



# OCe14000 10GbE and 40GbE Converged Network Adapters

High Performance Networking for Enterprise Virtualization and the Cloud



OneConnect OCe14000 Family

## Overview

As the fourth generation of the Emulex OneConnect product line, the OCe14000 family of Converged Network Adapters (CNAs) provides high performance 10Gb Ethernet (10GbE) and 40GbE connectivity delivering multiple benefits for the enterprise cloud, including:

- Increasing data center IT agility and scalability through deployment of a secure multi-tenant cloud
- Driving scalability and flexibility in converged infrastructures
- Optimizing server hardware utilization by scaling high density virtualization
- Choice of single-port, dual-port, or quad-port 10GbE SFP+ or single-port 40GbE QSFP+ PCIe adapters

The OCe14000 family of 10GbE and 40GbE CNAs is designed for the high bandwidth and scalability demands of tier 1 enterprise applications with storage protocol (FCoE and iSCSI) offloads, more scalable virtualization with support for RDMA over Converged Ethernet (RoCE), enhanced Single-Root I/O Virtualization (SR-IOV) and NIC port partitioning, and cloud optimization using overlay network technology.

## Emulex Virtual Network Excleration (VNeX™) overlay network offloads for multi-tenant cloud networking

Scaling existing technologies for private or public multi-tenant infrastructures requires networking solutions that can enable VM-to-VM communication and virtual workload migration across Layer 2 and Layer 3 boundaries without impacting connectivity or performance.

At the same time, these solutions need to ensure isolation and security for thousands or millions of tenant networks. However, with existing technology, the available 4094 VLAN IDs are insufficient to isolate/secure each tenant in a data center (private cloud) or hybrid cloud environment.

Virtual Extensible Local Area Network (VXLAN), supported by VMware and Linux; and Network Virtualization using Generic Routing Encapsulation (NVGRE), supported by Microsoft, are two next-generation overlay networking solutions that address these requirements. These solutions are a frame-in-frame data packet encapsulation scheme enabling the creation of virtualized Layer 2 subnets that can span physical L3 IP networks. Traffic from each VM is tunneled to a specific virtual network; the packets are then routed transparently over the existing physical infrastructure.

## Key benefits

- Maximizes server hardware ROI with high virtual machine density
- Simplifies deployment of secure, scalable multi-tenant cloud infrastructures
- Minimizes TCO through deployment of heterogeneous workloads on Converged Infrastructure
- Accelerates applications and storage performance
- Quad-port 10GbE SFP+ or single-port 40GbE QSFP+ Ethernet adapters for applications requiring 40GbE full-duplex bandwidth using a single PCIe for slot constrained server platforms
- Reduces complexity through the deployment of a common network platform
- Reduces management, infrastructure and energy costs

## Key features

- Superior network convergence—storage and network traffic over a common Ethernet infrastructure
- SR-IOV
- Data acceleration with RoCE support
- Powerful hardware offloads for:
  - Overlay networks (NVGRE & VXLAN)
  - Storage protocols: iSCSI and FCoE
  - Stateless TCP
- Greater bandwidth with PCIe 3.0
- VMware vSphere NetQueue with RSS support
- Microsoft Windows Server VMQ, Dynamic VMQ, RSS and vRSS support

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Emulex VNeX offload technology powered by a multi-core adapter ASIC engine accelerates the performance of network virtualization by preserving legacy stateless TCP offloads and scaling methods on encapsulated packets, providing full native network performance in a virtual network environment.

## Remote Direct Memory Access (RDMA) support

The OCe14000 adapters leverage RoCE enabling server to server data movement directly between application memory without any CPU involvement providing high throughput and data acceleration on a standard Ethernet fabric without the need for any specialized infrastructure or management.

## Flexible workload storage connectivity with FCoE and iSCSI offloads

The OCe14000 adapters support FCoE hardware-based offload using the same enterprise-class Emulex drivers that work with Emulex LightPulse® Fibre Channel Host Bus Adapters (HBAs). The OCe14000 adapters also support iSCSI hardware-based offload, providing performance that is superior to iSCSI solutions based on software initiators and standard Network Interface Cards (NICs). Finally the OCe14000 adapters also have the ability to support NIC and iSCSI and FCoE offloads on the same port (i.e. concurrent storage).

