BROADCOM

Product Brief

Emulex® Gen 6 Fibre Channel HBAs

LPe31000/LPe32000 Series

Faster Flash

- Completes data warehousing transactions in ¼ of the time[1]
- Meets the massive bandwidth requirements of flash storage arrays with up to 32GFC throughput
- Maximizes the performance of flash-based systems by prioritizing mission-critical traffic in congested networks with the exclusive ExpressLane feature
- Via NVMe-enabled capability, delivers an additional 55% lower latency and supports NVMe over Fibre Channel and traditional SCSI over Fibre Channel concurrently

Better Virtualization

- Near limitless scalability to support maximum VM density with 2x more on-chip resources and bandwidth
- Improved VDI experience with low-latency HBAs providing noticeable improvements during boot storms
- Simplified management and installation with the Emulex HBA Manager plug-in for VMware vCenter®

1. Demartek TPC-H testing performed with Emulex Gen 6 FC HBAs in a Microsoft SQL Server environment versus the previous generations of HBAs.

Faster Flash. Better Virtualization. Lossless Networking.

The Emulex® Gen 6 (16/32G) Fibre Channel (FC) host bus adapters (HBAs) by Broadcom are designed to address the demanding performance, reliability, and management requirements of modern networked storage systems that use high-performance and low-latency solid-state storage drives for caching and persistent storage as well as hard disk drive arrays.

Fibre Channel (FC) is the gold standard for network storage connectivity in enterprise and cloud deployments. The latest Emulex Gen 6 FC HBAs offer higher performance, lower latency, enhanced diagnostics, and manageability that benefit both 16GFC and 32GFC environments. Emulex LPe31000-series HBAs are available with single or dual 16GFC optics that can be upgraded with 32GFC optics to use the full performance of Gen 6 FC technology. The LPe32000-series HBAs are available with single or dual 32GFC optics.

Unique to Fibre Channel technology is its deep ecosystem support, making it ideal for large-scale, easy-to-manage storage deployments. Users can count on a complete suite of management software, in-box drivers for mainstream server operating systems, software-defined storage APIs and tools, and the strength to support high service-level agreement (SLA) applications.

Accelerate

The unique Emulex Dynamic Multi-core architecture delivers unparalleled performance and more efficient port utilization than other HBAs by applying all ASIC resources to any port that needs it.

Compared to the previous generation, Emulex Gen 6 HBAs deliver 2x greater bandwidth—12,800 MB/s (two 32GFC ports, full duplex), less than half the latency, and support for an industry-leading 1.6 million IOPS on a single port, ensuring that SLAs are met. 32GFC provides seamless backward compatibility to 16GFC and 8GFC networks.

Emulex® GEN6 FIBRE CHANNEL

Lossless, Reliable Networking

- Near zero downtime: FC's lossless design ensures no dropped packets and maximum uptime
- Industry leader for reliability: Emulex HBAs can provide up to 1141 years of uninterrupted service![2]

Emulex Gen 6 HBAs are an excellent choice for database applications as recent TPC-H testing in a data warehousing environment has demonstrated up to 71% faster completion times versus the previous generations of HBAs. To enable the highest virtual machine density, Gen 6 HBAs provide support for up to 255 virtual functions, 1024 message-signaled interrupts, and expansive on-board context for exchanges and logins.

NVM Express (NVMe) is a relatively new protocol for solid-state storage devices that are built with nonvolatile memory technologies. NVMe provides substantially lower latency for storage I/O operations and significantly higher IOPS per device. NVMe scales up the number of devices that it can address by adopting NVMe over Fabrics technology.

Emulex Gen 6 HBAs are NVMe over Fibre Channel-enabled, providing an additional 55% lower latency for storage I/O operations versus SCSI. Gen 6 NVMe-enabled HBAs support NVMe over Fibre Channel and SCSI over Fibre Channel concurrently, allowing data centers to transition to all-flash storage at their own pace.

Protect

Emulex Gen 6 FC HBAs deliver enhanced security via the new secure firmware update feature, which protects and ensures the authenticity of device firmware.

Forward Error Correction (FEC) is a Gen 6 Fibre Channel standard feature that provides enhanced data reliability and performance by automatically detecting and recovering from bit errors. It is especially useful in diverse and complex user environments such as blade system implementations.

FEC is a digital signal processing technique that introduces redundant data, called an error correcting code, prior to data transmission. FEC then provides the receiver with the ability to correct errors without a reverse channel to request the retransmission of data, which improves performance.

T10 Protection Information (T10-PI) data integrity with high-performance hardware offload provides data protection from the server to the storage array. As one of the founders of the Data Integrity Initiative (DII), Emulex, along with Oracle and Seagate, was instrumental in defining the T10-PI standard, which, along with the Data Integrity Extensions (DIX) standard, delivers full end-to-end data integrity. T10-PI ensures the validity of I/O operations through the exchange of verification information during data transmissions.

