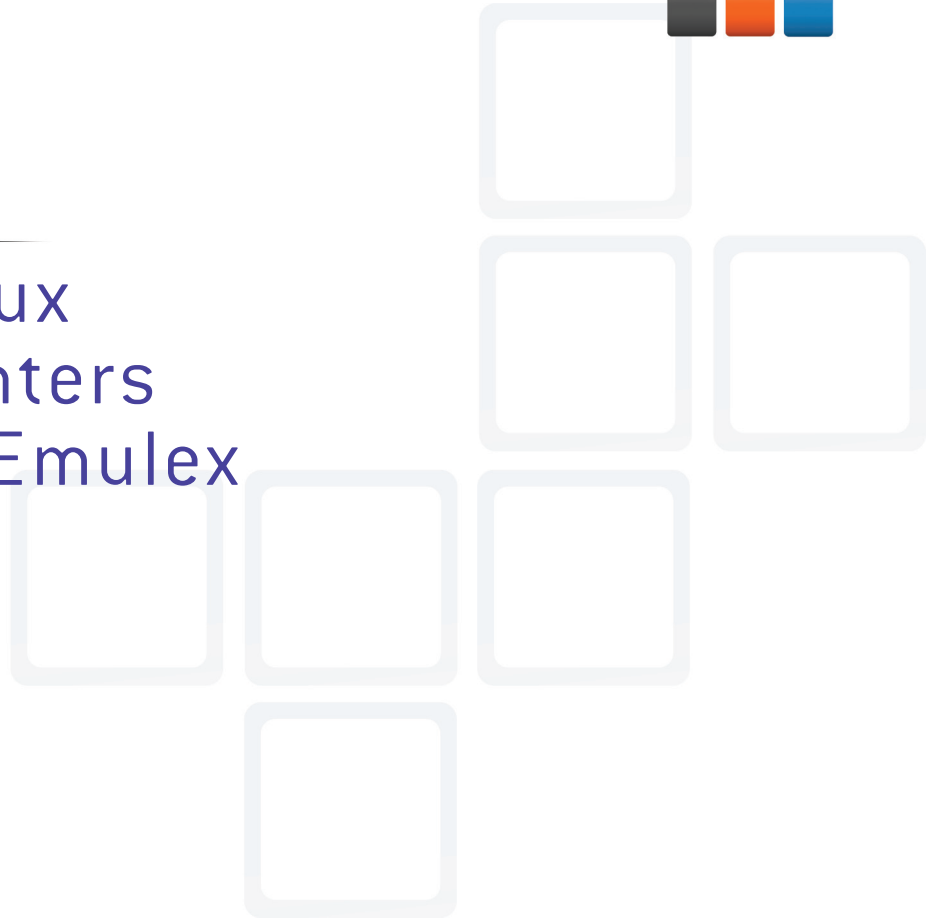




WHITE PAPER

Why Linux Data Centers Choose Emulex





■ **Eight Reasons Why Enterprise Data Centers Choose Emulex**

1 Converged networking framework to enable unified I/O (p.4)

Benefit—Reduce costs with Emulex OneConnect FCoE UCNAs that support high performance offload for TCP/IP, iSCSI and FCoE protocols

2 The most advanced Linux driver architecture (p.5)

Benefit—Enjoy a highly stable system and SAN environment with minimal planned and unplanned downtime

3 Technology leadership in storage and network connectivity (p.6)

Benefit—Take advantage of new virtualization and security technology trends for Fibre Channel, FCoE, iSCSI and networking

4 Strong partnerships with Red Hat, Novell, Oracle, Citrix, Ubuntu and Debian, CentOS, FreeBSD® and the OpenSource Community (p.9)

Benefit—Confidence that Emulex and Linux products and support will work well together to ensure that your data centers are operating at their best

5 Highly efficient and scalable enterprise management (p.11)

Benefit—Increase IT productivity so that you can manage larger networks without increasing administrative costs

6 “It Just Works” platform stability and interoperability (p.13)

Benefit—Lower cost of ownership

7 High performance (p.14)

Benefit—Achieve greater user satisfaction and increased performance from your IT investment

8 Broad product offering (p.14)

Benefit—Reduce training and administrative costs by standardizing on Emulex

At a Glance

Linux users look to Emulex, a leading provider of Fibre Channel host bus adapters (HBAs), for high performance, scalable, reliable connectivity solutions. With converged networking, Linux users now have a greater choice when deploying a storage area network (SAN) with iSCSI and Fibre Channel over Ethernet (FCoE) protocols. The Emulex OneConnect Universal Converged Network Adapter (UCNA) allows Linux environments of any size to invest in a single product to use for various protocols and is the only product known that allows the protocol selection to change after the adapter is installed.

Products

- Emulex® OneConnect™ Universal CNA
- Emulex LightPulse® Fibre Channel HBAs
- Emulex OneCommand™ Manager (formerly HBAnyware®)

Applications

- Organizations deploying SAN-based Linux servers
- Organizations deploying converged network solutions
- Organizations deploying cloud architectures



