

Overview and Frequently Asked Questions

Sun Storage 10GbE FCoE ExpressModule Converged Network Adapter

Overview

Oracle's Fibre Channel over Ethernet (FCoE) technology provides an opportunity to reduce data center costs by converging data and storage networking. Standard TCP/IP and Fibre Channel traffic can both run on the same high speed 10 Gb/sec Ethernet wire, resulting in cost savings through reduced adapter, switch, cabling, power, cooling, and management requirements. The Sun Storage Dual Port 10GbE FCoE ExpressModule Converged Network Adapter (CNA) from Oracle delivers high performance, reduces data center total cost of ownership (TCO), and protects current data center investment.

The Oracle Converged Network Adapter Advantage

The Sun Storage 10GbE FCoE ExpressModule CNAs have been designed specifically for use in Oracle's Sun blade servers. They exceed the business requirements of the enterprise data center with higher performance, investment protection, and increased power and cooling efficiency. Oracle solves enterprise-wide business challenges with a comprehensive offering of hardware, software, and services, providing customers with a total end-to-end solution. This end-to-end solution provides world class interoperability testing, service and support, and support for Sun and third-party storage arrays. And, Sun Storage 10GbE FCoE ExpressModule CNA architecture simplifies LAN and SAN management to improve resource use and reduce your TCO.

Customer Benefits

The customer benefits of implementing FCoE in the datacenter include lower Total Cost of Ownership (TCO), network consolidation, investment protection and high performance.

Lower TCO

Reduce your data center costs through convergence with the Sun Storage 10GbE FCoE PCIe CNA. Now, one converged network adapter can do the work of a discrete FC host bus adapter and Ethernet NIC. This convergence also means fewer cables, fewer switches, less power consumption, reduced cooling, and easier LAN and SAN management. The Sun Storage 10GbE FCoE ExpressModule CNA supports iSCSI storage protocol using iSCSI software initiators, which are available with all major operating systems.

Network Consolidation

FCoE converged network is an emerging high-performance networking technology that will power a new wave of network consolidation. FCoE requires the use of a new class of converged network adapters, like Oracle's Sun Storage 10GbE FCoE ExpressModule CNA, that appear to the operating system like a Fibre Channel HBA and an Ethernet NIC consolidated into a single adapter. Converged network adapters from Oracle are designed to preserve our customers' investment in proven Fibre Channel software stacks and provide an ability to run data networking traffic simultaneously. Network consolidation with Oracle's Sun Storage 10GbE FCoE ExpressModule CNAs could save Oracle customers up to 33% savings over a 4 year period.

Investment Protection

Preserve your existing investment in Fibre Channel storage and core Ethernet switches and routers for data networking with the new Sun Storage 10GbE FCoE PCIe CNA. It leverages the same identical software driver stacks that have been deployed and battle-hardened in millions of previous installations, and preserves familiar FC concepts such as WWNs, FC-IDs, LUN masking, and zoning.

High Performance

Boost your system performance with 10 Gb/sec speed and full hardware offload for FCoE protocol processing. Your next-generation data center requires the high-performance capabilities of the Sun Storage 10GbE FCoE ExpressModule Converged Network Adapter. Cutting edge 10 Gb/sec bandwidth eliminates performance bottlenecks in the I/O path with a 10X data rate improvement versus existing 1Gbps Ethernet solutions. The Sun Storage 10GbE FCoE PCIe CNA delivers up to 250,000 IOPS per port for truly superior performance. And full hardware offload for FCoE protocol processing reduces system CPU utilization for I/O operations, which leads to faster application performance and higher levels of consolidation in virtualized systems.

Frequently Asked Questions

What exactly is Fibre Channel over Ethernet?

Until now, storage and network I/O has existed on two separate networks, a model that 10 Gigabit Ethernet and Fibre Channel over Ethernet promise to change. As datacenters converge, their Ethernet and Fibre Channel networks, they can reap the benefits of lower costs, higher performance, reduced power consumption, simplified infrastructure, and seamless integration with existing storage.

While FCoE is based on Ethernet, it's an enhanced Ethernet that has been optimized for low latency, quality of service, guaranteed delivery and other functionality traditionally associated with a channel-type interface like parallel SCSI, Fibre Channel, FICON or ESCON.

Where does FCoE stand in the market?

FCoE will be used where performance, scalability and low latency are paramount. It will be used for getting a converged enhanced Ethernet into a simplified environment, much where you would find Fibre Channel today.

What are the main applications for FCoE?

The main application of FCoE is in data center storage area networks (SANs). FCoE has particular application in data centers with cabling reduction it makes consolidation possible, as well as in server virtualization applications, which often require many physical I/O connections per server.

How does FCoE help with datacenter consolidation?

