HP Embeds Converged Network Adapters

By Frank Berry January, 2011

In the movie Field of Dreams, Ray Kinsella (Kevin Costner) hears a voice whisper, "If you build it, they will come," and sees a vision of a baseball field. Watched by disbelieving neighbors, Ray plows under his corn and builds the field. A year passes without incident until Ray is told—by people who cannot see the players—that he will go broke unless he replants the crop. Ray sticks to his vision and the movie ends happily with the camera pulling back to reveal a stream of approaching car headlights that extends to the horizon.

In Field of Dreams, Ray built this field in the belief, "if you build it, they will come."

Server Vendors are Hedging their Bets

In the server market, where the use of industry standard components makes it difficult to design products that stand-out, new networking technologies offer the promise of differentiation. Higher performance 10GbE, convergence and virtualization are examples of important networking technologies that are still in the early stages of market adoption. Networking vendors are implementing the new technologies in different ways, meaning it will take years for the market to shake-out the best implementations. In the meantime, server vendors are hedging their bets by incorporating 10GbE, converged network adapters and network virtualization as modular options that end-users can add to a server if and when they need it.

Not HP

Hewlett-Packard bypassed the harder to sell, harder to buy and harder to install modular options, and embedded advanced networking down onto their new G7 server blade motherboards. Now, 10GbE, Virtual and Converged Networking are embedded and ready to use with your HP server. Recent surveys and focus groups conducted by IT Brand Pulse indicate that if HP sticks to its vision, and embeds advanced networking capabilities onto their server motherboards, this movie will end happily with the view pulling back to reveal a trail of approaching data center managers that extends to the horizon.

HP embedded advanced networking in G7 server blades in the belief, "if you build it, they will come."

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Server Connectivity Needs an Upgrade

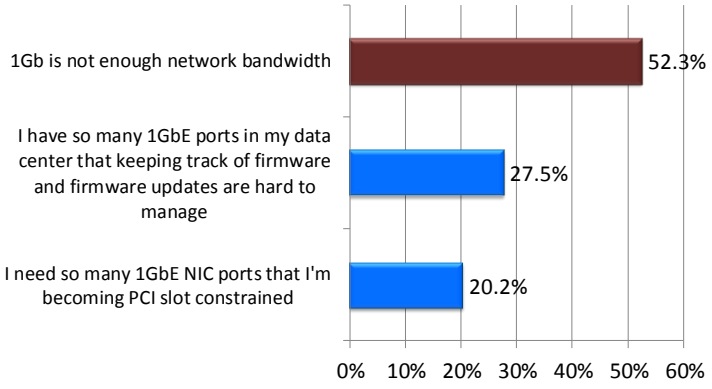
Until Recently, Deployment of 10GbE Has Been Limited

It's no wonder that some people think HP got ahead of IT organizations by putting 10GbE down on their motherboards. Available since 2004, the deployment of 10GbE at the core of the data center has become common, while 10GbE NICs have been limited to a relatively small niche of high-performance LAN and HPC applications. During that time, 1GbE LOM and NICs have managed to satisfy LAN and iSCSI SAN performance requirements of the vast majority of web and business application servers. In addition, 10GbE chips were too expensive to embed onto motherboards, and servers could not take full advantage of the available 10Gb NIC bandwidth.

1GbE is No Longer Enough

Some say that for the last several years, 10GbE NICs were high-performance solutions looking for a performance-bottleneck problem. But today data center managers are expressing concern their 1GbE server connections may be over-subscribed. In a recent IT Brand Pulse survey, the respondents said the biggest issue with their 1GbE network was not enough bandwidth.

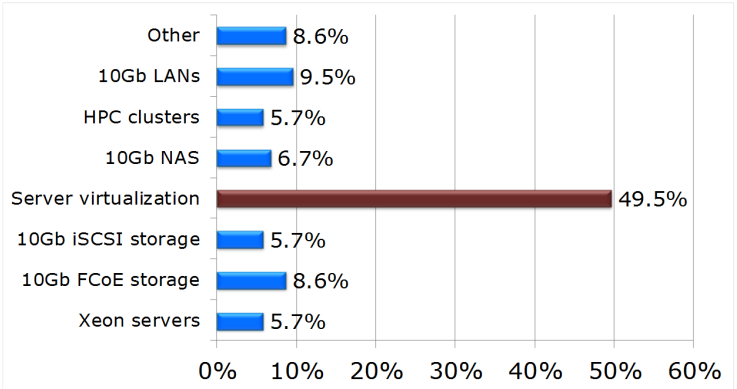
What is the biggest issue with your 1GbE network:



Server Virtualization is Why

To fully utilize available compute resources, servers are now routinely deployed with multiple virtual machines, and a corresponding heavy application load that was previously spread across multiple physical servers. Data center mangers are justifiably concerned about the potential for their 1GbE server connections to get over-subscribed. That's why IT professionals surveyed, said that server virtualization is the application most driving adoption of 10GbE in their data center.

