) leverages the Cavium™ leading eighth-generation Ethernet ASIC controller. It supports simultaneous LAN (TCP/IP) and SAN (Fibre Channel over Ethernet [FCoE] and iSCSI) traffic at 10Gb Ethernet (10GbE) line-rate speeds. The QL41162HLRJ provides extremely low host CPU usage by enabling full hardware offloads.

The QL41162HLRJ leverages Cavium's long-standing industry leadership in Ethernet by providing the highest levels of performance, efficiency, and scalability for the enterprise data center.

For more effective utilization of the 10GbE bandwidth, the FastLinQ QL41162HLRJ CNA offers switch-independent NIC partitioning (NPAR), which enables segmentation of a single 10GbE port into multiple network partitions and dynamic allocation of bandwidth to each port. The segmentation allows IT organizations to optimize resource utilization while lowering infrastructure and operational expenses (OPEX).

The acceleration of data center convergence—triggered by virtualization, software-defined networking (SDN), and multitenant cloud computing platforms—demands high-performance, converged network solutions. The QL41162HLRJ CNA is the solution of choice for workload-intensive

computing environments, providing a reliable, high-performance 10GbE connectivity solution.

## FEATURES

- PCI Express® (PCIe®) Gen 3 x8 (8GT/s) support
- Full line-rate performance across both RJ45 ports
- Broad OS and hypervisor support
- Simplifies deployment and troubleshooting using the QConvergeConsole® (QCC) GUI, QCC CLI, vCenter Plug-in, and OpenStack® integration
- Network boot support:
  - iSCSI remote boot
  - FCoE boot from SAN
  - Preboot Execution Environment (PXE) 2.0
  - Unified Extensible Firmware Interface (UEFI) support
- Switch-independent NPAR with up to eight partition assignments per 10GbE link
- MSI and MSI-X support
- IPv4 and IPv6 stateless offloads

**FEATURES** *(continued)*

- PCI-SIG® single root input/output virtualization (SR-IOV)
- Comprehensive stateless offloads
- Auto negotiation: 1G/10G
- RX/TX multiqueue:
  - VMware® NetQueue
  - Windows® Hyper-V Virtual Machine Queue (VMQ)
  - Linux® Multiqueue
- Tunneling offloads:
  - Windows Network Virtualization using Generic Routing Encapsulation (NVGRE)
  - Linux Generic Routing Encapsulation (GRE)
  - VMware and Linux Virtual Extensible LAN (VXLAN)
- Receive side scaling (RSS)
- Transmit side scaling (TSS)
- Support for vLAN tagging
- Support for jumbo frames larger than 1,500 bytes (up to 9,600 bytes)
- Network teaming, failover, and load balancing:
  - Switch Independent NIC Teaming/Bonding
  - Switch Dependent NIC Teaming/Bonding
  - Link aggregation control protocol (LACP) and generic trunking
- Data center bridging (DCB)

**BENEFITS****Designed for Next-gen Server Virtualization**

The QL41162HLRJ CNA supports today's most compelling set of powerful networking virtualization features: SR-IOV, switch-independent NPAR, tunneling offloads (VXLAN, GRE, and NVGRE), and industry-leading performance, thus enhancing the underlying server virtualization features.

- SR-IOV delivers higher performance and lower CPU utilization with increased virtual machine (VM) scalability.
- Cavium NPAR enables up to eight physical, switch-agnostic NIC partitions per adapter port that are switch-independent. Dynamic and fine-grained bandwidth provisioning enables seamless migration to 10GbE infrastructure.
- Concurrent support for SR-IOV and NPAR enables virtual environments with the choice and flexibility to create an agile virtual server platform.
- Designed to meet the demands of large public cloud deployments, the QL41162HLRJ CNA features tunneling offloads for multitenancy with VXLAN, GRE, and NVGRE support.
- The QL41162HLRJ is designed for maximum flexibility, which enables simultaneous, fully offloaded, high-performance, multiprotocol (FCoE, iSCSI, and NIC) support from each independent port of the adapter.