OneConnect™

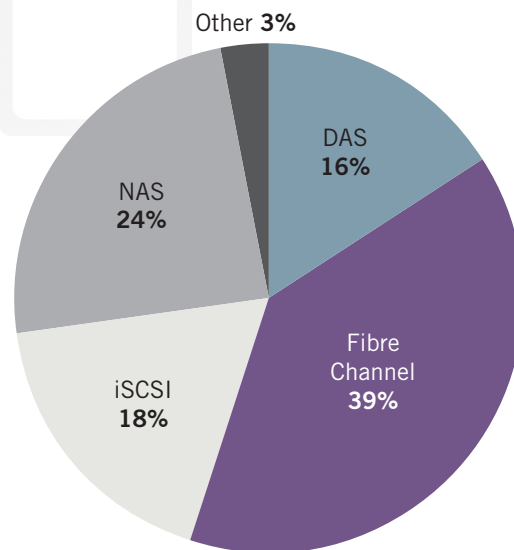


OneCommand™



Linux is gaining momentum as the operating system of choice for many large enterprises. Similarly, SANs have become the de facto standard for corporations that have recognized the manageability, availability, and cost savings associated with shared storage. The most prominent storage solution for Linux is Fibre Channel, according to the September 2010 IDC Worldwide Disk Storage (see Figure 1). As corporate data centers standardize on Linux, they insist on “enterprise-class” SAN connectivity solutions and supporting system software that can meet their reliability, scalability and manageability requirements. After careful evaluation, many of the world’s largest organizations are choosing Emulex LightPulse Fibre Channel HBAs and OneConnect UCNAs as the foundation for their Linux-attached SANs.

Figure 1
Worldwide Linux
external disk
storage system
by connection.



Emulex HBAs and UCNAs are the storage connectivity option of choice for enterprise data centers, and data center managers increasingly rely on Emulex for their Linux deployments. Why are Linux IT departments choosing Emulex? Because Emulex offers:

- A leading edge converged networking framework
- The most advanced Linux driver architecture
- Technology leadership in Linux, virtualization and storage networking
- Leading quality and reliability
- Highly efficient and scalable enterprise management
- High performance, broad product offering



1. Converged Networking

Consolidation in the data center has typically meant improved operations and reduced costs (e.g., benefits of blade servers or virtualization). These same benefits are extended to I/O as data centers implement a new consolidated network technology for data and storage, called “converged networking.” Converged networking combines existing Local Area Networks (LANs) and SANs into a single high performance 10Gb/s Ethernet (10GbE) framework that intelligently connects every server, network and storage device within the data center, thereby enabling unified I/O.

Data center administrators face a major networking challenge from the combination of high bandwidth requirements, increasing network sprawl and the need for a more adaptive networking infrastructure. Most data centers today have:

- Multiple network fabrics, each dedicated to a specific type of traffic
- High numbers of adapters and switch port deployments
- Complex cabling infrastructure
- Complex management of switch and adapter firmware and associated service contracts

Converged networking solutions address these issues and transition the data center to a more dynamically provisioned network that is highly responsive and addresses the quality and service level requirements of business applications.

Emulex offers the OneConnect UCNA that supports multiple protocols, allowing data center administrators to consolidate to a single high performance, high bandwidth 10GbE infrastructure. OneConnect UCNAs provide CPU offload for FCoE and iSCSI block storage, stateless TCP offload for networking, and NFS and CIFS for file based storage.

The decision to deploy iSCSI or FCoE is largely based on current deployments in your environment. Enterprise data centers with Fibre Channel SANs already in place typically choose FCoE, while smaller data centers with no Fibre Channel typically choose iSCSI. The flexibility offered by the OneConnect UCNA means that any size data center administrator need not make their final decision before purchasing and, in fact, once deployed, the protocol of choice can change. That is, the decision to use one protocol over another does not result in additional cost should the need change.

Emulex UCNAs:

- Deliver optimized I/O performance, enabling more virtual machines per server
- Protect investments in existing storage infrastructure by leveraging existing storage management tools and processes for connected devices
- Enable seamless extension of Fibre Channel SANs
- Are supported by the Emulex OneCommand Manager application that provides management throughout the data center from a single console for OneConnect UCNAs and LightPulse Fibre Channel HBAs

OneConnect UCNAs

The Emulex OneConnect UCNA is designed to address the key challenges of evolving data center networks and improve the overall efficiency of data center operations. It enables compact form factors that meet the space constraints of all server platforms, including blade servers, and lowers power usage which reduces energy and cooling costs.

With the Emulex OneConnect UCNA, data center administrators can achieve lower total cost of ownership (TCO) through a simplified network infrastructure with the cost for network connections, cable and cable installation reduced by up to 85%. For virtualized servers, UCNAs will minimally reduce the number of Ethernet connections from five or more to two.

Convergence in your data center

Converged networking creates a new economic model for the data center which we call Convergenomics™. To analyze converged networking solutions for your data center, download your copy of Emulex's *Convergenomics™ - The Guide to Network Convergence Solutions* and go to the Convergenomics Calculator on www.emulex.com.



2. Advanced Linux Driver Architecture

Data center administrators know that a highly reliable software architecture is critical to the foundation of an enterprise SAN. The Emulex Linux-based software stack features:

- A single adapter driver model ensuring that one driver supports all generations of Emulex LightPulse HBAs and OneConnect UCNAs. The single driver model preserves IT investment by taking advantage of new features and OS versions delivered through new driver releases across all Emulex adapters. A single driver simplifies management and reduces operating costs by eliminating the need to maintain complex driver/hardware compatibility matrices.
- Service Level Interface (SLI™) allowing new firmware releases to be deployed on one server or throughout the network. New firmware releases translate into new functionality and enhanced performance.
- Consistency between “In Box” native Fibre Channel drivers included with the Linux distributions and the driver certified by leading server and storage vendors. One driver gives end users support continuity (without finger pointing) and interoperability between server, storage and Linux distribution suppliers.
- Support for all leading Linux distribution including Red Hat Enterprise Linux and MRG, Novell SLES and SLERT, Oracle Enterprise Linux, Asianux (Red Flag, Miracle, Haansoft) and special OEM versions.
- Implementation of key new Linux kernel features such as /sys filesystem (sysfs) and Device Mapper MPIO multipathing (dm_multipath).