## Optimized host virtualization density with SR-IOV support

SR-IOV optimizes I/O for VMs, enabling higher host server virtualization ratios to deliver maximum server Return on Investment (ROI). SR-IOV provides a more cost-effective solution than multiple, physical adapter ports.

SR-IOV enables multiple VMs to directly access the OCe14000's I/O resources, thus allowing VM networking I/O to bypass the host and take a path directly between the VM and the adapter, eliminating redundant I/O processing in the hypervisor. This, in turn, allows higher I/O performance, lower CPU utilization and significantly reduced latency as compared to the alternative of software-emulated NIC devices that are implemented in the hypervisor.

## Optimized bandwidth allocation with Universal Multi-Channel™ port partitioning

Emulex Universal Multi-Channel (UMC) is ideal for virtualized server environments because bandwidth allocation can be optimized to support virtual machine migration, management and I/O intensive applications. UMC allows multiple Peripheral Component Interconnect (PCI) physical functions (PFs) to be created on each adapter port. As a CNA, each adapter can be configured with up to sixteen functions.

The key benefits of deploying Emulex UMC technology include:

- Lower total cost of ownership (TCO)
- Consolidates multiple 1GbE adapters, associated cables and switch ports
- Higher VM workload bandwidth allocation to drive higher VM density on host servers
- Lower per-Gb bandwidth cost compared to deploying multiple 1GbE adapters

## Optimized I/O utilization

- Granular bandwidth provisioning minimizes wasted idle bandwidth and waste of dedicated 1GbE adapters
- Enables Service Level Agreement (SLA) based provisioning and deployment

## Simplified deployment

- UMC is not dependent on specialized OS support
- Works with any 10GbE or 40GbE switch

UMC is ideal for virtualized server environments because bandwidth allocation can be optimized to support I/O intensive applications, virtual machine migration, and management functions.

## Available Quad-port 10GbE SFP+ Model

Use cases such as Content Delivery Network (CDN) and hosting providers have standardized on 10GbE and often are looking for more bandwidth per server for the services they provide.

The Emulex quad-port 10GbE model (OCe14104) delivers 40GbE full-duplex bandwidth using a single PCIe slot. An additional benefit of this configuration is utilization of existing 10GbE SFP+ switch connections versus buying new 40GbE QSFP+ switches.

## Simplified management OneCommand® Manager application

The OneCommand Manager application provides centralized management of Emulex OneConnect CNAs and LightPulse® HBAs throughout the data center from a single management console. The OneCommand Manager application provides a graphical user interface (GUI) and a scriptable command line user interface (CLI). OneCommand Manager for VMware is fully integrated with VMware vCenter to simplify management for virtual server deployments.

## Fourth generation platform delivers enterprise-class reliability and performance

Leveraging generations of advanced, field-proven controller and adapter technology, OCe14000 CNAs meet the robust interoperability and reliability requirements of enterprise and scale-out data centers.

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## Controller

- Emulex Engine™ (XE)100 series (Skyhawk™) of Ethernet Controllers

## Ethernet Standards

- Single IEEE 802.3-2012 40GBASE Ethernet port (40GBASE-SR4/40GBASE-CR4)
- Single or Dual IEEE 802.3-2012 10GBASE Ethernet ports (10GBASE-SR/10GBASE-CR)
- Single or Dual 1 GBaseX/SGMII auto negotiation
- IEEE 802.1Q virtual LANs (VLAN)
- IEEE 802.3-2012 Flow control with Pause frames
- IEEE 802.1Qbg Edge Virtual Bridging
- IEEE 802.1Qaz Enhanced Transmission Selection (ETS); Data Center Bridging Capability Exchange (DCBX)
- IEEE 802.1Qbb Priority Flow Control (PFC)
- IEEE 802.1-AX Link Aggregation/LACP
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- IEEE 802.1Qau Congestion Notification

## Ethernet Network Interface (Layer 2 NIC) and TCP/IP

- NDIS 6.0, 6.2, 6.3-compliant Ethernet functionality
- IPv4/IPv6 TCP, UDP checksum offload
- IPv4/IPv6 Receive Side Scaling (RSS)
- IPv4/IPv6 Large Receive Offload (LRO)
- IPv4/IPv6 Large Send Offload (LSO)
- Dynamic VMQ (Windows Server 2012 Hyper-V) and NetQueue (VMware vSphere)
- Programmable MAC and VLAN addresses
- 128 MAC/VLAN addresses per port
- Support for hash-based Multicast MAC address filters
- Support for hash-based Broadcast frame filters per port
- VLAN offloads (insertion and extraction)
- Jumbo frame support up to 9000 Bytes

