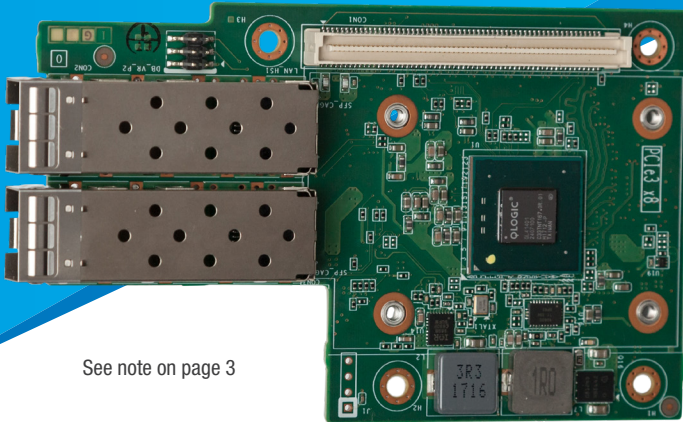


# FastLinQ QL41132HOCU

Dual-port 10G SFP+ OCP Intelligent Ethernet Adapter with Universal RDMA



See note on page 3

- Universal RDMA delivers the ultimate choice and flexibility with concurrent support for RoCE, RoCEv2, and iWARP technologies
- FastLinQ® SmartAN™ for simplified connectivity with 10G SFP+ interfaced switches (SFP+ interfaces can accept DAC or optical [discrete or AOC] connections)
- Secure firmware update process with private and public key encryption technology prevents hackers from altering adapters
- Increase VM density and accelerate multitenant networks with full offload for tunneling protocols
- A powerful 10GbE adapter that delivers the best price and performance ratio

## OVERVIEW

FastLinQ offers a dual-port 10GbE OCP Intelligent Ethernet Adapter with Universal RDMA offloads for Open Compute Project (OCP) servers. The QL41132 dual-port adapter leverages the Cavium™ long-standing industry leadership in Ethernet, providing the highest level of performance, efficiency, and scalability for Open Compute server and storage applications in Web 2.0, enterprise data centers, and cloud infrastructure.

For more effective use of the bandwidth, the FastLinQ Intelligent Ethernet Adapter from Cavium offers switch-independent NIC partitioning (NPAR), which enables segmentation of each 10GbE port into eight virtual ports, with flexible allocation of bandwidth to each port. The segmentation allows IT organizations to improve resource utilization while lowering infrastructure and operational costs.

Virtualization, cloud computing, high-performance computing, convergence, and clustering initiatives are increasing workload demands. Cavium's cutting-edge server and network virtualization features—Virtual Extensible LAN (VXLAN), Network Virtualization using Generic Routing Encapsulation (NVGRE), Genetic Routing Encapsulation (GRE), and Generic Network Virtualization Encapsulation (GENEVE) tunneling offloads—deliver the most advanced 10GbE adapters. The FastLinQ QL41132HOCU

Intelligent Ethernet Adapter is the solution of choice for workload-intensive computing environments, providing a reliable, high-performance 10GbE connectivity solution.

## FEATURES

- Accelerate the most demanding telco NFV workloads with the Cavium Data Plane Development Kit (DPDK) high-speed packet processing engine
- Orchestrate and manage hyperscale OpenStack® deployments with Cavium cloud-enabled management framework
- Backward compatibility with 1GbE infrastructure for complete investment protection
- Dual-port 10GbE connectivity for OCP servers
- x8 PCI Express® (PCIe®) 3.0 (8GT/s) support
- Universal Remote Direct Memory Access (RDMA) technologies—RDMA over Converged Ethernet (RoCE), RoCEv2 (Routable RoCE), and Internet Wide Area RDMA Protocol (iWARP)
- VXLAN, NVGRE, GRE, and GENEVE tunneling offloads