The application in my data center that is driving the adoption of 10Gb Ethernet is:



New Server Technology Answers The Call

Powerful Servers That Can Drive 10Gb Networks

The latest generation of 64-bit micro-processors from AMD and Intel incorporate up to 12 cores per processors. The HP BL680c G7 and BL685c G7 are examples of servers that IT managers can use to consolidate up to 20 older single-core, 4-chip servers onto a single server while maintaining the same level of performance. And with over 10x the I/O performance of older single-core processors, the new generation of servers are fully capable of driving a 10GbE link to its performance limit.

8 or 12-Core

AMD Opteron 6100

8-Core

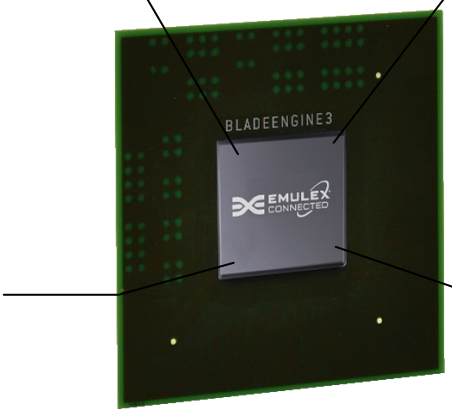
Intel Xeon 7500

Faster Ethernet Controllers that Allow LAN/SAN Convergence and Virtual Networks

Data Center Bridging (DCB) was invented so Ethernet could reliably support LAN and SAN. The advent and adoption of DCB spurred the development of a new generation of 10Gb Ethernet controller ASICs used in LOM and NIC server applications, as well as in NAS and iSCSI storage applications.

LOM built on this third generation 10Gb ASIC provides **20% better performance with 20% lower power usage** than the previous generation of 10GbE LOM and adapters.

Support for iSCSI and FCoE protocols **enable LAN and SAN convergence** a single 10GbE port. Support for iSCSI and FCoE offload frees the server processors to **support more virtual machines.**



10GbE

Emulex BladeEngine 3

Support for a suite of Ethernet enhancements called Data Center Bridging (DCB) is the foundation of lossless Ethernet networks that can **reliably support LAN and SAN traffic**.

HP Flex-10 technology allows 10Gb ports to be divided into up to 4 ports. Combined with HP Virtual Connect, server blades with two 10Gb ports can be transformed into up to 8 ports with 2x10Gb of bandwidth with out the need to purchase, power or manage extra cards or switches.

Product Spotlight

HP ProLiant™ BL460c G7 Server

IT Brand Pulse selected a ProLiant BL460c G7, one of the most popular servers inside of HP BladeSystem c-Class , in order to evaluate an implementation of 10Gb CNA LOM for this product spotlight.

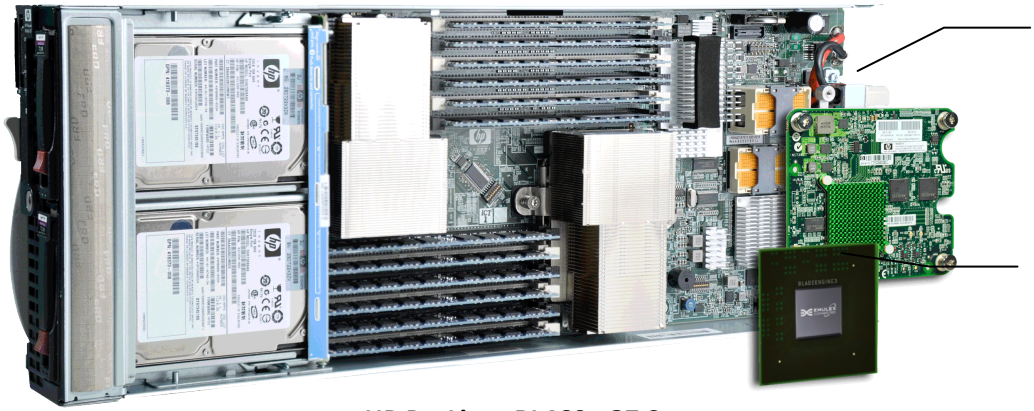
With a new generation of LAN-on-Motherboard, HP ProLiant BL460c G7 servers offer the promise of higher performance with support for 10GbE, less cabling with support for converged networking, and end-to-end virtual server management with support for virtual networking.