Emulex HBAs are renowned for reliability, ensuring maximum SAN uptime. Their *It Just Works* reputation is based on 17 million installed ports with proven industry-leading reliability of 10 million hours field mean time between failures (MTBF).

2. Based on published FIELD MTBF of 10 million hours for the Emulex family of FC HBAs.

Simplify HBA Management and Remediate Network Performance Problems with Emulex SAN Manager

Emulex Gen 6 HBAs work with the Emulex SAN Manager application to reduce operational cost and complexity via the following:

- Visibility into the endpoints of the fabric
  - Captures complete SAN HBA host inventory; host names; and OS, software, and firmware versions
  - Identifies multipath misconfiguration errors via the multipath validation tool
- Centralized in-band access to managed HBAs across the SAN
  - Configures the Adaptive Congestion Management feature
  - Enables optical transceiver statistics to be downloaded for analysis to help detect optic degradation; lists queue depths by port
- Automatic identification and mitigation of application performance problems with direct communication between Emulex HBAs and Brocade® fabric switches and directors
  - Visualizes SAN congestion with a dashboard that presents congestion and bandwidth graphs
  - Remediates congestion automatically via the Adaptive Congestion Management feature

The Emulex SAN Manager application is available separately. Contact Broadcom sales for information.

Control

Emulex Gen 6 HBAs are managed HBAs—intelligent adapters designed to work with Emulex SAN Manager to reduce the complexity of managing enterprise-class SANs. Unlike other adapters, managed HBAs are designed to perform many operational tasks without the intervention of the host on which they reside. Managed HBAs differ from other adapters in the following ways:

- Communicate across the fabric, in-band, to the Emulex SAN Manager centralized management application.
- Register with the fabric as managed devices.
- Collaborate with the fabric to identify and address performance problems with fabric notifications.
- Monitor and record performance data and fabric notifications for analysis.

The flagship Emulex HBA Manager application, formerly known as OneCommand™ Manager, features a multiprotocol, cross-platform architecture that provides centralized management of all current and previous generations of Emulex FC HBAs. This application enables IT administrators to manage network connectivity with one tool for maximum efficiency. Emulex HBA troubleshooting is simplified with Emulex HBA Capture, an Emulex device driver utility that gathers system, adapter, device driver, and application information. Data collected by HBA Capture is compressed into a single file and can be sent to Broadcom Technical Support for analysis when system issues are being debugged or for diagnostic purposes.

The LPe31000/LPe32000-series HBAs support Brocade I/O Insight for Gen 6 FC, which proactively and nonintrusively monitors device-level and application-level I/O to gain insights into performance and availability, ensuring predictable performance and operational stability.

Additionally, Emulex HBAs support the following Brocade features:

- ClearLink™ (D_Port): Automated end-to-end signal integrity checks help identify any cabling, optics, or port issues in minutes versus hours
- Link Cable Beaconing: Locates a connection on either the Brocade switch port or the Emulex HBA port by making the LED port blink for easy end-to-end identification
- Host Name Registration: Eliminates the need to manually associate world wide port names with servers, with automated capture of information from Emulex HBA ports
- Read Diagnostic Parameters: Brocade switches and Emulex HBA ports will self-report diagnostic information, including port speed, link errors, and SFP information (temperature, Tx and Rx power, and so on)

Standards

General Specifications

The LPe31000/32000-series FC HBAs are powered by the XE501 controller and use an 8-lane (x8) PCIe 3.0 bus (backward compatibility to PCIe 2.0 supported). The architecture enables all resources to be applied to any port that needs it, delivering over 1.6 million IOPS on a single port.

Industry Standards

- Current ANSI/IETF Standards: FC-PI-4; FC-PI-5; FC-PI-6; FCFS-3; FC-LS-2; FC-GS-6; FC-DA; FC-DA-2; FCP-4; SPC-4; SBC-3; SSC-4
- Legacy ANSI/IETF Standards: FC-PH; FC-PH-2; FC-PH-3; FC-PI; FC-PI-2; FC-PI-3; FC-FS; FCGS-2/3/4/5; FCP-2/3; FC-HBA; FC-TAPE; FC-MI; SPC-3; SBC-2; SSC-2; SSC-3
- PCIe base spec 3.0
- PCIe card electromechanical spec 3.0
- Fibre Channel Class 3
- PCI Hot Plug (PHP)

HBA Port Virtualization

- NPIV

Logins

- Supports 12,288 concurrent logins and active exchanges per port

Architecture

Single-Port LPe32000, Dual-Port LPe32002

Supports 32GFC, 16GFC, and 8GFC link speeds, automatically negotiated

Single-Port LPe31000, Dual-Port LPe31002

Supports 16GFC, 8GFC, and 4GFC link speeds, automatically negotiated

Comprehensive OS and Hypervisor Support

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

For the latest applicable OS support, visit broadcom.com/support. Additional support is available from OEMs and partners.