**Extreme Application Performance**

The FastLinQ QL41162HLRJ Adapter features a high-speed, flexible architecture driven by independent, ultra-high performance engines. It delivers the industry's highest performance to meet and exceed the peak demands of the most demanding enterprise application or virtual platform.

- Availability of both RSS and TSS allows for more efficient load balancing across multiple CPU cores.
- Increases server performance with full hardware offload for storage traffic.
- Industry-leading FCoE performance of up to 3.6 million IOPS, suitable for high-density server virtualization and large databases.
- Industry-leading iSCSI performance of up to 2.9 million IOPS, suitable for a diverse set of applications leveraging the flexibility of iSCSI.

**OPEX Savings with Low-power PCIe Gen 3**

The QL41162HLRJ CNA is a PCIe Gen 3-based adapter that has one of the lowest power consumption profiles in the industry.

- Supporting the latest generation of host bus connectivity, PCIe Gen 3 enables the QL41162HLRJ Adapters to deliver line rate dual-port performance without compromise.
- The QL41162HLRJ Adapter is designed to provide maximum power efficiency, and yet delivering a fully offloaded, high-performance I/O connectivity platform.

**ACCELERATE ANY NETWORK WITH UNIVERSAL RDMA OFFLOAD**

The FastLinQ QL41162HLRJ Adapter supports RDMA over converged Ethernet (RoCE) and Internet wide area RDMA protocol (iWARP) acceleration to deliver low latency, low CPU utilization, and high performance on Windows server message block (SMB) Direct 3.0 and 3.02, and Internet extensions for RDMA (iSER). QL41162HLRJ Adapters have the unique capability to deliver Universal RDMA that enables RoCE, RoCEv2, and iWARP. Cavium Universal RDMA and emerging low latency I/O bus mechanisms such as network file system over RDMA (NFSoverRDMA) and non-volatile memory express over Fabrics (NVMe-oF) allow customers to accelerate access to data. Cavium's cutting-edge offloading technology increases cluster efficiency and scalability to many thousands of nodes.

**Simplified Management**

Cavium's QConvergeConsole® (QCC) delivers a broad set of powerful Ethernet and Fibre Channel (FC) adapter management features for administrators to maximize application performance and availability. Available in both GUI and CLI options, QCC offers application-based wizards to enable the environment to be quickly and easily provisioned based on published best practices. vCenter Plug-ins and OpenStack integration are also available.

## Leadership, Confidence, and Trust

FastLinQ adapters offer you peace of mind and confidence, as proven through the company's market share leadership: #1 in Converged Network Adapters. The QL41162HLRJ CNA offers the highest reliability and availability.

## TRUSTED, SECURE, RELIABLE, AND INTEROPERABLE

The FastLinQ QL41162HLRJ CNA adheres to standards that ensure interoperability with a wide range of network solutions. Cavium adapters are secure by design. Through public and private key encryption technology, the adapter enforces a process for secure firmware updates that prevent hackers from altering the code running on the adapter.

## Host Bus Interface Specifications

### Bus Interface

- PCI Express (PCIe) Gen 3 x8 (x8 physical connector)

### Host Interrupts

- MSI-X supports independent queues

### I/O Virtualization and Multitenancy

- SR-IOV (up to 192 virtual functions)
- Switch-independent NPAR (up to 16 physical functions)
- GRE and NVGRE packet task offloads
- Virtual Extensible LAN (VXLAN) packet task offloads

### Compliance

- PCI Base Specification, rev. 3.1
- PCI Express Card Electromechanical Specification, rev. 3.0
- PCI Bus Power Management Interface Specification, rev. 1.2
- Advanced configuration and power interface (ACPI) v2.0

