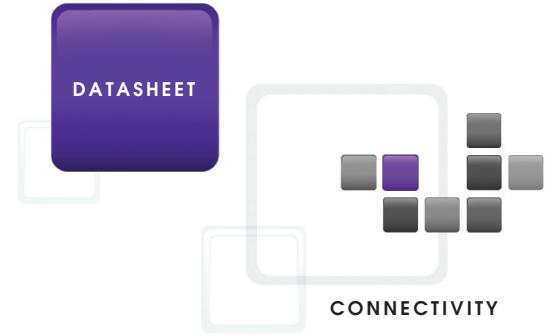




# Emulex Engine™ XE201

I/O Controller



**HIGHLY  
SCALABLE,  
MULTI-FABRIC,  
COMPREHENSIVE  
MANAGEMENT**

## One Product, One SKU, Multiple I/O Connectivity Options

In a market landscape that has more I/O options to choose from than ever before, the XE201 I/O controller provides best-of-breed Fibre Channel connectivity, along with Ethernet and multiple protocols, providing unique connectivity combinations on a single ASIC.

The XE201 delivers the industry's first native 16Gb/s Fibre Channel and 10Gb/s Ethernet product that enables you to choose a combination of up to four ports of native 8 and 16Gb/s Fibre Channel, Fibre Channel over Ethernet (FCoE), iSCSI, RDMA over Converged Ethernet (RoCE), 10 and 40Gb/s Ethernet for the ultimate in design flexibility. The XE201 delivers a low-power, single-chip solution that may be incorporated into industry-standard PCI Express expansion cards, custom format mezzanine cards, special-purpose storage target controllers, daughter cards or integrated directly into a system motherboard (e.g., LOM).

## Breakthrough Scalability Powers More Virtual Machines, More Workload

With its unique eight processor core architecture, the XE201 takes convergence and scalability to a new level, supporting ever expanding virtualization and cloud initiatives. The XE201 implements in hardware what was previously designed into firmware to deliver optimum performance. The controller design took a holistic system approach with Emulex vEngine™ technology, offloading more I/O onto the XE201 ASIC, thereby lowering the CPU burden on the host server. In terms of scalability, the XE201 supports up to 255 Virtual Functions (VFs), 1024 Message Signal Interrupts (MSI-X), 8192 concurrent logins and open exchanges for Fibre Channel and FCoE, and 2048 queue pairs for Ethernet. Emulex vScale™ dynamic resource pooling enables unmatched workload scalability across protocols.

## Key Benefits

- Attain the ultimate in connectivity flexibility with multi-network protocol options—Fibre Channel, FCoE, iSCSI, RoCE and Ethernet connectivity
- Achieve highest performance for Fibre Channel with over 1 Million Input/Output Operations per Second (IOPS), as well as MSI-X support, enabling multi-threaded interrupt support for multi-core servers
- Unique quad-port density and high-availability combo configurations
- Lower overall capital expense (CapEx) and operational expense (OpEx) costs by 50% through support of new network convergence strategies
- Meet slot and board real estate constraints with feature-rich multi-fabric Fibre Channel and Ethernet support
- Differentiate in virtualization and cloud markets with support for leading-edge virtualization features, such as support for NPIV, SR-IOV, VMQ, Netqueue and the ability to assign quality of service (QoS) at the virtual machine (VM) level



Emulex XE201 I/O Controller

# Emulex Engine™ XE201

I/O Controller



## Breakthrough Features for Unique Product Differentiation

Beyond unmatched multi-protocol functionality and performance, XE201 supports a wide range of new features for both server initiator and storage target modes, including:

- End-to-end data integrity with BlockGuard™ offload eliminates silent data corruption as data traverses the system from the O/S all the way to the disk array.
- Virtualization and Cloud Scalability:
  - **vScale™ workload-based performance and scalability**—multi-core ASIC engine with eight cores, running a combination of standard protocols and specialized functions
  - **vScale resource pooling**—dynamically allocates resources to multiple protocols, enabling scale-up of up to 255 virtual functions (VF) + 1 physical function (PF) per ASIC
  - **vEngine™**—I/O offload lowers CPU burden on host server, enabling support for more VMs
  - **vPath™**—supports emerging I/O standards including Single Root I/O Virtualization (SR-IOV), Virtual Ethernet Port Aggregator (VEPA) and Virtual Ethernet Bridge (VEB), all of which are supported by an internal Emulex Ethernet switch that allows data to be forwarded between VMs, which are collocated on same adapter, without travelling to an external switch, for higher performance and ensuring traffic isolation
- Comprehensive management support:
  - Internal thermal and power instrumentation
  - Administer multiple protocols from a single, integrated interface with OneCommand Manager
  - Common driver architecture—the same device drivers work across all generations of Emulex Fibre Channel and networking adapters and ensures in-box and in-distribution driver support with leading OS vendors

## Key Features

- Combinations of 16 and 8Gb/s Fibre Channel and/or 10Gb/s Ethernet, or a single 40Gb/s Ethernet port
- Virtualization and cloud scalability features to support up to 255 VFs, 2048 queue pairs for Ethernet and lower CPU overhead
- End-to-end enhanced data integrity with ECC, parity and support of Emulex-patented BlockGuard® offload implements the T10-PI standard to prevent silent data corruption
- GreenState™ power efficiency—selective function hibernation for reduced power consumption
- PCIe Generation 3 interface capable for next-generation server and storage devices
- Compatible with short- and long-wave optics
- Supports Emulex Service Level Interface (SLI 4) to enable driver compatibility with standard Emulex Common Drivers
- FC/FCoE Linux Target mode driver software development kit to speed deployment
- Extensive boot code, such as support for network boot, FCoE Boot and Universal Boot
- Supports both initiator and target modes

# Emulex Engine™ XE201

I/O Controller



## SPECIFICATIONS

### General Specifications

- The host system interface of XE201 consists of an eight-lane (x8) PCI Express 3.0 (backward compatible with PCIe 2.0) bus. The XE supports up to four physical interfaces (ports) that may use either native Fibre Channel (physical layer) protocol at speeds up to 16Gb/s (16GFC), or Ethernet protocol up to 40Gb/s.

### Key Features

- 8-lane (x8) PCIe 3.0 host interface
- Backward compatible with PCIe 2.0
- Up to 2 network interfaces at 16GFC
- Up to 4 network interfaces at 8GFC
- Up to 4 network interfaces at 10GbE (2 ports max. for KX4 interfaces)
- Up to 1 network interface at 40GbE
- Individually configurable network interfaces allow mixing Fibre Channel and 10GbE/CEE ports
- Unused network ports may be powered off to reduce power consumption
- Executes over 1M Input/Output Operations per Second (IOPS)
- Supports Initiator and Target modes
- Multiple Upper Level Protocol (ULP) engines minimize host CPU demands
- T10-DIF support assures data integrity and compliance
- PCIe SR-IOV compliant for up to 256 VMs (255 virtual functions [VF] + 1 physical function [PF])
- 8 PCIe Physical Functions (PF) configurable across all network ports
- Message Signal Interrupt (MSI-X) support for 1024 messages/vector
- Configurable PCIe SerDes settings
- Configurable network port SerDes settings

### Diagnostics Supported

- JTAG Boundary Scan
- Memory Built-in Self Test (BIST)
- Embedded Trace Monitor
- Embedded Trace Buffer
- Firmware based test suite
- Digital Diagnostics Management Interface (DDMI) support through I<sup>2</sup>C interface

### Reliability, Availability and Serviceability (RAS)

- Provides debug capabilities for descriptor processing, data handling and assist functions
- Supports Promiscuous mode
- Error injection support for diagnostics
- Functional firmware is field upgradeable across the PCIe bus
- Support for updating firmware even if previous update failed (de-bricking)
- Completes POST testing in less than 2 seconds after power on
- Reset/recovery on one port does not affect other ports
- Reset/recovery on one function does not affect other functions
- Reset/recovery on one I/O queue does not affect other queues
- Internal loopback functions supported
- Nonvolatile error logging support
- Byte parity/ECC error checking for all internal registers, data structures and busses
- End-to-end overlapping data integrity coverage using CRC, Parity and ECC
- Temperature management with four independent monitoring points