First Servers with CNA LOM

The definition of LAN-on-Motherboard (LOM) is a network controller chip integrated onto a server motherboard. Given this definition, Converged Network Adapters (CNAs) available in PCI adapter card, blade server mezzanine card, and network daughter card form-factors, are not LOM. By this definition, the BL460c G7, and other ProLiant server models introduced in the fall of 2010 are the industry's first servers with a LOM, which HP calls "FlexFabric Adapters".

HP FlexFabric™ Adapters

Embedded on the BL460c G7 server motherboard is a dual-port integrated 10Gb HP FlexFabric Adapter, a.k.a. LOM. The server also includes connectors for two dual port FlexFabric 10Gb mezzanine cards. Both types of FlexFabric Adapters enable network convergence when combined a Virtual Connect FlexFabric module to support simultaneous LAN, iSCSI and FCoE traffic over a single Ethernet link. A single 10GbE FlexFabric Adapter port can be configured as up to 4 FlexNICs, with an option to configure one as a FlexHBA for either FC or iSCSI storage connectivity). Each FlexNIC or FlexHBA can be configured with its own set of network policies tailored to the need of specific virtual machines and applications.



HP ProLiant BL460c G7 Server

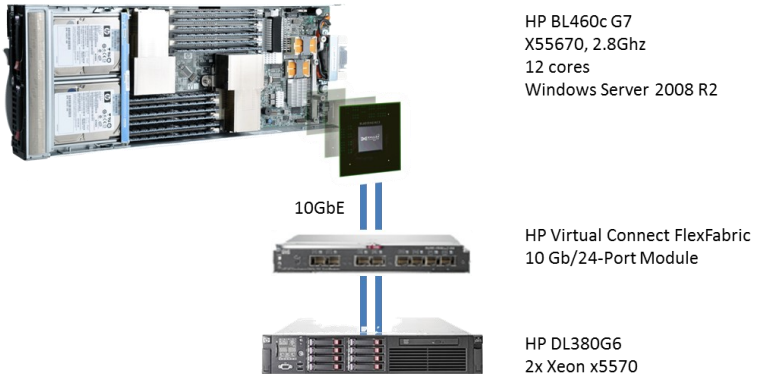
Product Spotlight

Advanced Server Connectivity Now Standard: High Performance NIC

We travelled to the Emulex test lab at their corporate headquarters in Costa Mesa, California, to do hands-on testing of integrated FlexFabric Adapter used inside the HP BL460c G7. In particular, we wanted to see the NIC (TCP/IP), iSCSI, and FCoE performance of the 10Gb LOM that now comes standard on this class of HP servers.

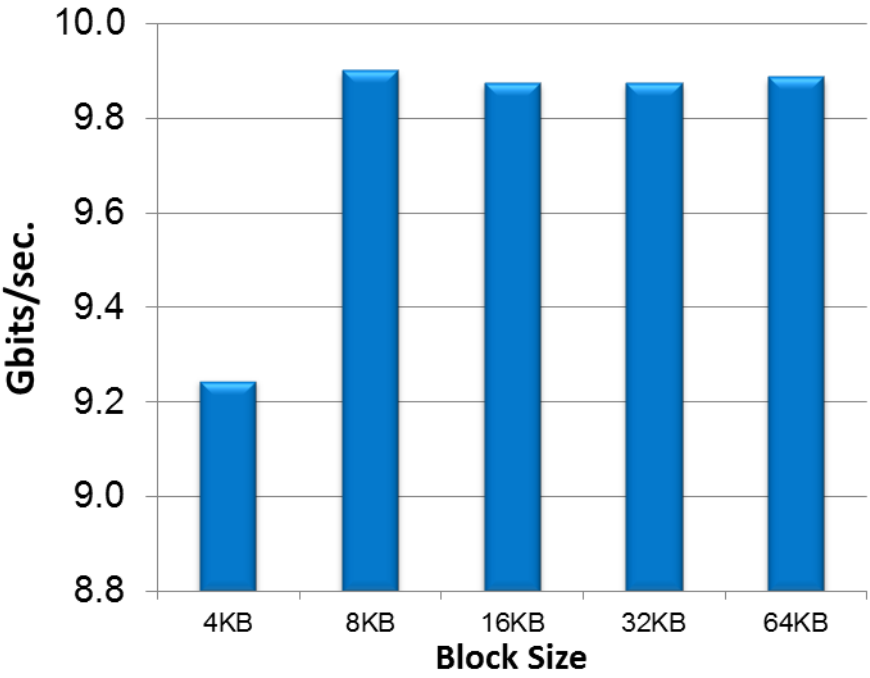
Because approximately 90% of server ports in a data center are NIC ports, the first capability we wanted to test was the iSCSI performance of the embedded FlexFabric Adapter (LOM). So, we ran a unidirectional receive throughput test with jumbo frames (9014 bytes). We used Ixia's IxChariot to simulate a TCP/IP load on the BL460c and HP Virtual Connect FlexFabric 10 Gb/24-Port Module.