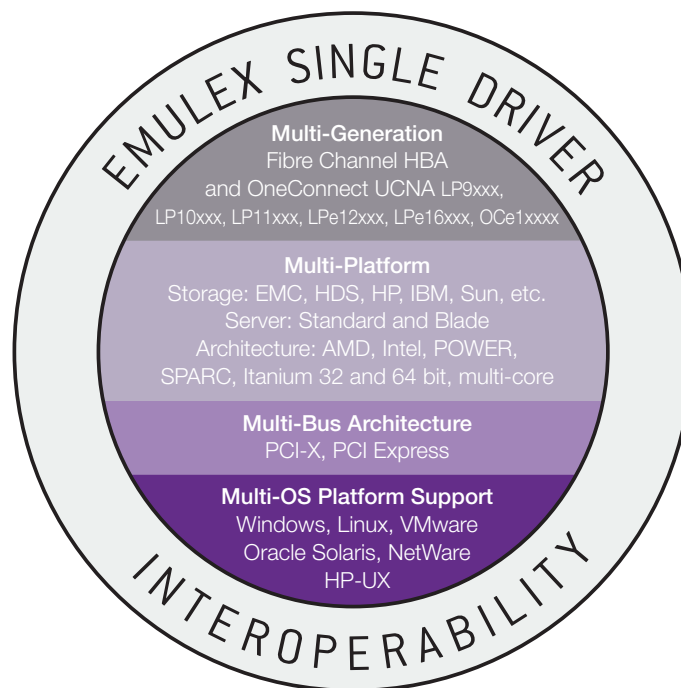


Figure 2
Emulex single driver model.



3. Technology Leadership in Linux, Virtualization and Network Connectivity

Data centers deploying Linux gravitate toward and standardize on suppliers who actively work to improve the Linux platform. With a dedicated team of Linux engineers, Emulex is recognized as a technology leader among the Linux development community. Key contributions include:

- **Fibre Channel Transport Layer architect**—Emulex architected and maintains the vendor-agnostic Fibre Channel Transport Layer that is now part of the Linux kernel. Emulex’s experience in the design and development of Fibre Channel controllers, and its strong partnerships with industry leading server, storage and software suppliers, is applied to critical Linux kernel components such as the Fibre Channel Transport.
- **Xen/KVM hypervisor support**—Hypervisors allow the creation of virtual machines (VMs) supporting “Guest” operating system instances. The Emulex Linux driver has been fully tested for interoperability with the hypervisor server virtualization module and supports N_Port ID Virtualization (NPIV). (See Page 7 for more details.)
- **T10-Protection Information (T10-PI) data integrity leadership**—Emulex, Oracle, Seagate and LSI are driving the T10-PI data integrity development, bringing to market the first application-to-disk data integrity solution, based on the American National Standards Institute (ANSI) T10-PI standard (see Figure 4).
- **MSI-X**—Emulex delivered improved host CPU utilization, I/O scalability and application performance through support for Message Signaled Interrupts eXtended (MSI-X) with Linux.
- **TargetConnect™ software developer kit (SDK)**—Linux storage solution developers experience intense deadline and budget pressure to design and deliver advanced features and functionality required by networked storage applications. The Emulex TargetConnect SDK provides the flexibility to quickly develop and deploy high performance, feature-rich Linux storage solutions based on Emulex LightPulse Fibre Channel and FCoE target mode drivers. These solutions include sophisticated storage devices which provide advanced functionality, including storage appliances, test and diagnostics, backup engine devices, deduplication and more.
- **NIC Teaming**—Emulex fully supports NIC Teaming for servers running Linux, allowing administrators to take advantage of network controller teaming technology with a graphical user interface (GUI). This improves performance and reliability with port failover for increased fault tolerance.
- **CPU virtualization**—Many newer high performance servers based on the latest Intel and AMD CPU chipsets provide a direct memory access (DMA) remapping capability which provides additional security in virtualized environments, helps enable Single Root I/O Virtualization (SR-IOV) and can provide a one-to-one mapping of a given port to a specified VM. For the latter capability, Emulex provides support to assign individual adapter ports to designated VMs, thus bypassing the hypervisor and delivering I/O performance equivalent to a non-virtualized environment. This direct assignment model is beneficial in workloads with very high I/O performance requirements.



Virtualization leadership

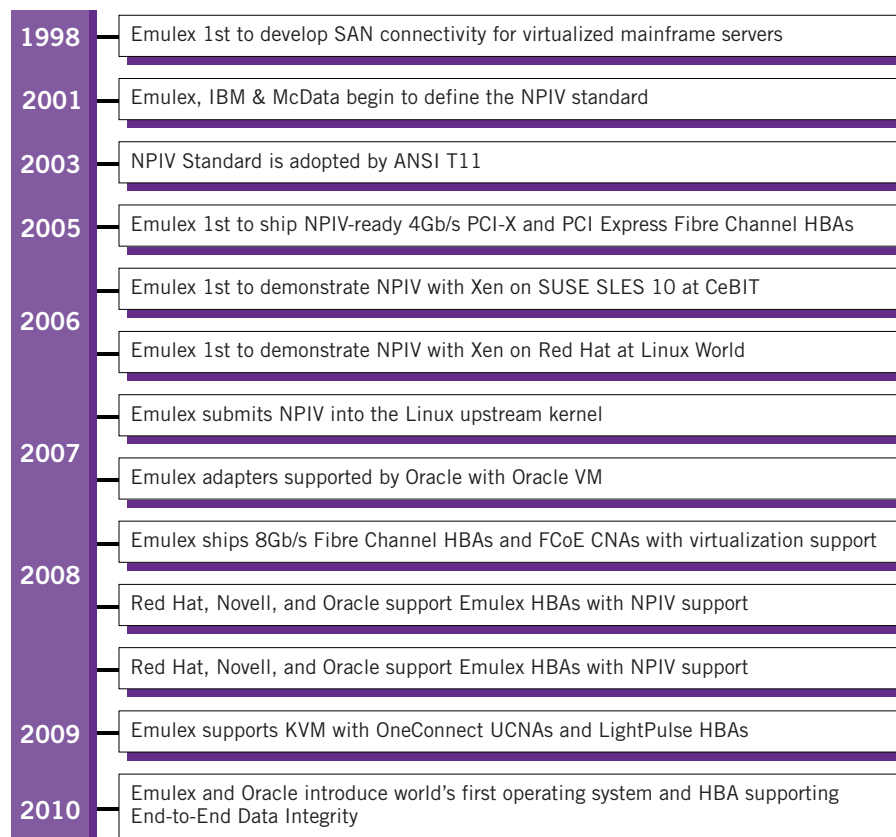
Virtualization technologies are driving corporate IT disaster recovery, capital control and operating efficiency initiatives. Emulex is providing key technologies that eliminate inhibitors to deployment of server virtualization in SAN environments. The following are just some of the contributions:

- Co-developed (with IBM) N_Port ID Virtualization (NPIV) technology. NPIV enables each HBA or UCNA port to register multiple “virtual ports” identified by Worldwide Port Name (WWPN) within the fabric.
- Emulex virtualization technology empowers administrators to deploy server virtualization, follow SAN best practices and seamlessly leverage popular storage management applications while implementing zoning and storage masking.
- Delivered the first NPIV-compliant driver into the Linux upstream kernel.
- Partnered with the Xen community to enhance support of NPIV.
- Collaborated with Cisco, Brocade and other vendors to ensure seamless interoperability of NPIV implementations and provide data center administrators greater flexibility when implementing server virtualization in SAN environments.
- Provided early NPIV management related sample code and completed test runs of the libvirt Virtual Shell Command Line Interface (CLI), known as “virsh,” with Emulex drivers and adapters to assure compatibility with this important set of application program interfaces (APIs) and CLIs.

Emulex adapters with NPIV are supported across all Linux distributions and work with Xen and KVM hypervisors.

Emulex technology leadership transcends internal engineering accomplishments. Emulex is a key contributor to various storage and software standards bodies and is highly engaged in the storage ecosystem, turning standards into interoperable solutions.

Figure 3
Emulex NPIV and Linux timeline.





Security innovations

Storage security has often been overlooked as an area of concern but can have significant impact given how critical data assets are to every organization. Storage security ranks with server and network security as a top-of-mind issue for IT management.

Emulex has taken a leadership role in applying the latest in security standards into the Emulex product lines.

- Recognizing the need to develop a complete data integrity solution for databases and other applications, Emulex, LSI, Oracle, and Seagate collaborate on T10-PI data integrity development. Based on this initiative, the Storage Networking Industry Association (SNIA) Data Integrity Working Group (DITWG) was established. There are two key technologies related to the T10-PI data integrity:

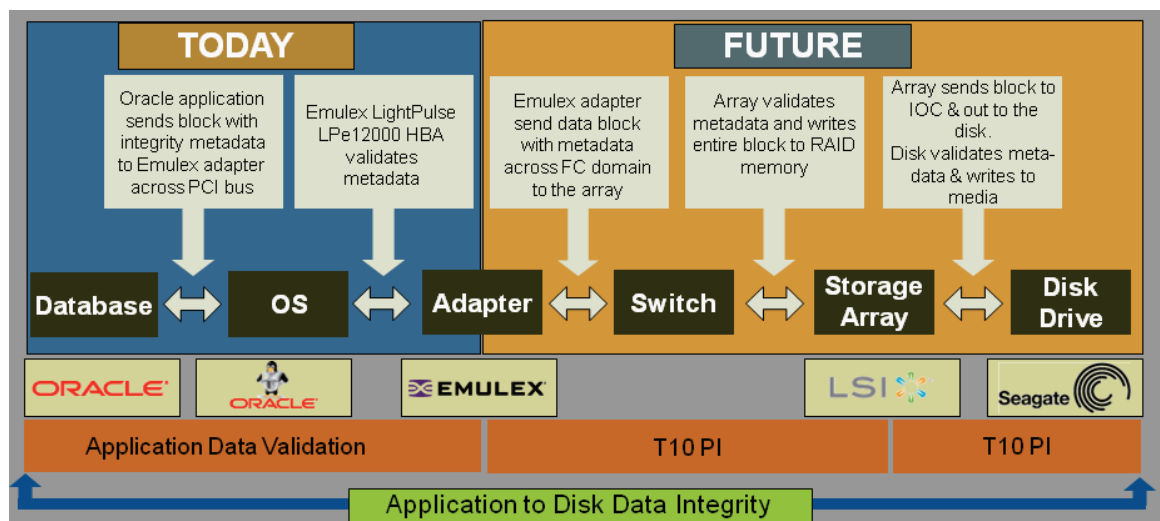
- **T10-PI**—the PI model is an extension of the SCSI Block Commands specification that was approved by the T10-PI technical committee

- **Data Integrity Extensions (DIX)**—Oracle has taken the lead with Emulex to define DIX

Both are based on appending extra information to data that can be used to verify its integrity and prevent silent data corruption. This extra information is referred to as integrity metadata. Customers interested in experiencing the Oracle OS implementation of the T10-PI model standard for an OS now have access to it through the Oracle Linux distribution as well as Emulex HBAs (see Figure 4).

- Emulex OneCommand Manager centralized management application addresses the security concerns for remote management of HBAs with the support of Authenticated Common Transport (Authenticated CT) protocol as defined in Fibre Channel Global Services 3 (FC-GS-3) specification. Support of Authenticated CT satisfies the number one recommendation of the SNIA storage security initiative calling for securing of the management path.
- Emulex took the lead in enhanced SAN security by supporting the Fibre Channel Security Protocol (FC-SP), a standard that is under the American National Standards Institute (ANSI) International Committee for Information Technology Standard (INCITS). FC-SP is a comprehensive approach to all aspects of data security. Support of HBA authentication helps data centers protect against WWN spoofing, host masquerading, non-malicious and administrator caused outages (see Figure 5).