## I/O Virtualization

- Stateless L2, L3, and L4 offloads for frame-in-frame encapsulation (VXLAN, NVGRE)
- PCI-SIG Address Translation Service (ATS) v1.0
- Support for up to 512 hardware queues
- Virtual Switch Port Mirroring for diagnostic purposes
- Virtual Ethernet Bridging (VEB)
- Virtual Ethernet Port Aggregator (VEPA)
- Emulex Universal Multi-Channel™ (UMC), support for up to 16 PCIe physical functions (PFs) per adapter which can be used as partitions as follows:
  - OCe14401 CNA adapter, the port can support the 16 NIC functions or 15 NIC functions and a storage function (iSCSI or FCoE) or 14 NIC functions, an iSCSI function, and a FCoE function (concurrent mode)
  - OCe14102 CNA adapter, each port can support eight NIC functions or seven NIC functions and a storage function (iSCSI or FCoE) or six NIC functions, an iSCSI function, and a FCoE function (concurrent mode)
  - OCe14104 CNA adapters, each port can support four NIC functions or three NIC functions and a storage function (iSCSI or FCoE) or two NIC functions, an iSCSI function, and a FCoE function (concurrent mode)
  - Note: the system hardware must support and enable ARI and the host operating system must support ARI for maximum number of functions to be enabled; see Emulex UMC manual for more details
- NIC Single Root I/O Virtualization (SR-IOV)
  - up to 63 virtual functions (VFs) per port for single-port and dual-port adapters
  - up to 31 VFs per port for 4-port adapters
- Quality of Service (QoS) for controlling and monitoring bandwidth assigned to and used by virtual entities
- Configurable control of network bandwidth by physical port, queue, or protocol
- Traffic shaping and QoS across each VF and PF

## Fibre Channel over Ethernet (FCoE) Offload

- Hardware offload for FCoE protocol
- ANSI T11 FC-BB-5 Compliant (FCoE)
- Programmable World Wide Name (WWN)
- Support for FIP and FCoE Ether Types
- Concurrent Logins (RPI): up to 8K per adapter (FCoE adapter-only mode)
- Open Exchanges (XRI): up to 4K per adapter (FCoE adapter-only mode)
- For single-port and dual-port adapters, up to 255 N\_Port ID Virtualization (NPIV) interfaces per port
- Concurrent FCoE and iSCSI support on each port
- For quad-port adapters, up to 127 NPIV interfaces per port

## Internet Small Computer System Interface (iSCSI) Offload

- Hardware offload for iSCSI protocol
- Header and data digest support
- Up to 4K outstanding commands (iSCSI adapter-only mode)
- Up to 512 offloaded iSCSI connections (iSCSI adapter-only mode)
- Support for multipath I/O
- Operating system-agnostic INT13-based iSCSI boot and iSCSI crash dump support
- RFC 4171 Internet Storage Name Service (iSNS)
- Support for both IPv4 and IPv6 connections
- MTU packet size support up to 8342 bytes
- Concurrent iSCSI and FCoE support on each port

## Converged Enhanced Ethernet (CEE) and Data Center Bridging (DCB)

- IEEE 802.1Qbb Priority Flow Control (PFC)
- IEEE 802.1Qaz Enhanced Transmission Selection (ETS)
- IEEE 802.1Qaz Data Center Bridging Exchange (DCBX)
- IEEE 802.1Qau Congestion Notification (QCN)
- Absolute per-priority rate control option/configuration

## RDMA

- Direct data placement in application buffers without CPU intervention
- Supports IBTA RoCE specifications
- Linux Open Fabrics Enterprise Distribution (OFED) support
- Support for Linux Network File System (NFS) over RoCE, iSCSI Extensions for RDMA (iSER)
- Low latency queues for small packet sends and receives
- Windows Server SMB Direct (SMB over RDMA)