NIC Test Bench



The Results

At 8Kb block sizes or greater, the FlexFabric Adapter was able to achieve throughput of 9.9 Gb/sec — very close to the full line speed of 10Gb/sec.

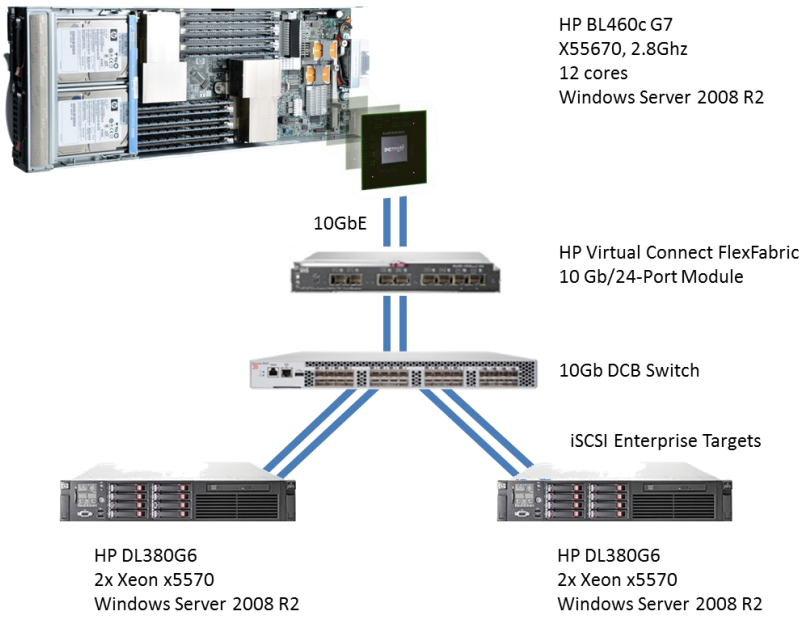


BL460c G7 10GbE LOM Unidirectional NIC Transmit Throughput Performance 9014 Byte Packet Size

Product Spotlight

Advanced Server Connectivity Now Standard: High Performance iSCSI SAN Adapter

The FlexFabric Adapter (LOM and mezzanine cards) have the unique capability to support iSCSI protocol with a hardware off-load that improves performance and frees the blade server CPUs to support more virtual machines and application workloads. We wanted to see how well iSCSI performed in a high-performance read environment and in a more mixed read/write environment. So we tested using SourceForge IOmeter software to setup iSCSI Enterprise Targets (IET).