Hardware Environments

- Intel x64, Intel x86, ARMv8 64-bit, and PowerPC

Throughput

- 16GFC: 3200MB/s full duplex line rate per port
- 32GFC: 6400MB/s full duplex line rate per port

Optical

- Data rates: 32GFC (28.05 Gbaud NRZ), 16GFC (14.025 Gbaud NRZ), 8GFC (8.5 Gbaud NRZ), 4GFC (4.25 Gbaud NRZ), automatically detected (4GFC supported for LPe31000-series HBAs only)
  - 0.5m to 35m at 16 Gb; 0.5m to 20m at 32 Gb on 50/125-µm OM2 MMF
  - 0.5m to 100m at 16 Gb; 0.5m to 70m at 32 Gb on 50/125-µm OM3 MMF
  - 0.5m to 125m at 16 Gb; 0.5m to 100m at 32 Gb on 50/125-µm OM4 MMF
  - 10 km at 32 Gb/16 Gb on 9/125-µm single-mode fiber when Emulex-approved longwave transceivers are used

Physical Dimensions

- Short, low-profile PCIe card: 167.64 mm x 68.91 mm (6.60 in. x 2.71 in.)
- Standard bracket (low-profile bracket ships in box)

Environmental Requirements

- Operating temperature: 0°C to 55°C (32°F to 131°F); 150 LFM required LPe31004-M64
  - 200 LFM required for LPe31004-M6 model
- Storage temperature: –20°C to 85°C (–4°F to 185°F)
- Relative humidity: 5% to 95% noncondensing

Agency and Safety Approvals

North America

- FCC/ICES Class A
- UL/CSA Recognized

Europe

- CE Mark
- EU RoHS Compliant
- EU Low Voltage Directive

Australia

- RCM Class A

Japan

- VCCI Class A

Taiwan

- BSMI Class A
- BSMI RoHS Compliant

Korea

- KCC Class A

China

- China RoHS Compliant

Ordering Information

LPe31000-M6[3]
1-Port 16GFC Short Wave Optical – LC SFP+ (Upgradeable to 32GFC)

LPe31002-M6[3]
2-Port 16GFC Short Wave Optical – LC SFP+ (Upgradeable to 32GFC)

LPe32000-M2
1-Port 32GFC Short Wave Optical – LC SFP+

LPe32002-M2
2-Port 32GFC Short Wave Optical – LC SFP+

Options

Only Emulex-approved options are warranted and fully supported by Technical Support. Emulex options are denoted by -ELX, -EM, or -EL5 in the transceiver part number. When upgrading LPe31000-series 16GFC models to 32GFC, Broadcom 32GFC optical transceiver kits must be used.

To order, use the following part numbers:

LP32-SW-OPT-1
32GFC Short Wave Optical (1-piece kit)

LP32-SW-OPT-2
32GFC Short Wave Optical (2-piece kit)

LP32-LW-OPT-1
32GFC Long Wave Optical (1-piece kit)

LP32-LW-OPT-2
32GFC Long Wave Optical (2-piece kit)

LP16-LW-OPT-1
16GFC Long Wave Optical (1-piece kit)

LP16-LW-OPT-2
16GFC Long Wave Optical (2-piece kit)

Added Features

Performance Features

- Doubling the maximum FC link rate from 16GFC to 32GFC and enhanced virtualization capabilities help support IT green initiatives.
- Frame-level multiplexing increases link efficiency and maximizes HBA performance.
- Support for NVMe/FC for low-latency, high-performance, end-to-end NVMe/FC storage networks.
- N_Port ID Virtualization (NPIV) increases network scalability by enabling a single FC adapter port to provide multiple virtual ports.

Data Protection Features

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

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.
- The beaconing feature flashes the HBA LEDs, simplifying their identification within server racks.
- The environmental monitoring feature helps optimize SAN availability.

Management Features

- The Emulex HBA Manager application[4] enables centralized discovery, monitoring, reporting, and administration of Emulex HBAs 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) as well as a web browser.
- 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. ExpressLane is fully compatible with the majority of switches that offer QoS features.
- The Emulex HBA Manager application 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 with open management standards, such as SMI-S and common HBA API support, enabling seamless upward integration with enterprise storage and server management solutions.

3. Only Broadcom certified optical transceiver kits can be used.
4. The Emulex OneCommand Manager application has been renamed the Emulex HBA Manager application.

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For more product information: broadcom.com

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