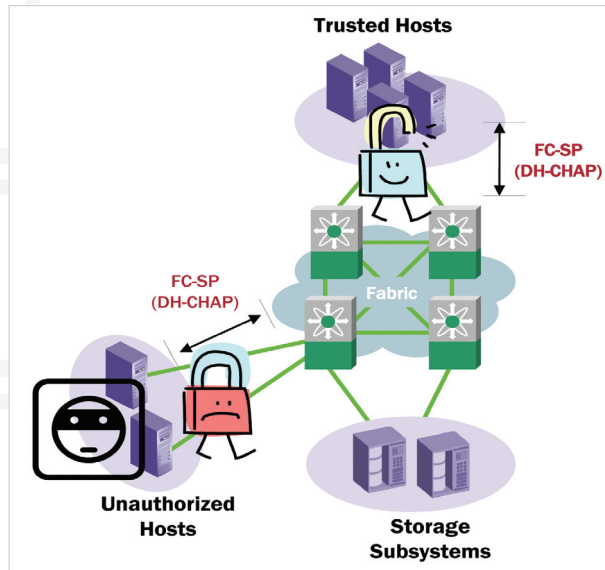
Figure 4
Current and future support for enhanced data integrity.



Emulex is an active and influential contributor to the FC-SP standard. As storage security comes of age, Emulex is committed to delivering flexible and standards-based security technologies that will help mitigate data storage security risks and address threats in the Fibre Channel storage space.



Figure 5
Host threats prevention.



Support of DH-CHAP Authentication helps data centers protect against a variety of host threats such as WWN spoofing, host masquerading and administrative caused outages.

4. Strong Partnership with Linux Suppliers

Linux data centers rely on Emulex OneConnect and LightPulse adapters for robust performance while looking to Linux suppliers for in-box distribution of the Emulex driver and extensive support. Emulex, a key contributor to the open development community, works closely with market leading Linux distribution suppliers to ensure the latest drivers are delivered and supported. After providing the Emulex drivers through in-box distribution, these key Linux partners provide frontline support with assistance from Emulex as required.

Emulex's involvement with these key suppliers takes many shapes as each supplier is unique. This involvement could include providing necessary hardware, participating in partner programs, completing mutual reviews of roadmaps and participating in supplier's events. Here are some examples of the relationships that Emulex has with these key Linux contributors:

Red Hat

Red Hat first delivered driver support of Emulex HBAs to Linux customers in 2004. Since then, the two companies have collaborated on many technological advances. Through regular meetings, Red Hat and Emulex collaborate on upcoming technology, such as converged networking for Linux environments, as well as day-to-day program level issues. Emulex delivers HBAs and UCNAs to key partners, such as Red Hat, for integration testing with their products.

As a virtualization leader, Emulex contributes to Red Hat's lead role in the open project and API, libvirt, for the development and standardization of virtualization management tools. A goal of the community and the API is to offer access to a comprehensive set of virtualization related management operations for use by developers and skilled end-users.

Novell SUSE

With a relationship that predates Novell's acquisition of SUSE, Emulex regularly provides hardware to Novell for development and testing. Additionally, Emulex provides code when needed, and did so for NPIV management in Novell's system management product suite, ZENworks. The solution offered by Emulex and Novell provides virtual ports (vPorts) via NPIV technology with each Emulex adapter. The management of NPIV is then automated with PlateSpin Orchestrate software for efficient, unified and time saving management of all virtual assets.

Emulex also qualifies its products under Y, Novell's self-certification program. Lastly, as a member of PartnerNet, Emulex and Novell regularly share roadmaps and strategies, ensuring that Linux customers continue to receive products that meet the robust needs of their enterprise environments.



Oracle

Oracle Enterprise Linux and Oracle VM have supported Emulex adapters since day one. Emulex is part of Oracle's Unbreakable Linux Program and participates in Oracle's Validated Configuration Program to offer best practices for Linux deployments for our joint customers.

Collaborating on new technology initiatives, Oracle and Emulex are working together on a number of joint projects including the T10-PI standard for enhanced data integrity, NPIV management in an Oracle VM environment for Linux enterprises and joint collaboration for a major data warehousing project with Oracle's Executive Technology Centers. Listed in Oracle's Solutions catalog, Emulex, through its strong partnership with Oracle, ensures that Linux end users have a fully supported, robust Fibre Channel SAN.

Ubuntu and Debian

Emulex works closely with Canonical, a leader of the Ubuntu and Debian Project, and the Ubuntu and Debian community to ensure its OneConnect products deliver industry-leading features and performance. Secure, fast and powerful, Ubuntu and Debian help you maximize your infrastructure. Ubuntu Server supports the most popular hardware and software. With no licence fees or subscription costs, Ubuntu Server can help you achieve real savings in your data center. Community-based and professional support is readily available. Its streamlined, efficient architecture sees more services delivered with less computing power and fewer resources required. The Ubuntu and Debian community is built on these ideas: that software should be available free of charge, that software tools should be usable by people in their local language and despite any disabilities, and that people should have the freedom to customize and alter their software in whatever way they see fit.

CentOS

Emulex certifies its products with CentOS to ensure all Linux customers have reliable, supported adapter solutions. CentOS is an Enterprise-class Linux Distribution derived from sources freely provided to the public by a prominent North American Enterprise Linux vendor. CentOS conforms fully with the upstream vendor's redistribution policy and aims to be 100 percent binary compatible. (CentOS mainly changes packages to remove upstream vendor branding and artwork.) CentOS is free and available to all Emulex customers looking for an open solution that provides the performance and flexibility needed in today's open source environments.

