BROADCOM®

Product Brief

Emulex Engine XE601

I/O Controller

Accelerate Workload Performance for NVMe Data Centers

- Accelerate workloads with up to 3x better latency than the previous generation
- Speed up applications, AFAs, and handle peak workload I/O spikes with up to 5M IOPS—over 3x more than the previous generation
- Get faster data transfer speed with the industry's first PCIe 4.0 controller delivering 2x more bandwidth per lane

Easily Deploy, Manage, and Upgrade SANs

- Save time with no server reboots for firmware updates, queue depth changes, and optics replacements
- Meet SLAs with industry-leading controller reliability—10M hours MTBF
- Easy performance upgrade from 32GFC to 64GFC with hot-plug optics kits
- Enable full end-to-end implementation of Brocade Fabric Vision from the HBA to the switch

Next-Gen Controllers for the Modern Data Center

The Emulex® XE601 storage I/O controller (IOC) by Broadcom is designed for demanding mission-critical workloads and emerging applications. Applications continue to grow in size and scale and, to support them, enterprises are increasingly turning to new server technologies that contain hundreds of processor cores as well as high-performance storage solutions including low-latency NVMe, all-flash arrays (AFAs). NVMe can significantly increase the performance of storage area networks (SANs), making the selection of high-speed networking technology the critical element for achieving maximum system-wide performance. Fibre Channel is purpose-built for storage networks, meeting the requirements for high availability, scalability, predictable performance and low latency.

Compared to the previous generation, Emulex XE601 offers up to 2x higher bandwidth, 3x better latency, enhanced security, and operational efficiency for 32GFC and 64GFC SANs.

Performance

The Emulex Dynamic Multi-core Architecture delivers unparalleled performance and the most efficient port utilization with eight processing cores and 16 threads that dynamically apply ASIC resources to any port that requires them, ensuring SLAs are met. XE601 delivers up to 25,600 MB/s full duplex, 3x better hardware latency, and supports an industry-leading 5 million IOPS.

The I/O fast path design provides hardware acceleration for Emulex's Dynamic Multi-core architecture, reducing latency for each transaction by processing I/O requests in hardware, thereby operating significantly faster than software-based solutions. These performance advances enable XE601 to handle demanding workloads and I/O spikes experienced under peak workload conditions like no other Fibre Channel HBA in the industry.

XE601 supports NVMe over Fibre Channel (NVMe/FC), providing significantly lower latency versus traditional Fibre Channel SCSI Protocol (SCSI FCP). Recent testing by independent performance labs has shown that NVMe/FC can deliver up to 50% more IOPs and 30% lower latency than traditional SCSI FCP.* XE601 also supports NVMe/FC and SCSI FCP concurrently, providing investment protection and allowing data centers to transition to end-to-end NVMe over FC SANs at their own pace.

The port aggregation capability (also known as trunking) provides a method to aggregate physical ports together to form a single logical port. Aggregating physical ports to make a single high-bandwidth datapath increases the logical connection bandwidth for applications that need it, such as data warehousing and virtual machine migration.

**Emulex labs/Demartek, 2018.*

Emulex® GEN7 FIBRE CHANNEL

Fully Protect Data

- Thwart malicious firmware with a Silicon Root of Trust and digitally signed firmware
  - Complies with NIST 800-193 framework
  - Digital signature verification during firmware download and power-on
- Guarantee driver security with Broadcom digitally signed drivers
- Secure Boot guarantees UEFI boot code security with digitally signed boot code
- Data Integrity Field (T10 DIF) protects data from corruption

Operational Efficiency

Emulex XE601 offers enhanced reliability, availability and serviceability (RAS) including port isolation and port-based error isolation that enables users to easily detect, isolate, and recover from errors.

Emulex controllers are easy to manage and save administrators time and operating costs with features such as no reboots for firmware updates, queue depth changes, or optics replacements.

Security

One of the key initiatives for enterprises is that their infrastructure is safe from network attacks. Fibre Channel has field proven security in protecting the world's most sensitive data in banking, finance, healthcare, government, and military for over 20 years. Fibre Channel is protected from threats coming from IP networks because there is no direct connectivity for an attack from the IP network. This makes Fibre Channel a very strong link in the security chain.

XE601 provides unmatched security features for Fibre Channel environments. They the only Fibre Channel controllers with Silicon Root of Trust security embedded into the hardware itself. Firmware digital signatures are verified each time the system is booted as well as before installing any new firmware, providing a tamper proof solution.

Emulex's digitally signed drivers are integrated with all the major enterprise operating systems. Drivers are digitally signed and are verified to be authentic code written by Emulex HBAs before they can be installed.