### Interface

- Supports direct attached copper (twisted pair) and optical interfaces

### Fibre Channel Specifications

#### Industry Standards

- Current ANSI/ITF Standards: FC-PI-4; FC-PI-5; FC-FS-2 with Amendment 1; FC-AL-2 with amendments 1 and 2; FC-LS-2; FC-GS-6; FC-DA; FC-SP-2; FCP-4; FC-MJS; FC-SB-4; FC-SP; SPC-4; SBC-3; SSC-3; RFC4338
- Legacy ANSI/ITF standards: FC-PH; FC-PH-2; FC-PH-3; FC-PI; FC-PI-2; FC-FS; FC-AL; FC-GS-2/3/4/5; FCP; FCP-2; FC-SB-2; FC-FLA; FC-HBA; FC-PLDA; FC-TAPE; FC-MI; SPC-3; SBC-2; SSC-2; RFC2625

#### Architecture

- Supports 16GFC, 8GFC and 4GFC link speeds, automatically negotiated
- Supports up to 2 FC ports at 16GFC max., or
- Supports up to 4 FC ports at 8GFC max.

#### Fibre Channel Resources

- Concurrent Logins (RPI): 8192 per ASIC
- Open Exchanges (XRI): 8192 per ASIC
- Buffer to Buffer credits: Supports 10KM link at 16GFC

### Emulex OS Driver Support

- Windows
- Linux
- Solaris
- VMware ESX/ESXi
- Custom driver development supported via Emulex exclusive Service Level Interface (SLI) API

### Remote Boot Support

- Network Boot (PXE), UEFI and OpenBoot support including PXE, iBFT, FCoE and Fibre Channel

### Data Integrity

- Supports Protection Information/Data Integrity Field standard per T10 working group (T10-PI)
- Simultaneous 512-Byte and 520-Byte block support
- Simultaneous 4096-Byte and 4104-Byte block support
- DIF Error Reporting
- End-to-End CRC (ECRC) support per PCIe 3.0 specification
- GMAC support

### Ethernet Networking Specifications

#### Industry Standards

- IEEE 802.3ba 40GBASE Ethernet ports (40GBASE-KR4/40GBASE-CR4)
- IEEE 802.3ae 10GBASE Ethernet ports (10GBASE-KR/10GBASE-KX4/XAUI)
- IEEE 802.3boot 1000BASE Ethernet ports (1000BASE-KX/SGMII)
- IEEE-802.3ap Backplane Ethernet Interfaces
  - 1000BASE-KX (1GbE copper connection)
  - 10GBASE-KX4 (10GbE over 4 lanes)
  - 10GBASE-KR (10GbE over 1 copper lane)
  - 40GBASE KR4 (40GbE over 4 lanes)
- IEEE 802.1Q virtual LANs (VLAN) with 256 VLAN IDs and Q-in-Q tagging (VLAN Stacking)
- IEEE 802.3x Flow control with Pause frames
- IEEE 802.1p QoS tagging
- IEEE 802.1Qbg Edge Virtual Bridging
- IEEE 8021Qbh Bridge Port Extension
- IEEE 802.3ad Link Aggregation Control Protocol (LACP)

#### Architecture

- Supports up to four 10GbE network ports, or one 40GbE port
- Supports SFP+ optical interface devices
- IEEE 802.3 Clause 49 (10GBASE-SR)

# Emulex Engine™ XE201

I/O Controller



## SPECIFICATIONS

### Data Center Bridging Support

- IEEE 802.1Qau Ethernet congestion management
- IEEE 802.1Qaz Enhanced Transmission Selection (ETS)
- IEEE 802.1Qbb Priority Flow Control (PFC)

### System Level Design

- System Management Interface bus (SMBus)
- RMII DMFT NC-SI system management interface
- I<sup>2</sup>C management interface support
- IPMI pass-through from 10Gb Ethernet to SMBus or RMII interface
  - IPMI support independent of other network operations (PXE, system state, etc.)
- Serial over LAN (SoL) pass-through from 10Gb Ethernet to SMBus or RMII interface
  - SoL support independent of other network operations (PXE, system state, etc.)
  - SoL failover for multi-port applications
- Integrated Thermal Sensor works with management utilities