## PCI Express (PCIe) Interface

- PCIe 3.0 x8 (8, 5.0, and 2.5 GT/s per lane) compliant interface:
  - Up to 64 Gb/s full duplex bandwidth
  - Configurable width and speed to optimize power versus bandwidth
- Support for up to 16 PCIe physical functions (PFs)
- Support for x1, x2, x4, and x8 links widths
- NIC Single Root I/O Virtualization (SR-IOV)
  - up to 63 virtual functions (VFs) per port for single-port and dual-port adapters
  - up to 31 VFs per port for quad-port adapters
- Message Signal Interrupts Extended (MSI-X)
- Advanced Error Reporting (AER)
- Completion Timeout (CTO)
- Function Level Reset (FLR)
- Alternative Routing ID Interpretation (ARI)

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## Comprehensive OS Support

- Windows
- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server
- Oracle Linux
- VMware vSphere
- CentOS
- Oracle Solaris
- Debian (NIC mode only, storage not supported)
- Ubuntu (NIC mode only, storage not supported)
- FreeBSD (NIC mode only, storage not supported)

## Management, Boot Support

- vCenter management plugin support
- Role-based management, integrated with Active Directory and LDAP
- Flexible personality definition for networking and storage protocols
- Multi-channel configuration and bandwidth control
- UEFI and x86 remote boot support including PXE v2.1, UEFI 2.3.1, iSCSI and FCoE
- MAC statistics gathering (SNMP, Ethernet MIB, MIB2, RMON, RMON2)
- Offline and online firmware updates
- Integrated Thermal Sensor works with management utilities

## Hardware Environments

- x86, x64 servers

Please refer to the product page on [www.emulex.com](http://www.emulex.com) for further details.

## Interconnect

- Copper
  - SFP+ Direct Attached Twin-Ax Copper interface
  - Standards compliant passive copper cables up to 5m and active copper cables up to 10m
- Optical<sup>2</sup>
  - Optic 10GBASE-SR short wave lasers with LC type connector supported up to 300m on laser-optimized OM3 multimode fiber (MMF) cables
  - Optic 40GBASE-SR4 short wave lasers with MPO type connector supported up to 100m for OM3 and 150m for OM4 respectively on MMF cables

## Physical Dimensions

- For single-port and dual-port adapters
  - Short, low profile MD2 form factor card
  - 167.64mm x 68.91mm (6.60" x 2.71")
  - Standard, full height bracket installed (low-profile bracket ships in box)
- For quad-port adapters:
  - Standard, full-height form factor
  - 167.64 mm by 111.15 mm (6.60" x 4.376")
  - Standard, full height bracket installed

## Environmental Requirements

- Operating temperature: 0° to 55°C (32° to 131°F)
- Storage temperature: -40° to 70°C (-40° to 158°F)
- Relative humidity: 5% to 95% non-condensing

## Agency and Product Safety Approvals

### North America

- FCC/Industry Canada Class A
- UL/CSA Recognized
- Class 1 Laser Product per DHHS 21CFR (J)

### Europe

- CE Mark
- EU RoHS compliant
- TUV Bauart Certified
- Class 1 Laser Product per EN60825-1

### Australia

- C-Tick or RCM Mark

### Japan

- VCCI Class A

### Taiwan

- BSMI Class A

## Korea

- MSIP (formally KCC/MIC) Class A

## China

- China RoHS Compliant

## Ordering Information

### Adapters<sup>1</sup>

#### OCe14102-UX

- Dual-Port 10GBASE-CR (direct attach copper) SFP+, CNA Adapter

#### OCe14102-UM

- Dual-Port, 10GBASE-SR (short reach optical) SFP+, CNA Adapter, Optics included

#### OCe14104-UX

- Quad-port, 10GBASE-CR (direct attach copper) SFP+, CNA Adapter

#### OCe14104-UM

- Quad-port, 10GBASE-SR (short reach optical) SFP+, CNA Adapter, Optics included

#### OCe14401-UX

- Single-Port, 40GBASE-CR4 (direct attach copper) QSFP+, CNA Adapter

### Optional Accessories<sup>2</sup>

#### OC10-SR-OPT-1

- 10GBASE-SR (short reach optical) SFP+ Optical Kit, 1 pc

#### OC10-SR-OPT-2

- 10GBASE-SR (short reach optical) SFP+ Optical Kit, 2 pcs

#### OC40-SR4-OPT-1

- 40GBASE-SR4 (short reach optical) QSFP+ Optical Kit, 1 pc

<sup>1</sup> For optical adapter support, a customer must either order a short reach optical model or a direct attach model with an Emulex accessory transceiver kit.

<sup>2</sup> Only Emulex Accessories are warranted and fully supported by Technical Support.



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