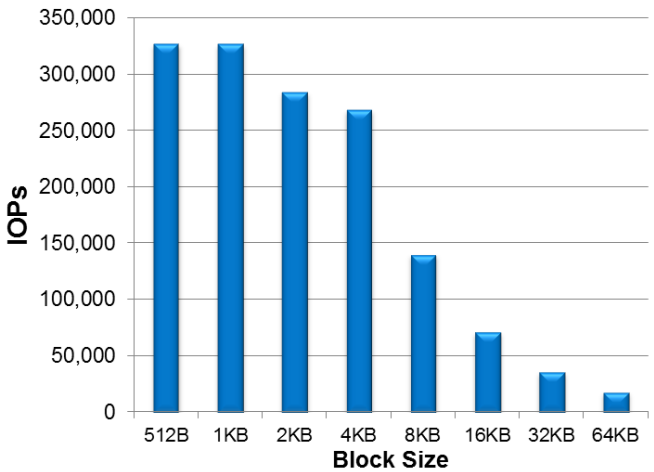


The Results

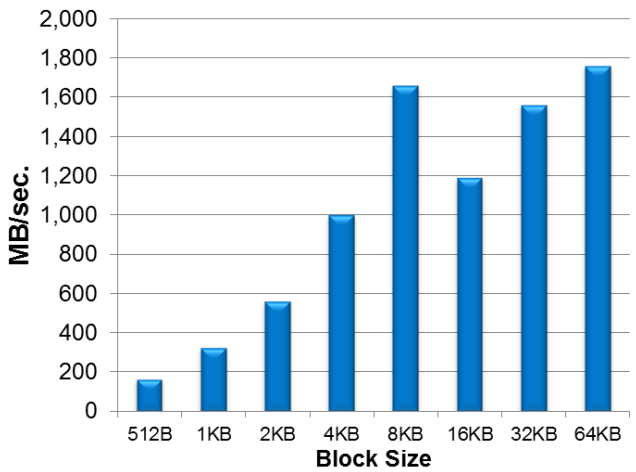
The test produced peak read-only performance of over 325,000 IOPS, with 268,000 IOPS and 140,000 IOPs at 4KB and 8KB blocks ,which are typical for real-world applications.

In mixed read/write throughput testing, the FlexFabric Adapter continued to impress by ramping to nearly 1,800 MB/sec. at large block sizes—similar to the results IT Brand Pulse has seen during iSCSI testing of other leading converged network adapters.

BL460c G7 10GbE LOM iSCSI Single Port
IOPs Sequential Read



BL460c G7 10GbE LOM iSCSI Single Port
Throughput Read/Write Full Duplex

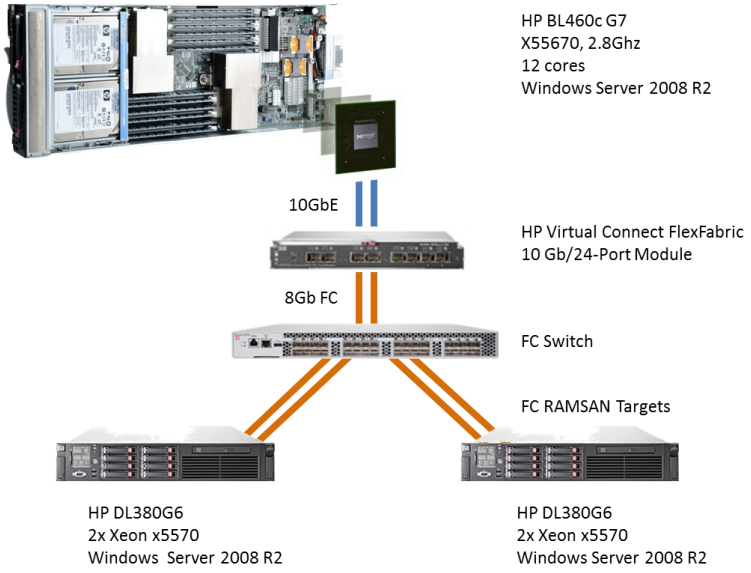


Product Spotlight

Advanced Server Connectivity Now Standard: High Performance FCoE SAN Adapter

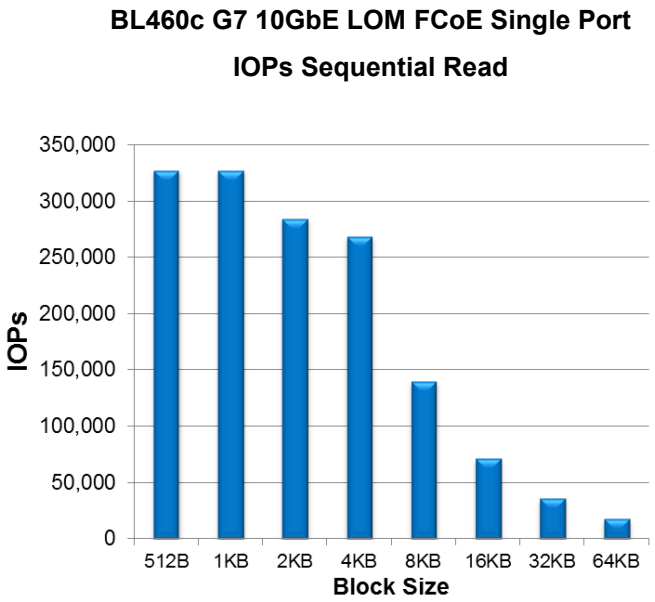
The FlexFabric Adapter (LOM and mezzanine cards) also support the FCoE protocol, which is important for HP server customers that need connectivity to Fibre Channel storage. With the FlexFabric Adapter that comes standard, and a HP Virtual Connect FlexFabric 10 Gb/24-Port Module, BL460c G7 servers are equipped to connect to Fibre Channel SANs.

