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Product Brief

Emulex® Engine XE701 SEC
I/O Controller

Innovative Security Built on a Zero Trust, Quantum-Safe Platform

- Post-quantum cryptography algorithms to meet CNSA 2.0, DORA, and NIS 2 mandates.
- Secures data in-flight between host servers and target devices with EDIF support and simplified session-based key management.
- Zero Trust platform:
  - Silicon root-of-trust hardware-based firmware authentication. Compliance with the NIST 800-193 framework.
  - Secure boot, digitally signed drivers, T10-DIF, and more.

Cost-Effective Encryption

- Simple, session-based in-flight encryption:
  - No complex and expensive key management application needed.
  - No impact to storage array compression, dedupe, ransomware detection, or other advanced storage features.
- Runs on existing FC SAN infrastructure.

Overview

The Emulex® XE701 SEC secure controller by Broadcom is designed to deliver the highest level of security, performance, and manageability for mission-critical infrastructures.

Cybersecurity is a focal point of enterprises and governments globally. The longstanding approach of protecting critical data via firewalls is no longer sufficient, and the combination of artificial intelligence (AI) and quantum computing magnifies the risk if data is not encrypted at all points in the data center including the network.

To address these concerns, governments have responded with new mandates—including the United States' Commercial National Security Algorithm (CNSA) 1.0/2.0 and the European Union's Network and Information Security (NIS) 2 and Digital Operational Resilience Act (DORA)—that require enterprises to modernize their IT infrastructures with more robust encryption requirements.

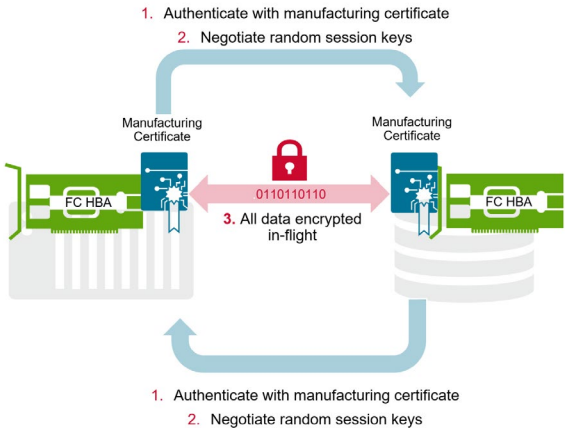
Security

Today IT managers rely on Fibre Channel (FC) with field-proven security for the world's mission-critical data in banking, finance, health care, government, transportation, and military. FC offers *air gap* protection with no connectivity to vulnerable IP networks.

Emulex secure controllers introduce a cost-effective, easy-to-manage solution that encrypts all data in-flight (EDIF), protecting data as it moves across databases, applications, servers, and storage. Emulex Secure controllers integrate post-quantum cryptography (PQC) algorithms to ensure that encrypted data remains encrypted even as quantum computing and AI put legacy encryption at risk.

The session-based key management solution, based on the emerging ANSI/INCITS FC-SP-3 standard, does not require complex and prohibitively expensive key management software. Compared to other encryption methods, such as application-based encryption, Emulex Secure controllers can encrypt *all* applications, at a lower cost, and with no impact to storage array services such as compression, dedupe, and ransomware detection.

Figure 1: Session-Based Encryption



Maximum Application Performance

- Crypto functions offloaded to hardware, enabling encryption without sacrificing system performance.
- Accelerate workloads with industry-leading 64G performance:
  - Over 20% better application response time vs. other manufacturers' 64G HBAs.
  - 2x better application performance and up to 3x better latency than the previous generation.
  - Over 10M IOPS—3x more than the previous generation HBA.
  - Supports NVMe over FC and SCSI FC concurrently.

Easy to Manage and Deploy

- 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.

Performance

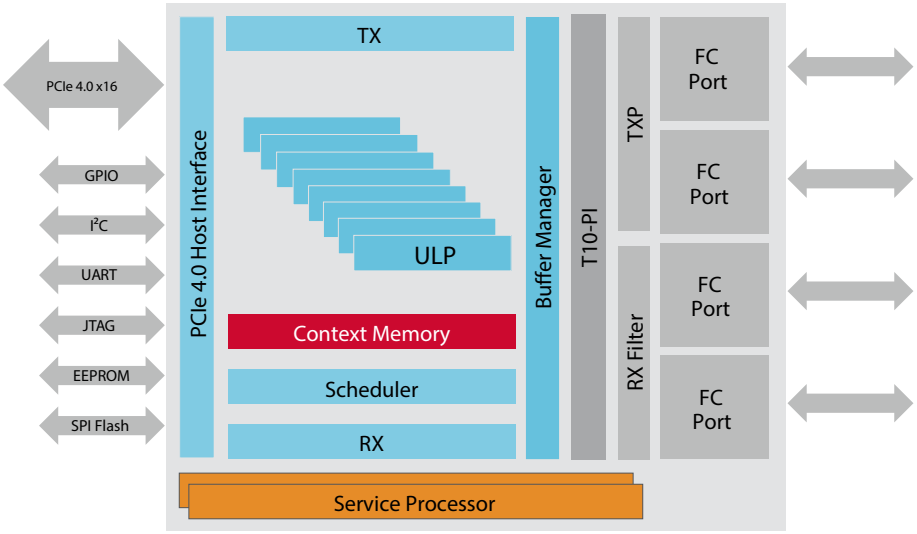
Compared to alternative approaches to network encryption that significantly impact application performance or limit the ability to compress or dedupe data, the Emulex secure controller delivers network encryption with better performance and no impact to storage services. The Emulex Dynamic Multi-core architecture delivers unparalleled performance and the most efficient port utilization with 8 fully redundant data engines and 16 threads that dynamically apply ASIC resources to any port that requires them, ensuring that SLAs are met. Compared to Gen 6 controllers, Emulex Gen 7 secure controllers can support 64GFC to deliver up to 2x greater bandwidth.