## Ethernet Specifications

### Throughput

- 10Gbps line rate per port
- 1G/10G Auto Negotiation

### Ethernet Frame

- 1,500 bytes and larger (jumbo frame)

### Stateless Offload

- TCP segmentation offload (TSO)
- Large send offload (LSO)
- Large receive offload (LRO)
- Giant send offload (GSO)
- TCP and user datagram protocol (UDP) checksum offloads
- Receive segment coalescing (RSC)
- Interrupt coalescing
- RSS and TSS
- VMware NetQueue, Microsoft VMQ (up to 208 dynamic queues), and Linux Multiqueue
- Universal RDMA

### Compliance

- IEEE Specifications:
  - 802.1AS/1588-2008 PTPv2
  - 802.1q (VLAN)
  - 802.1Qaz (DCBX and ETS)

### Compliance (continued)

- 802.1Qbb (Priority-based Flow Control)
- 802.3-2015 Clauses 55, 40, 25 (10GBASE-T, 1000BASE-T, 100BASE-TX)
- 802.3ad (Link Aggregation)
- 802.3x (Flow Control)
- 1588-2002 PTPv1 (Precision Time Protocol)
- RFQs:
  - IPv4 (RFC 791)
  - IPv6 (RFC 2460)

### Board Firmware Features

- Secure Firmware Update process

## RDMA Specifications

### Universal RDMA

- RoCE
- RoCEv2
- iWARP
- Storage over RDMA: iSER, SMB Direct, and NVMe™ over Fabrics
- NFSoRDMA

## FCoE Specifications

### Performance

- 3.6 million FCoE IOPS

## iSCSI Specifications

### Performance

- 2.9 million iSCSI IOPS

## Tools and Utilities

### Management Tools and Device Utilities

- QLogic® Control Suite™ (QCS) Command Line Interface (CLI) for Linux and Windows
- QConvergeConsole (QCC) integrated network management utility (GUI) for Linux and Windows
- QCC Plug-in for vSphere (GUI) and ESXCLI plug-in for VMware
- QCC PowerKit (Windows PowerShell® cmdlets) for Linux and Windows
- Native OS management tools for networking

## Boot Support

- iSCSI remote boot
- FCoE boot from SAN
- PXE 2.0
- UEFI

## Operating System Support

- For the latest applicable operating system information, see [Cavium.com](http://Cavium.com) **Downloads**

## Physical Specifications

### Ports

- Dual 10Gbps Ethernet: RJ45 connectors

### Form Factor

- PCI Express short, low-profile card: 167.65mm × 68.90mm (6.60in. × 2.71in.)

## Environmental and Equipment Specifications

### Temperature

- Operating: 32°F to 131°F (0°C to 55°C)
- Storage: -40°F to 149°F (-40°C to 65°C)

### Airflow

- 150LFM at 55°C

### Humidity (Relative, Non-condensing)

- Non-operational: 93% maximum at 65°C
- Operational: 7% -93% at 55°C

### Cabling Distance (Maximum)

- CAT6a/7 up to 100 meters

### Compliance

- RoHS compliant

## Agency Approvals—Safety

### US and Canada

- UL 60950-1, CSA C22.2

### Europe

- TUV EN60950-1
- TUV IEC 60950-1
- CB Certified

Note:  
All advertised features are enabled in the hardware. Actual feature availability is dependent on software driver releases. See the release notes.

Picture may not be representative of the final shipping product.

## Agency Approvals—EMI and EMC

## 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

QL41162HLRJ-BK/SP/CK (Dual-port)<sup>1</sup>: Non-AVS<sup>2</sup>

## Adapter

- Bulk Kit (BK)
- Single-Pack (SP)
- Channel Kit (CK)

QL41162HLRJ-11-BK/SP/CK: AVS Enabled Adapter

- 1 Ships with a standard-size bracket installed. A spare low-profile bracket is also included.
- 2 AVS is Adaptive Voltage Scaling.



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