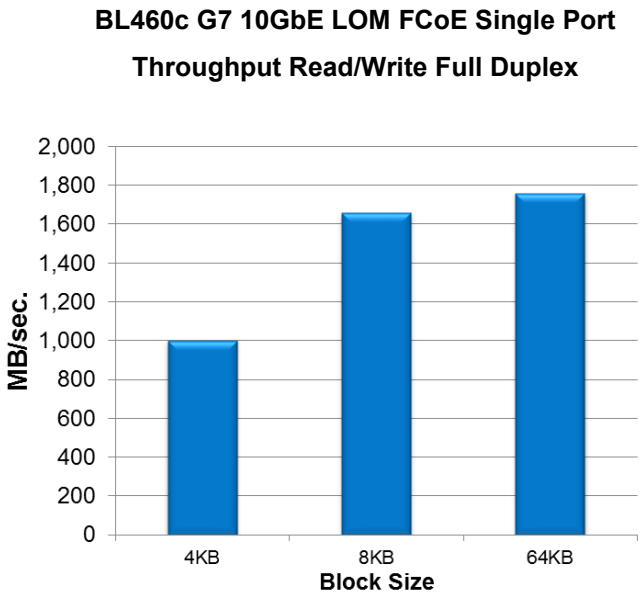
To test FCoE performance we used SourceForge IOmeter software along with a configuration of servers to create Fibre Channel RAMSAN targets and an 8Gb Fibre Channel switch. (Refer to the Test System Configuration chart for more details.)



The Results

In read-only testing, performance topped out at 810,000 IOPS — less than the 960,000 IOPS we saw in previous tests using solid-state disks — but substantially more than the 500,000 IOPS performance of leading 8Gb Fibre Channel adapters. In throughput testing, the FlexFabric Adapter achieved 1,200 to 1,300 MB/sec., or the equivalent of 10Gb/sec. line speed.