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

- NDIS 5.2, 6.0 and 6.2 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)
- Supports 2K offloaded connections
- 2K Tx and 2K Rx queues
- Programmable MAC addresses
- 2048 unicast MAC addresses with hardware filtering
- Wire speed on-chip CAM for packet filtering and steering
- Support for s-channels
- Multicast MAC address filtering
- Broadcast frame filtering per port
- VLAN insertion and extraction
- Support for nested VLANs (Q-in-Q)
- Jumbo packet support up to 9000 Bytes
- Support for NIC teaming including failover load balancing and VLAN creation
- Wake-On LAN (WOL): D3 cold support
- Support for 4 Magic Packets

### Software iSCSI Specifications

- iSCSI Initiator support
- Software iSCSI Boot (iBFT)
  - Legacy BIOS and UEFI support

### Fibre Channel over Ethernet (FCoE) Specifications

- ANSI T11 FC-BB-5 support
- Programmable World Wide Name (WWN)
- Support for FC Fabric and Point-to-Point topologies
- Support for FC Class 3
- FCP Initiator and Target modes
- FC-TAPE
- Class 3 Error Recovery (REC-SRR)
- Support for FICON extensions
- Concurrent Logins (RPI): 8192 per ASIC
- Open Exchanges (XRI): 8192 per ASIC
- 16K concurrent logins per Target port
- FC-2 Priority Bit support
- 255 N\_Port IDs per physical N\_Port
- Common HBA API (cHBA API) support
- Virtual Storage Area Network (T11 VSAN) support
- SR-IOV compliant FCoE interfaces for VMs with 255 virtual functions

### Remote Direct Memory Access (RDMA) Specifications

- Direct data placement in application buffers without CPU intervention
- Supports IBTA RDMA over Converged Ethernet (RoCE) specifications
- Linux Open Fabrics Enterprise Distribution (OFED) support

### I/O Virtualization (IOV) Support

- Complies with PCI-SIG specifications for IOV
- Single-Root IOV (SR-IOV)
- PCI-SIG Address Translation Service (ATS) v1.1
- Virtual Switch Port Mirroring for diagnostic purposes
- Virtual Network Tagging (VNTag) support
- Virtual Ethernet Bridging (VEB)
- Support for up to 255 Virtual Functions (VF)
- Quality of Service (QoS) for controlling and monitoring bandwidth assigned to and used by virtual entities
- Configurable control of bandwidth by physical port, virtual entity and protocol
- Traffic Shaping and QoS across each VF and PF:
- NIC fine-grain QoS 10 Mb/s to 10Gb/s in 10Mb/s increments
- HBA fine-grain QoS in 1000 IOPS increments

### Electrical Specifications

- Power supply 1.8V, 1.2V, 0.9V

### Package Type

- 29mm x 29mm 762-ball grid array
- RoHS (lead free) compliant, including China RoHS



**World Headquarters** 3333 Susan Street, Costa Mesa, CA 92626 +1 714 662 5600  
**Wokingham, UK** +44 (0) 118 977 2929 | **Munich, Germany** +49 (0) 89 97007 177  
**Paris, France** +33 (0) 158 580 022 | **Beijing, China** +86 10 68499547  
**Tokyo, Japan** +81 3 5325 3261 | **Bangalore, India** +91 80 40156789

### Connect with Emulex

[twitter.com/emulex](https://twitter.com/emulex) [friendfeed.com/emulex](https://www.facebook.com/emulex) [bit.ly/emulexlinks](https://bit.ly/emulexlinks) [bit.ly/emulexfb](https://www.linkedin.com/company/emulex)

[www.emulex.com](http://www.emulex.com)

©2011 Emulex, Inc. All rights reserved. This document refers to various companies and products by their trade names. In most, if not all cases, their respective companies claim these designations as trademarks or registered trademarks. This information is provided for reference only. Although this information is believed to be accurate and reliable at the time of publication, Emulex assumes no responsibility for errors or omissions. Emulex reserves the right to make changes or corrections without notice. This report is the property of Emulex and may not be duplicated without permission from the Company.