With FCoE, network (IP) and storage (SAN) data traffic can be consolidated using a single network switch. This consolidation can:

- reduce the number of network interface cards required to connect to disparate storage and IP networks
- reduce the number of cables and switches
- reduce power and cooling costs

With 10 Gigabit Ethernet coming and boosts in server and storage processing power, do you really need FCoE at all?

It depends on your environment and your market. Sure, 10 Gigabit Ethernet exists today. The prices for the adapters have come down dramatically. A 10 Gigabit Ethernet adapter with optics (transceivers) maybe with cable, is now available for around \$1,000 to \$1,200 - that's the normal price for Fibre Channel adapters. Those prices continue to come down.

It is unclear as you go down market into an SMB space as to whether the need is for 10 GbE with iSCSI or 10 GbE with NAS, versus 4 Gb or 8 Gb Fibre Channel.

Going forward, part of that question gets resolved in that a single adapter gets put into the server. That single adapter is an enhanced Ethernet adapter that has the ability to run both Fibre Channel stacks for talking to storage, as well as Ethernet-based stacks for supporting things like TCP/IP for iSCSI, for NFS, for CIFS, for HTTP, as well as other activities, all on one single adapter. For redundancy purposes you put a pair of them in there.

The speed aspect of FCoE is certainly needed more in the enterprise where there's more scaling. When speeds and feeds are talked about, whether it's 10 GbE for iSCSI, or 10 Gb Fibre Channel in the case of FCoE, most of the focus centers around bandwidth and around throughput.

While some applications don't require that much bandwidth, most applications do have a concern about response time. They do have a concern about latency or a concern about the number of I/Os, transactions, files, videos messages processed per second.

So, while bandwidth may not be the concern, there certainly is the benefit of lower response time, lower latency, as well as

supporting more IOPS. When you start looking at consolidated environments, for example, using server virtualization to aggregate multiple physical servers, speed is important. In the past, you might have had 10 servers, each running at just under a megabyte per second, hardly requiring a 1 Gigabit Ethernet, let alone a 1 Gb, 2 Gb, 4 Gb or 8 Gb Fibre Channel. But when you aggregate 10 of those systems together onto one physical server, it's straight math. All of a sudden it's adding up to 8 Gb, 10 Gb or more. So, we start to see the aggregation play, whether it be on megabytes per second throughput, whether it's on IOPS, transactions, files, messages processed or on lower latency.

Additionally, although networks have gotten faster, storage has gotten larger with more processing power. You have more data to process now. Going forward, you will need those capabilities.

Why do we need FCoE if we already have iSCSI

FCoE and iSCSI are both encapsulation protocols, but the similarities end there. FCoE encapsulates Fibre Channel frames so they can be transported over Ethernet. In contrast, iSCSI encapsulates SCSI to be transported over TCP/IP. FCoE is not routable over IP, but iSCSI is.

There is a perception that iSCSI will be able to do everything that FCoE can do and vice versa. The reality is that iSCSI's fundamental value proposition has been about ease of use and low cost. Whereas the fundamental value proposition of FCoE is not of low cost, but of a convergence of multiple technologies -- Fibre Channel, Ethernet, the Fibre Channel upper-level protocol stacks, such as Fibre Channel on SCSI and FICON, coexisting on an Ethernet without the need for IP.

FCoE is positioned more toward the upper part of market where iSCSI really hasn't seen much adoption. Part of that has to do with the fact that for iSCSI to play in the upper market requires extra hardware and extra capabilities, which play counter to its low-cost value proposition. Midmarket is the high end of where iSCSI plays and the low end of where FCoE plays.

Where iSCSI continues to find increasing market share is in the lower part of the market -- the midmarket to lower part of the SMBs, maybe into SOHO, even the upper parts of SMB; certainly making some inroads into different parts of the enterprise. Likewise, FCoE will trickle down from the

enterprise into the upper reaches of the SMB market.

If the predominant focus is NAS or iSCSI (and only a few servers are FC) then it does not make sense to include the added cost of CNAs as part of a general infrastructure; it will make more economic sense to use Ethernet only cards in general, and FC HBAs or CNAs in the few servers that require it.

The problem with iSCSI is that it relies upon TCP/IP as its underlying supporting protocol. TCP/IP is a "lossy" protocol -- as TCP/IP-based iSCSI packets are sent across an Ethernet network, packets may be lost or dropped and require retransmission. This can result in packets arriving at the target in an out-of-order sequence, especially during busy periods. Congestion and out-of-order packet delivery is particularly undesirable for mission-critical applications in enterprise SANs since they need the guaranteed, in-order delivery of packets that the Fibre Channel protocol can provide.

What effect does FCoE have on Fibre Channel?

Fibre Channel will, at least for next couple of years, continue to be popular in environments that are risk-averse, that don't want to jump to FCoE, that want to take more of a wait-and-see and go from 4 Gb to 8 Gb to 16 Gb Fibre Channel, and maybe even beyond that, depending on their comfort level.