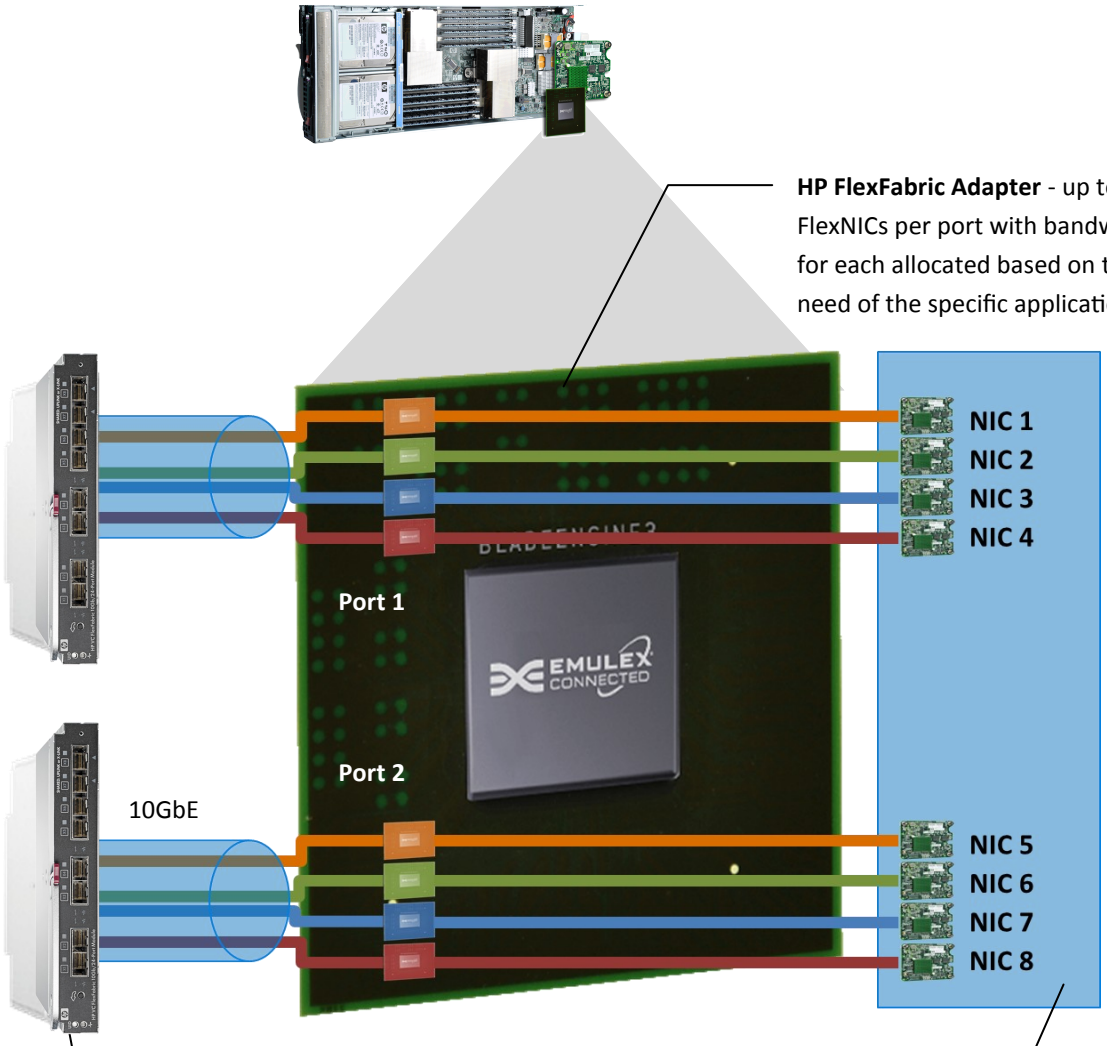




Product Spotlight

Advanced Server Connectivity Now Standard: Virtual Networking

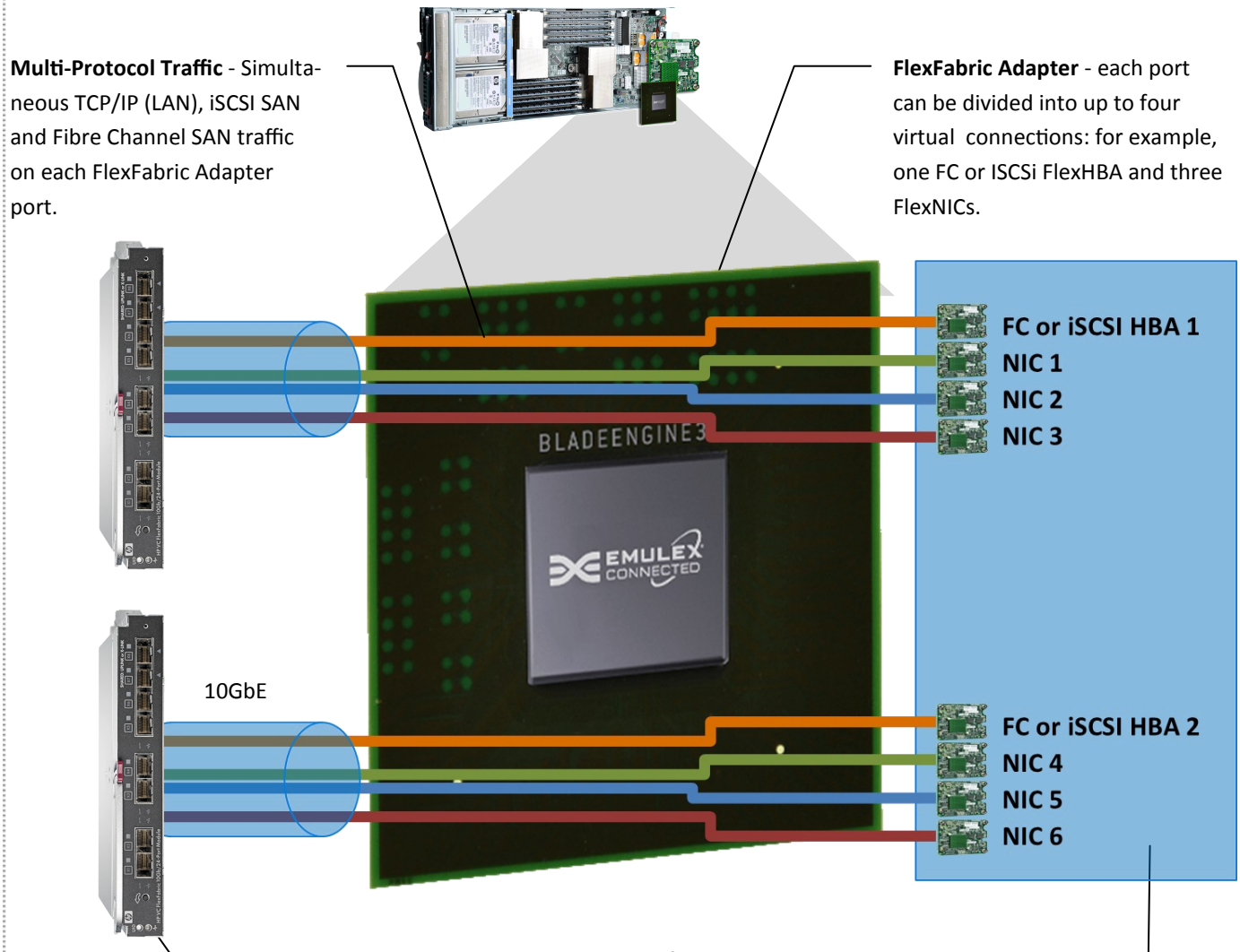
When combined with HP Virtual Connect, each HP FlexFabric Adapter 10Gb port can be partitioned into 4 separate physical ports, called FlexNICs, with up to 8 FlexNICs per server. This is especially important for virtualized environments which typically require 6-8 network connections per server. Virtual Connect Server Profiles can then be used to specify how much bandwidth you want each FlexNIC to have.