FreeBSD

Emulex supports the many users of FreeBSD with products that are certified and supported. FreeBSD is an advanced operating system focused on ease of use, innovative feature sets, and high capacity network server scalability. FreeBSD's code base has undergone over thirty years of continuous development, improvement, and optimization. It is developed and maintained by a large team of individuals. FreeBSD provides advanced networking, impressive security features, and world class performance and is used by some of the world's most pervasive embedded networking and storage devices, including Emulex.

Citrix

Emulex and Citrix developed a strong relationship through Citrix's acquisition of XenSource, a partner of Emulex's since 2006. Emulex is part of the Citrix Ready Program, ensuring reliable and interoperable solutions.

Citrix delivers the Emulex drivers with all the XenServer versions (Enterprise, Express, and Standard). To ensure future solutions meet the needs of Linux enterprise environments, Citrix and Emulex also collaborate on technology roadmaps.



5. Efficient Scalable Enterprise Management

In any data center, manageability is critical and is one of the reasons that Linux data centers standardize on Emulex. Emulex OneCommand Manager application is designed for efficient, scalable administration of enterprise-class SANs and for converged network solutions. OneCommand Manager provides a multi-protocol management stack for the storage (Fibre Channel and iSCSI) and network connectivity solutions through a GUI or scriptable CLI.

Emulex OneCommand Manager application is designed for efficient, scalable administration of enterprise-class SANs. Figure 6 provides a framework management architecture based on Emulex OneCommand.

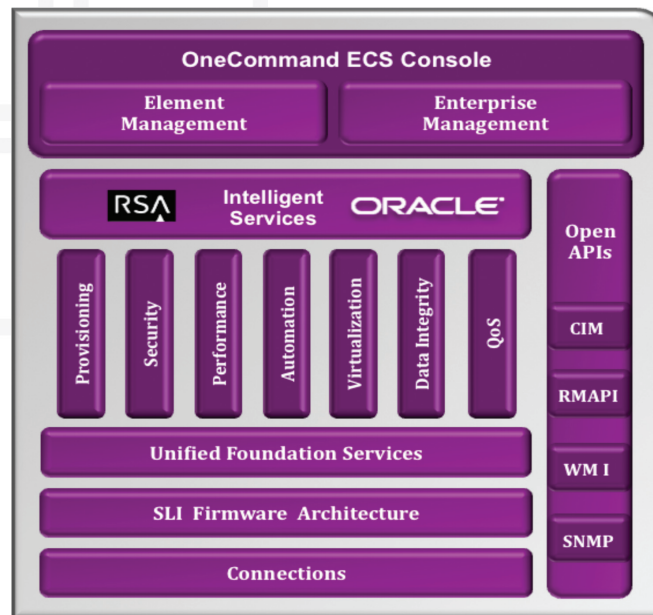


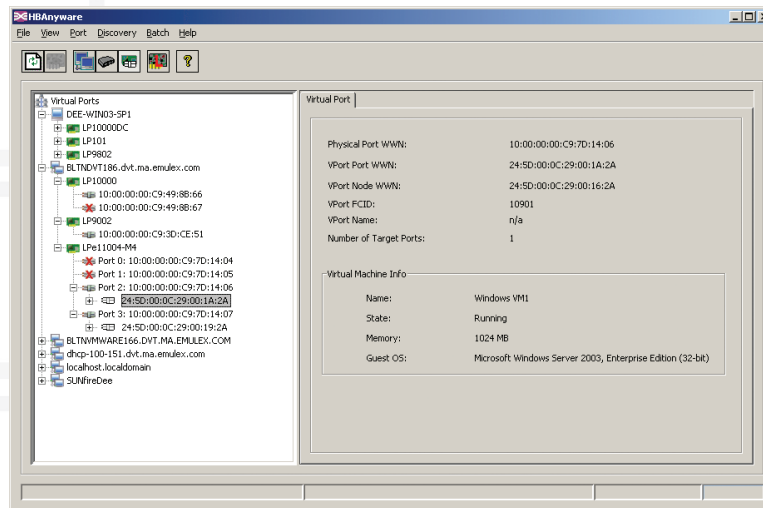
Figure 6
OneCommand
framework
architecture.

The OneCommand Manager application provides comprehensive control of Emulex OneConnect UCNAs and LightPulse HBAs within a centralized, cross-platform framework, combining flexible remote-management options with secure access control. OneCommand Manager delivers:

- State-of-the-art, powerful management capabilities, no matter where the HBAs or UCNAs are located, what platform they are running on, or how they can be accessed—whether in-band (over the Fibre Channel link, an exclusive feature of Emulex) or out-of-band (over the local area network).
- Automation of key management tasks for unparalleled HBA and UCNA configuration and management efficiency. Driver profiles, which contain the driver's parameter settings, can be replicated and efficiently applied to other HBAs in a single step.
- Batch mode propagation of driver profiles and firmware versions effortlessly across the SAN.
- Scriptable CLI giving storage administrators the flexibility to tailor or automate their adapter management actions using customized scripts.
- Tools for offline, online and different protocols for OneConnect-enabled servers (using either a OneConnect UCNA or a OneConnect LAN on Motherboard (LOM)).
- Export of HBA/UCNA data using an open, flexible XML format, which IT administrators can import into commonly used data analysis tools, such as Excel, to create custom reports.
- Discovery and management of vPorts residing on Emulex Fibre Channel HBAs and UCNAs (see Figure 7).



Figure 7
The OneCommand Manager application provides discovery and management of vPorts.