## FEATURES *(continued)*

- Network boot support:
  - iSCSI remote boot
  - Pre-execution environment (PXE) 2.0
- MSI and MSI-X support
- IPv4 and IPv6 offloads
- PCI-SIG® single root I/O virtualization (SR-IOV) support
- Comprehensive stateless offloads
- Receive side scaling (RSS)
- Transmit side scaling (TSS)
- Jumbo frame support up to 9,600 bytes
- Network teaming, failover, and load balancing:
  - Switch-independent teaming modes
  - Switch-dependent teaming modes—dynamic Link Aggregation Control Protocol (LACP) and static generic trunking
- Data center bridging (DCB)

## ACCELERATE ANY NETWORK WITH UNIVERSAL RDMA OFFLOAD

The Cavium QL41132HOCU 10GbE Adapter supports RoCE and iWARP acceleration to deliver low latency, low CPU utilization, and high performance on Windows Server® Message Block (SMB) Direct 3.0 and 3.02. QL41132HOCU 10GbE 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 iSCSI Extensions for RDMA (iSER), Network File System over RDMA (NFSoverRDMA), and NVMe Express® (NVMe™) over Fabric (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.

## HIGH-DENSITY SERVER VIRTUALIZATION

The latest hypervisors and multicore systems use several technologies to increase the scale of virtualization. The Cavium QL41132HOCU 10GbE Adapter supports:

- VMware® dynamic NetQueue
- Windows® Hyper-V® dynamic Virtual Machine Queue (dVMQ)
- Linux® Multiqueue
- Windows, Linux, and VMware switch-independent NPAR
- Windows Hyper-V, Linux Kernel-based Virtual Machine (KVM), and VMware ESXi™ SR-IOV

These features provide ultimate flexibility, quality of service (QoS), and optimized host and virtual machine (VM) performance.

## WIRE-SPEED NETWORK VIRTUALIZATION

Enterprise-class data centers can be scaled using overlay networks to carry VM traffic over a logical tunnel using NVGRE, VXLAN, and GENEVE. Although overlay networks can resolve virtual local area network (VLAN) limitations, native stateless offloading engines are bypassed, which places a higher load on the system's CPU. The Cavium QL41132HOCU 10GbE Adapter efficiently handles this load with advanced NVGRE, VXLAN, and GENEVE stateless offload engines that access the overlay protocol headers. This access enables traditional stateless offloads of encapsulated traffic with native-level performance in the network. Additionally, Cavium QL41132HOCU Adapters support VMware NSX® and Open vSwitch (OVS).

## HYPER-SCALE ORCHESTRATION WITH OPENSTACK

The Cavium QL41132HOCU 10GbE Adapter supports the OpenStack open source infrastructure for constructing and supervising public, private, and hybrid cloud computing platforms. These platforms allow providers to rapidly and horizontally scale VMs over their entire, diverse, and widely spread network architecture to meet the real-time needs of their customers. Cavium's integrated, multiprotocol management utility, QConvergeConsole® (QCC), provides breakthrough features that allow customers to visualize the OpenStack-orchestrated data center using auto-discovery technology.

## ACCELERATE TELCO NETWORK FUNCTION VIRTUALIZATION (NFV) WORKLOADS

In addition to OpenStack, the Cavium QL41132HOCU 10GbE Adapter supports NFV that allows decoupling of network functions and services from dedicated hardware (such as routers, firewalls, and load balancers) into hosted VMs. NFV enables network administrators to flexibly create network functions and services as they need them, reducing capital expenditure and operating expenses, and enhancing business and network services agility.

## TRUSTED, SECURE, RELIABLE, AND INTEROPERABLE

The Cavium QL41132HOCU 10GbE Adapter 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 prevents hackers from altering the code running on the adapter.

## Host Bus Interface Specifications

### Bus Interface

- PCI Express (PCIe) 3.0 x8, 2.0 x8 (electrical)

### Host Interrupts

- MSI-X supports independent queues

### I/O Virtualization

- SR-IOV (up to 192 virtual functions):
- NPAR (up to 16 physical functions)