Operational Efficiency

Emulex secure controllers offer enhanced reliability, availability, and serviceability (RAS), including port isolation and port-based error isolation that enable users to easily detect, isolate, and recover from errors.

Emulex HBAs 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

Figure 2: Block Diagram



Standards

General Specifications

- The XE701 SEC controller uses an 16-lane (x16) PCIe 4.0 bus on the single-port and dual-port models (with backward compatibility to PCIe 3.0 supported). The architecture enables resources to be applied to any port that needs them, delivering up to 10M IOPS on 64GFC HBAs.

Industry Standards

- Current ANSI/INCITS standards:
  - FC-PI-8; FC-FS-6; FC-LS-5; FC-GS-9; FCP-5; FC-SP-2; FC-SP-3 INCITS 577-202x rev 3.04; SPC-5; SBC-4; SSC-5; FC-NVMe-2.
- Legacy ANSI/INCITS standards:
  - FC-PI-1/2/3/4/5/6/7; FC-FS-1/2/3/4/5; FC-LS-1/2/3/4; FC-GS-1/2/3/4/5/6/7/8; FC-PH-1/2/3; FC-DA-1/2; FCP-2/3/4; FC-HBA; FC-TAPE; FC-MI; SPC-3/4; SBC-2/3; SSC-2/3/4; FC-NVMe with AM1.
- PCIe base spec 4.0.
- PCIe card electromechanical spec 4.0.
- PCI Hot Plug (PHP).
- UEFI 2.7.

HBA Port Virtualization (NPIV)

- NPIV.

Logins, Exchanges

- Support for 2048 concurrent logins (RPIs) and 6000 active exchanges (XRIs) per port.
- Boot from SAN (BFS).

Zero Trust Security Features

- Secure boot and signed drivers.
- Security Protocol and Data Model (SPDM).
- Post-Quantum Silicon Root of Trust (Leighton-Micali Signature, LMS).
- Data Encryption In-Flight (EDIF, AES-GCM-256).
- Support for Post-Quantum Digital Signature and Key Exchange Method (FIPS 203, 204).
- CNSA (Commercial National Security Algorithm Suite) compliant.

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 64GFC maximum.
- Integrated data buffer and code space memory.

HDK/SDK

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

Throughput

- 32GFC: 6,400 MB/s full-duplex line rate per port.
- 64GFC: 12,800 MB/s full-duplex line rate per port.

Optical

- Data rates:
  - 64GFC (28.9 Gbaud PAM4), 32GFC (28.05 Gbaud NRZ), 16GFC (14.025 Gbaud NRZ), 8GFC (8.5 Gbaud NRZ), automatically detected (8GFC supported for LPe37100-series HBAs only).
- Optics: Short-wave lasers with LC-type connectors.
- Cable:
  - 0.5m to 70m at 64GFC/32GFC on 50/125-µm OM3 MMF.
  - 0.5m to 100m at 64GFC/32GFC on 50/125-µm OM4 MMF.
  - 0.5m to 100m at 64GFC/32GFC on 50/125-µm OM5 MMF.
  - 10 km at 64GFC/32GFC/16GFC on 9/125-µm single-mode fiber when long-wave transceivers approved by Broadcom for use in Emulex HBAs 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.

Environmental Requirements

- Operating temperature: 0°C to 55°C (32°F to 131°F).
- Storage temperature: –20°C to 85°C (–4°F to 185°F).
- Relative humidity: 5% to 95% non-condensing.

Additional Features

Performance Features

- Double the maximum FC link rate from 32GFC to 64GFC
- Support for NVMe/FC for low-latency, high-performance, end-to-end NVMe/FC storage networks.
- Registration and support for FPINs and congestion signaling.
- Buffer-to-buffer credit recovery: automatic buffer credit loss detection and recovery for reliable performance.
- Frame-level multiplexing increases link efficiency and maximizes HBA performance.
- N_Port ID Virtualization (NPIV) increases network scalability by enabling a single FC adapter port to provide multiple virtual ports.
- Enhanced data protection is provided by T10 PI with high-performance offload. T10 PI provides additional data protection in environments such as Oracle Unbreakable Linux.

Ordering Information

- 4-port 32GFC/64GFC I/O controller, model no. XE701 SEC

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For more product information: broadcom.com

XE701SEC-PB100 February 28, 2025