Standards

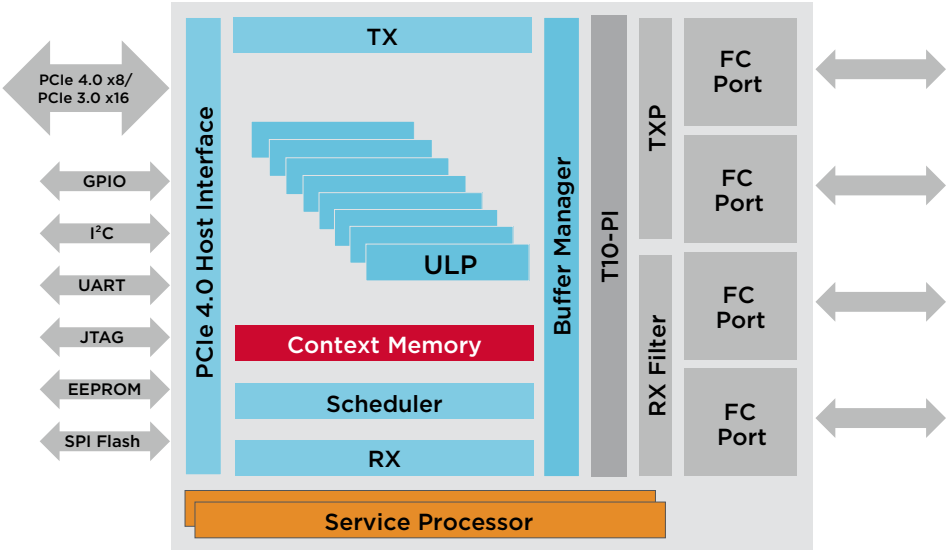
General Specifications

- The XE601 can be configured as 64GFC or 32GFC with host connections of PCIe 3.0 x16 or 4.0 x8
- Supports FC standard for N-2 speeds

Industry Standards

- Current ANSI/IETF Standards: FC-PI-7; FC-FS-5; FC-LS-3; FC-GS-7; FC-PI-5; FC-PI-6; FC-DA; FC-DA-2; FCP-4; SPC-4; SBC-3; SSC-4; FC-NVMe; FC-NVMe/AM1
- Legacy ANSI/IETF Standards: FC-PI-4; FC-FS-3; FC-FS-4; FC-LS-2; FC-GS-6; FC-PH; FC-PH-2; FC-PH-3; FC-PI; FC-PI-2; FC-PI-3; FC-FS; FC-GS-2/3/4/5; FCP-2/3; FC-HBA; FC-TAPE; FC-MI; SPC-3; SBC-2; SSC-2; SSC-3
- PCIe base specification 4.0
- PCIe card electromechanical specification 4.0
- Fibre Channel Class 3
- PHP hot plug-hot swap
- UEFI 2.5

Figure: XE601 Block Diagram



Architecture

- 64GFC ports support 16/32/64GFC link speeds, automatically negotiated
- 32GFC ports support 8/16/32GFC link speeds, automatically negotiated
- Supports up to four FC ports at 32GFC max.
- Supports up to four FC ports at 64GFC max.
- Integrated data buffer and code space memory

Comprehensive OS and Hypervisor Support

- Microsoft Windows
- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server
- VMware vSphere
- Oracle Linux; Oracle Linux with the Unbreakable Enterprise Kernel (UEK)
- Citrix
- Oracle Solaris

Additional support is available from OEMs and partners.

HDK/SDK

Hardware and software development kits are available for custom FC target mode implementations

Optical

- Data rates: 57.8 Gb/s (64GFC); 28.05 Gb/s (32GFC); 14.025 Gb/s (16GFC); 8.5 Gb/s (8GFC) automatically negotiated
- Optics: Short-wave lasers with LC-type connector
- Cable:
  - 0.5m to 70m at 32GFC/64GFC on 50/125 µm OM3 MMF
  - 0.5m to 100m at 32GFC/64GFC on 50/125 µm OM4 MMF
  - 0.5m to 100m at 32GFC/64GFC on 50/125 µm OM5 MMF
  - 10 km link lengths on 9/125 µm singlemode fiber when longwave transceivers are used

Package Type

- 27 mm × 27 mm package size
- 672-ball Flip Chip Ball Grid Array (FCBGA)
- 1 mm pitch
- RoHS (lead free) compliant, including China RoHS

Power and Environmental Requirements

Power supply voltages: 0.8V, 0.9V, 1.1V, 1.8V

Ordering Information

4-port 32GFC/64GFC I/O controller, model no. XE601

Additional Features

Performance Features

- Doubling the maximum FC link rate from 32GFC to 64GFC and support for NVMe over Fibre Channel help support data center modernization initiatives.
- Frame-level multiplexing increases link efficiency and maximizes HBA performance.
- Accelerates network access to SSDs with NVMe over Fibre Channel — supports the FC-NVMe INCITS T11 standard.

Data Protection Features

- End-to-end data protection using hardware parity, CRC, ECC, and other advanced error checking and correction algorithms ensures data is safe from corruption.
- Enhanced data protection provided by T10 PI with high-performance offload. T10 PI provides additional data protection in environments such as Oracle Unbreakable Linux.

Deployment and Management Features

- Universal boot capability allows the appropriate boot environment to be automatically selected for any given hardware.
- Boot from SAN capability reduces system management costs and increases uptime.
- Detailed, real-time event logging and tracing enables quick diagnosis of SAN problems.
- Beaconing feature flashes the HBA LEDs, simplifying their identification within server racks.
- Environmental monitoring feature helps optimize SAN availability.

Management Features

- The Emulex OneCommand® Manager application enables centralized discovery, monitoring, reporting, and administration of HBAs provided by Emulex on local and remote hosts. Powerful automation capabilities facilitate remote driver parameter, firmware and boot code upgrades.
- Advanced diagnostic features, such as adapter port beaconing and adapter statistics, help optimize management and network performance, while the environmental monitoring feature helps to maintain optimum host-to-fabric connections. In addition to the GUI interface, management functions can also be performed via a scriptable Command Line Interface (CLI).
- Troubleshoot optics and cables before critical errors affect your system with Brocade ClearLink supported Switches and Emulex HBAs.
- Meet SLAs and QoS with ExpressLane application prioritization on hosts.
- OneCommand Manager supports role-based management to facilitate administration of adapters throughout the data center without compromising security. Management privileges can be assigned based on LDAP and AD group memberships.
- Emulex's management instrumentation complies to open management standards, such as SMI-S and common HBA API support, which enables seamless upward integration into enterprise storage and server management solutions.

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For more product information: broadcom.com

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