### 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
- *Advanced Configuration and Power Interface (ACPI)*, v2.0

## Ethernet Specifications

### Throughput

- 10Gbps line rate per-port

### Ethernet Frame

- Standard MTU sizes and jumbo frames up to 9,600 bytes

### Stateless Offload

- IP, TCP, and User Datagram Protocol (UDP) checksum offloads
- TCP segmentation offload (TSO)
- Large send offload (LSO)
- Giant send offload (GSO)
- Large receive offload (LRO) (VMware)
- Generic receive offload (GRO) (Linux)
- Receive segment coalescing (RSC) (Windows)
- RSS
- TSS
- Interrupt coalescing
- VMware NetQueue, Microsoft® Hyper-V dVMQ, and Linux Multiqueue
- RDMA

### Multitenancy Tunneling Offloads

- VXLAN
- NVGRE
- GENEVE
- GRE

## Board Hardware Features

- Wake on LAN (WoL)
- Network Controller Sideband Interface (NC-SI)
- Pulse Width Modulation (PWM) switching voltage regulator
- Over temperature protection design compliance

## Board Firmware Features

- Secure Firmware Update process
- Smart Auto Negotiation (FastLinQ SmartAN)

## Compliance

- IEEE Specifications:
  - *802.1AS (Precise Synchronization)*
  - *802.1ax-2008 (Link Aggregation)*
  - *802.1p (Priority Encoding)*
  - *802.1q (VLAN)*
  - *802.1Qaz (DCBX and ETS)*
  - *802.1Qbb (Priority-based Flow Control)*
  - *802.3-2015 (1Gb and 10Gb Ethernet Flow Control)*
  - *802.3-2015 Clause 52 (10Gb Ethernet Optical)*
  - *1588-2002 PTPv1 (Precision Time Protocol)*
  - *1588-2008 PTPv2*
  - *SFF8431 Annex E (10Gb Direct Attach Copper)*
- RFQs:
  - *IPv4 (RFQ 791)*
  - *IPv6 (RFC 2460)*

## RDMA Specifications

### Universal RDMA

- RoCE
- RoCEv2
- iWARP
- Storage over RDMA: iSER, SMB Direct, Storage Spaces Direct (S2D), and NVMeoF
- NFSoRDMA

## Tools and Utilities

### Management Tools and Device Utilities

- QLogic® Control Suite integrated network adapter management utility (CLI) for Linux and Windows
- QConvergeConsole integrated network management utility (GUI) for Linux and Windows
- QConvergeConsole Plug-ins for vSphere® (GUI) and ESXCLI plug-in for VMware

## Management Tools and Device Utilities *(continued)*

- QConvergeConsole PowerKit (Windows PowerShell® cmdlets) for Linux and Windows
- Pre-boot unified extensible firmware interface (UEFI) Device Configuration pages in system BIOS
- Native OS management tools for networking

## Boot Support

- Unified extensible firmware interface (UEFI)
- PXE
- iSCSI Remote Boot

## APIs

- SNIA HBA API v2
- SMI-S

## Operating Systems

- For the latest applicable operating system information, see <http://driverdownloads.qlogic.com>

## Physical Specifications

### Ports

- Dual 10Gbps Ethernet: SFP+ cages

### Form Factor

- OCP version 2.0
- Type 1 heatsink

### Cooling Requirements

- 200 LFM at 45°C (113°F)

## Environment and Equipment Specifications

### Temperature

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

### Humidity

- Operating: 10% to 80%
- Storage: 5% to 90%

### Compliance

- RoHS compliant

#### 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.

Connectivity

| Rate | Cable and Maximum Distance (m) |                    |     |
|------|--------------------------------|--------------------|-----|
|      | DAC                            | SR FOC             | AOC |
| 10G  | 7                              | 400 OM4<br>300 OM3 | 30  |

DAC = Direct attach copper  
 SR FOC = SR fiber optic cable  
 AOC = Active optical cable

Agency Approvals—Safety

US and Canada

- UL 60950-1
- CSA C22.2

Europe

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

Agency Approvals<sup>1</sup>—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

QL41132HOCU-SP/BK/CK

- Dual port
  - SP=Single Pack
  - BK=Bulk Kit
  - CK=Channel Kit

<sup>1</sup> Agency approvals have not been authorized at the time of publication; this list is preliminary



Corporate Headquarters Cavium, Inc. 2315 N. First Street San Jose, CA 95131 408-943-7100

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