What is the advantage of FCoE over Fibre Channel?

Data centers typically run multiple networks, including Ethernet networks for client-to-server, server-to-server communications and FC SAN for networked storage. To support various types of networks, data centers use separate redundant interface modules for each network segment— Ethernet network interface cards (NICs) and FC interfaces in their servers and redundant pairs of switches at each layer in the network architecture. Use of the parallel infrastructure increases capital costs, makes data center management more difficult and reduces business flexibility. Consolidation of I/O in the data center, allowing FC and Ethernet to share a single, integrated infrastructure would help enterprises to address these challenges smoothly and the answer is FCoE technology.

Storage architects embrace FCoE simply because they see that converging and leveraging I/O technology makes sense for them. They can swap out the physical and data link layers from Fibre Channel to Ethernet relatively easily, so the switch to

FCoE switch is an easy change.

Enterprise storage and network architects are beginning to consider the implications of server consolidation and virtualization. As they see footprint shrink thanks to compact or blade servers and server virtualization, they will begin to question the proliferation of interconnects on the back end required to keep up with the I/O demands of these super servers.

With the simplified FCoE topology, what formerly took a minimum of four interfaces per server — two NICs and two HBAs — now requires only one FCoE CNA per server. FCoE helps to extend datacenter SANs to servers whose expansion capability was insufficient, or where the cost of the Fibre Channel HBAs was prohibitive. Now virtually every datacenter server can leverage the benefits of centrally managed storage. In a typical 20-server rack with fully redundant connectivity, this reduces 40 Ethernet and 40 fibre connections down to only 40 FCoE CNA connections.

The reduced power consumption that comes from using fewer NICs and fewer switches provides relief to organizations that are up against their datacenter power and cooling envelopes.

Why not InfiniBand?

So is InfiniBand a viable alternative to FCoE for your enterprise customers? Yes and no. The primary advantages that InfiniBand offer over FCoE are that InfiniBand is more mature and more widely used in high-performance computing environments; it's also more economical and already has higher bandwidth capabilities (40 Gb/sec) than Ethernet. But like FCoE, it requires companies to upgrade their network infrastructure, introduce InfiniBand-to-FC and/or Ethernet gateways and install InfiniBand HCAs on host servers.

InfiniBand has limited or no support for VMware and XenServer, and only a limited number of target storage systems (such as those from DataDirect Networks and LSI) support InfiniBand.

Is there a deployment cost savings by implementing & deploying FCOE over these other protocols?

FCoE CNAs **Lowers CapEx** by 50% space savings with reduced number of server ports, switch ports and cabling. **Lowers OpEx** by 66% reduction in power consumption and

cooling. And, preservation of familiar data and storage concepts resulting in lower training and administrative costs.

Improved Performance with 150% performance improvement compared to most widely used infrastructures today, including increased speed of links and utilization of links. **Network Consolidation** over a 4 year period can save customers up to 33% on capital and operational expenses.

Is there a significant performance advantage of FCOE CNAs when compared 10GbE NIC with a software stack?

Yes. Due to the offload capabilities of the FCOE CNAs there will performance and scalability advantages of the FCOE CNAs when compared to other networking solutions.

Can the FCoE CNA be used for general Ethernet data networking?

Yes, the FCoE CNAs are designed to be fully Ethernet compliant and support Ethernet networking.

Can the FCoE CNA support simultaneous NIC and iSCSI storage functionality?

Yes, using a software iSCSI initiator the FCoE CNA can support simultaneous NIC and iSCSI storage functionality.

Can the FCoE CNA support simultaneous Fibre Channel and IP traffic?

Yes, the FCoE CNA is designed to support the simultaneous transport of both IP and Fibre Channel traffic.

Will the FCoE CNA be fully Fibre Channel compliant?

Yes, the FCoE CNA is designed to be fully Fibre Channel compliant.

What formats are supported?

Both ExpressModule and PCIe low profile form factors are supported.

Can the FCoE CNA run native Fibre Channel frames over a Fibre Channel SAN?

No. The Fibre Channel frame is encapsulated into an Ethernet frame with the CNA. Subsequently the physical port of the CNA transmits and receives transports Ethernet frames only.

Can the FCoE CNA connect to a 10GbE Ethernet switch available today?

The FCoE CNA can connect to a standard 10GbE Ethernet switch available today if it is used for data networking only. However, if the FCoE CNA is used for storage networking, it must be connected to a new FCoE capable switch.

Where can I find out more information?

You can contact your Oracle Sales representative directly or call 1-800-Oracle1. For more information about the Sun Storage 10GbE FCoE CNA on the web, go to:

<http://www.oracle.com/us/products/servers-storage/storage/storage-networking/index.html>

Pricing for all Oracle Networking products can be found at:

www.oracle.com/pricing



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