Product Spotlight

Advanced Server Connectivity Now Standard: Converged Networking

Consolidating LANs, iSCSI SANs and Fibre Channel SANs promises to reduce cabling and simplify management. HP Flex-10 technology, used in FlexFabric adapters and HP Virtual Connect, allows server administrators to divide each 10Gb port into up to four physical function ports called FlexNICs (up to 8 per server blade), while also allocating bandwidth to various management LAN or SAN applications. For example, in the above diagram we could give .5Gb of bandwidth for management traffic, 2Gb for vMotion, 4Gb for iSCSI traffic and 3.5Gb for Virtual Machine traffic.



Conclusions

Server Connectivity Needed an Upgrade

Server virtualization and more powerful servers are driving an increase in server I/O that calls for the extension of 10Gb Ethernet from the core of the data center, to the edge.

Advanced Server Connectivity Now Standard

A new generation of Ethernet controllers match the performance of high-performance multi-core processors, support the convergence of LANs, iSCSI SANs and Fibre Channel SANs at the server edge, and can be partitioned into multiple data and storage network connections (FlexNICs). The best thing is that all this technology is now standard equipment on new HP ProLiant server blades.

Designed For Phased Deployment

Taking advantage of 10GbE performance, LAN/SAN convergence or virtual networking can be deployed independently. This allows data center managers to phase-in the capabilities as time allows.

A Prototype for the Future

New HP server blades such as the BL460c G7 are the only servers today with a 10Gb CNA LOM. However, they will hardly be the last. In the future, 10Gb CNA LOM will be standard equipment on most business servers.

Related Links

HP BladeSystem
http://hp.com/go/bladesystem

HP Virtual Connect Technology
http://www.hp.com/go/virtualconnect

http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01608922/c01608922.pdf?jumpid=reg_R1002_USEN

HP FlexFabric Adapters
http://h18004.www1.hp.com/products/blades/components/emulex/nc551m/index.html

About the Author

Frank Berry is founder and senior analyst for IT Brand Pulse. As former vice president of product marketing for the host bus adapter group and vice president of corporate marketing for QLogic, Mr. Berry has over 9 years experience in the development and marketing of host bus adapters. Prior to that Mr. Berry was vice president of worldwide marketing for the automated tape library (ATL) division of Quantum. You can contact Frank at frank.berry@itbrandpulse.com.