Integration with leading management software

Emulex was a principal in the definition of the Storage Management Initiative Specification (SMI-S) and was the first Fibre Channel adapter vendor to deliver an SMI-S provider. Emulex offers open, standards-based interfaces and components, enabling integration with enterprise storage or server management solutions.

Emulex offers pre-boot utilities for integrated blade installation and provisioning with solutions such as:

- **IBM Remote Deployment Manager Software (RDM)**—Automates the provisioning of Emulex OneConnect and LightPulse adapters in IBM servers.
- **HP Rapid Deployment Pack (RDP) software**—Supports seamless OneConnect and LightPulse adapter installation and deployment.

Expedites SAN troubleshooting

Emulex OneConnect and LightPulse adapters are designed to assist with troubleshooting and to minimize the impact of field upgrades.

- HBA and UCNA beaconing facilitates physical identification of an adapter within a server by distinctive flashing of the adapter's LEDs.
- OneCommand Manager application features robust online diagnostic functions (such as various loopback tests), warm Power-On Self-Tests, and end-to-end diagnostic functions to validate connectivity across the fabric.
- Critical state information can be captured and saved in a file, either automatically or on demand. This information can be used when troubleshooting or as backup information when engaging technical support.
- Streamlined replacement avoids configuration errors. Emulex adapters store port parameters on the host, so that when an adapter is replaced, the parameters associated with the previous port are not automatically applied to the replacement adapter without user involvement.



6. Guaranteed Quality and Reliability

Emulex provides “It Just Works” quality—delivering reliability, data integrity and interoperability to large enterprise SANs.

Emulex customers depend on Emulex for reliability and data integrity:

- Emulex LightPulse Fibre Channel HBAs have achieved an unparalleled 10 million hours mean time between failure (MTBF) based on the reliability data collected from shipments of the LP10000, LP110000, and LPe11000 families of LightPulse Fibre Channel HBAs.
- Since 1996, Emulex has used a combination of parity, CRC (cyclic redundancy check), ECC (error correcting code) and other advanced error-checking algorithms to verify that the data blocks being passed from the host interface through the LightPulse adapter are protected from data corruption.
- As a member of the Data Integrity Initiative, Emulex was the first HBA vendor to demonstrate true “application-to-disk” data integrity by implementing the T10-PI standard in an Oracle-aware implementation.

Emulex has established one of the industry’s most comprehensive interoperability labs. A vast collection of servers, storage subsystems and test equipment continuously test and re-test OneConnect and LightPulse adapters to ensure interoperability in real-world environments and common customer configurations (see Figure 8 for a view of Emulex’s compatibility database accessible from the web).

Figure 8
Emulex interoperability database provides compatibility information: www.emulex.com/interop

The screenshot shows the Emulex website's interoperability database search results. The search criteria are: Manufacturer: Oracle, Emulex HBA: Oracle Enterprise Linux, Data Rate: 4Gb/s, Bus Type: Blade, and Operating System: Oracle Enterprise Linux. The results table lists various Emulex HBA models compatible with Oracle Enterprise Linux 4 and 5.

| Manufacturer | Model Type | Manufacturer Model | Emulex HBA | Data Rate | Bus Type | Operating System |
|--------------|------------|-------------------------|-------------|-----------|----------|--|
| Oracle | Software | Oracle Enterprise Linux | LP1105-BC | 4Gb/s | Blade | <ul style="list-style-type: none"> Linux - Oracle Enterprise 4 Linux - Oracle Enterprise 5 |
| Oracle | Software | Oracle Enterprise Linux | LP1105-BCv | 4Gb/s | Blade | <ul style="list-style-type: none"> Linux - Oracle Enterprise 4 Linux - Oracle Enterprise 5 |
| Oracle | Software | Oracle Enterprise Linux | LP1105-BU | 4Gb/s | Blade | <ul style="list-style-type: none"> Linux - Oracle Enterprise 4 Linux - Oracle Enterprise 5 |
| Oracle | Software | Oracle Enterprise Linux | LPe11020-S | 4Gb/s | Blade | <ul style="list-style-type: none"> Linux - Oracle Enterprise 4 Linux - Oracle Enterprise 5 |
| Oracle | Software | Oracle Enterprise Linux | LPe1105-FSC | 4Gb/s | Blade | <ul style="list-style-type: none"> Linux - Oracle Enterprise 4 Linux - Oracle Enterprise 5 |
| Oracle | Software | Oracle Enterprise Linux | LPe1105-HP | 4Gb/s | Blade | <ul style="list-style-type: none"> Linux - Oracle Enterprise 4 Linux - Oracle Enterprise 5 |
| Oracle | Software | Oracle Enterprise Linux | LPe1105-M4 | 4Gb/s | Blade | <ul style="list-style-type: none"> Linux - Oracle Enterprise 4 Linux - Oracle Enterprise 5 |
| Oracle | Software | Oracle Enterprise Linux | LPem11002-S | 4Gb/s | Blade | <ul style="list-style-type: none"> Linux - Oracle Enterprise 4 Linux - Oracle Enterprise 5 |



7. High Performance Fibre Channel Solution

Emulex OneConnect and LightPulse adapters deliver excellent performance across a wide range of application environments with varying server workloads. Emulex integrated processors and dedicated hardware engines ensure maximum I/O processing speeds in transaction processing environments, while enabling sustained high bandwidth and CPU efficiency that maximizes application performance. Key technology innovations include:

- Dynamic interrupt coalescing optimizes I/O interrupt management for both heavy and light traffic.
- Frame-level Multiplexing continuously determines the optimum use of the Fibre Channel network to ensure maximum link utilization.
- Out-of-order Frame Reassembly reorders data frames in the proper sequence, minimizing retransmissions and enhancing overall network performance.
- Compared to the leading competitor, Emulex offers 20-times more Buffer Credits providing uninterrupted link-rate performance during periods of high server I/O bus activity.
- Support for multiple concurrent DMA reads accelerates I/O performance for highly transactional applications.

8. Choice for Enterprise Linux SANs

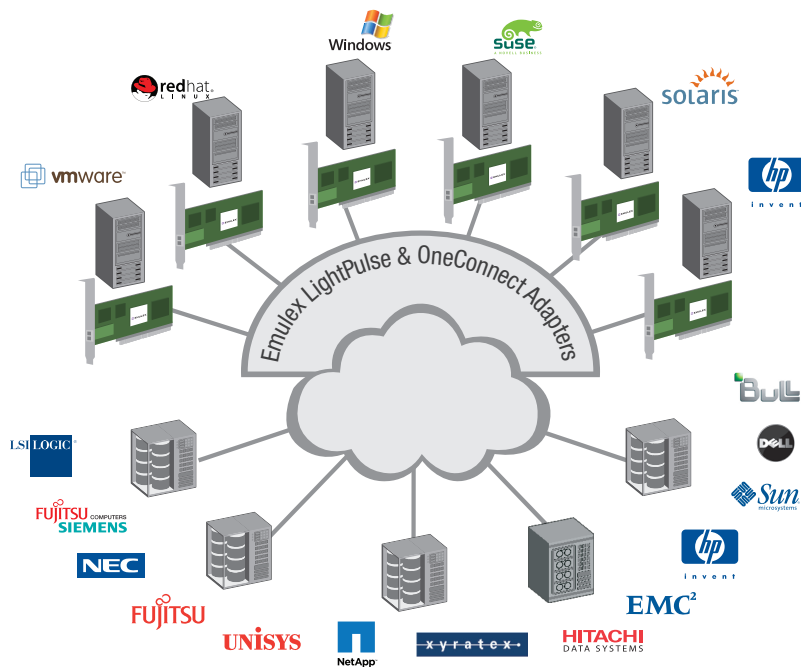
Emulex is the recognized Fibre Channel HBA and UCNA leader for large enterprise customers. More than 95 of the Fortune 100, as well as large corporations worldwide, use Emulex adapters for their mission critical applications.

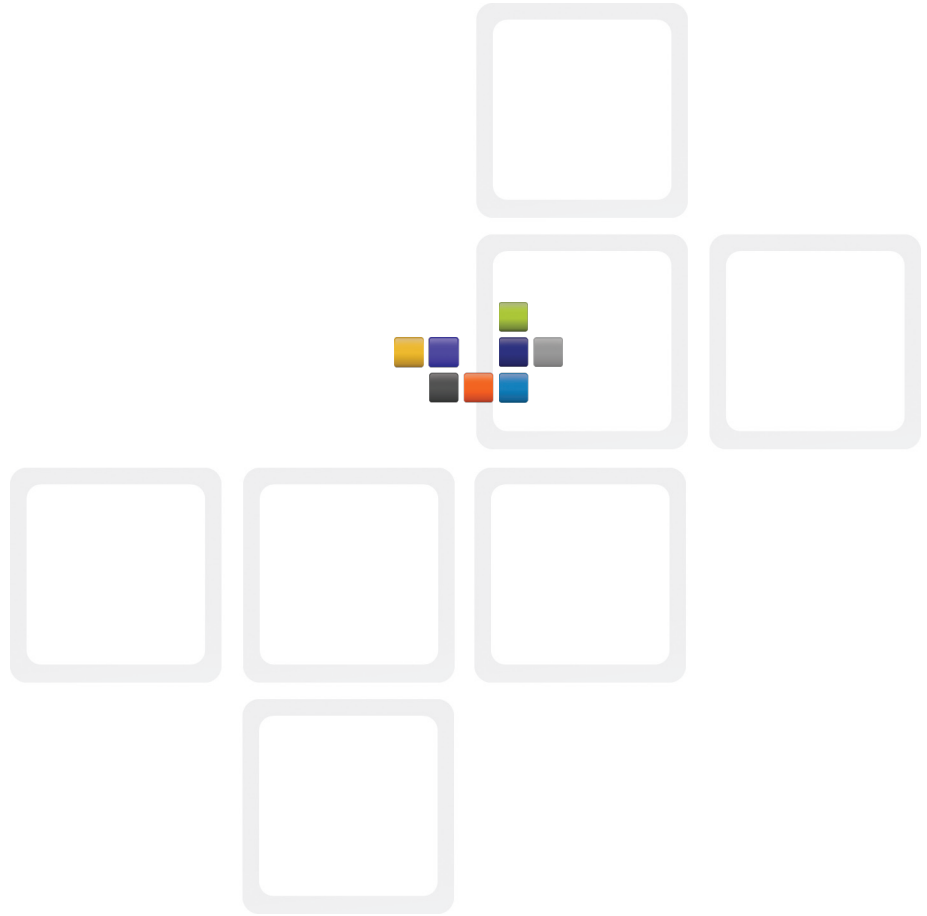
Emulex offers a broad family of HBAs and UCNAs supporting all major bus architectures. Emulex has partnered with major system suppliers, such as IBM, HP, Sun, Fujitsu Siemens and Dell, providing Fibre Channel connectivity for leading blade solutions.

Emulex LightPulse and OneConnect adapters are supported by leading server, storage and Linux distribution suppliers, allowing data center administrators to standardize on Emulex adapters knowing they will have the support and accompanying products from their preferred vendor.

Emulex is the HBA and UCNA vendor of choice for Linux enterprise solutions. Companies who have already standardized on Emulex for their Windows, Solaris, HP-UX, VMware or AIX solutions are now achieving the same scalability, performance, manageability and investment protection with open-source Linux Fibre Channel HBA and UCNA solutions from Emulex.

Figure 9
Emulex HBAs and UCNAs are fully supported throughout the SAN.





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