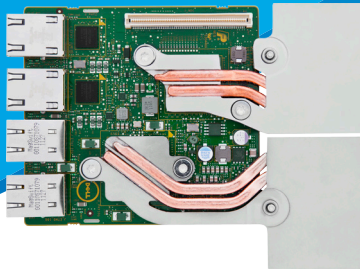# 10GbE Network Connectivity in the Data Center

QLogic 10GbE Relieves Data Congestion

With a variety of network adapter configurations available for Dell PowerEdge rack and tower server models, QLogic technology makes it easier than ever to deploy 10Gb Ethernet throughout the data center.

ABSTRACT

Although 10GbE standards were first ratified about a decade ago, until recently, they had gained limited traction for use in the rack-and-tower-based data center. This was largely due to a combination of limited requirements and prohibitive cost barriers associated with the cabling infrastructure.

This technical brief outlines some of those costs along with the escalating requirements related to the changing needs of today's data centers due to new architectural deployments such as server virtualization, cloud computing, and Big Data. The shift in the cost vs. benefit balance is resulting in a marked upswing in 10GbE adoption rates, a trend that will continue to accelerate in coming years.

10 GIGABIT ETHERNET

In 2003, 10GbE using fiber-optic cabling was introduced. Fiber-optic cables—and the requisite laser optic components used in the connected devices—were expensive compared to the more familiar UTP cabling that was used with 1GbE network installations. While fiber optic technology supported connections that might be hundreds of meters long, the high costs made 10GbE over fiber-optic cabling viable only in niche applications such as congested network core "backbones" and switch-to-switch trunking applications, where maximum bandwidth aggregation and longer supported distances were critical.

The adoption of server virtualization technologies, which permitted more applications to run on each physical machine, was driving the need for more bandwidth at the server in order to relieve I/O bandwidth and cabling congestion. 1GbE bandwidth reached a critical limit. To address the server cabling congestion, in 2004, the use of twin axial (twinax) copper cables for very limited distance connections at the server was introduced. These twin axial Direct Attach Copper (DAC) cables, while even more expensive than fiber-optic cables, eliminated the expensive (hundreds of dollars each) optical transceiver requirements in the equipment they connected. Like fiber-optic cables, SFP+DAC cables are manufactured in fixed standard lengths—but only up to about 7 meters—making installation challenging.

"The demands being placed on today's data centers to 'do more with less' are driving the deployment of virtualized servers. These densely populated virtual machines are creating concentrated demands for data that are increasingly difficult to meet with 1GbE network connections. You need 'big ports' to relieve the cable congestion and the data bottleneck happening at the server. Dell® has partnered with QLogic® to provide some of the highest performing and most reliable 10GbE solutions in the industry as the default network adapters used in our PowerEdge™ server offerings."

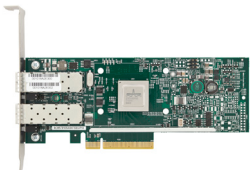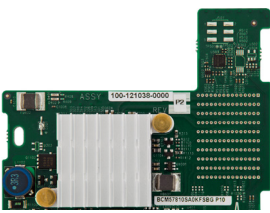*– Brian Payne, Executive Director, PowerEdge Marketing, Dell Inc.*

"At QLogic, we produce the world's best host adapter solutions for data center communications. Our 10GbE network host adapters are designed to squeeze more out of every data center investment dollar. [QLogic] technology combines the very best features of performance, manageability and reliability of any 10GbE solution on the market today. We are proud to partner with Dell to make these solutions available in their PowerEdge family of servers as the default choice for their customers."

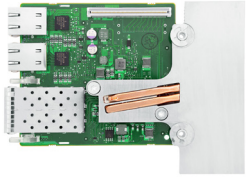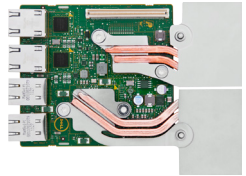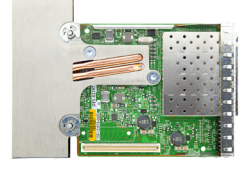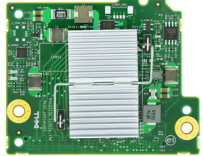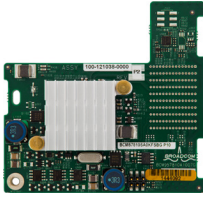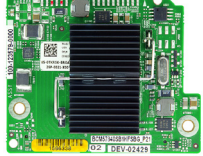*– Greg Scherer, CTO Office Product Strategy, QLogic Corporation*

To optimize the costs and capabilities of the short reach SFP+DAC cables and the more expensive, longer-reach fiber-optic solutions, 10GbE network switches were added to each server rack. These "Top-of-Rack" switches enabled the use of short SFP+DAC cables from the possibly dozens of servers within that rack to that switch, which then aggregated the data and connected the next centralized or "End-of-Row" switch with a few fiber-optic cables.

The combination of Top-of-Rack switches with SFP+DAC and fiber-optic cabling provided an effective solution for new data center builds. 10GbE provides massive bandwidth increases, while reducing the adapter port and cabling complexity at the server. Thus, 10GbE relieves the cabling congestion at the server, while providing "reserve" bandwidth to accommodate multiple virtual machines and peak demand events such as Virtual Machine (VM) live migrations. Still, fiber-optic and SFP+DAC cables are relatively expensive and difficult to install, and are not compatible with existing 1GbE equipment installed in established data centers, making any kind of phased approach to moving to 10GbE nearly impossible. For 10GbE to be embraced and widely deployed, another more universal and cost-effective solution was needed.

Dell PowerEdge Select 10GbE Network Adapters Powered by QLogic Technology			
Server Type	Photo	Description	Details

Rack and Tower Servers (NICs)		QLogic 57810S Dual-Port 10GbE SFP+ Converged Network Adapter	• 10GbE/Two Ports
			• L2 Networking, iSCSI Host Bus Adapter, FCoE[1]
			• Dell Part Numbers (with Server)
			  − 430-4421 (FH)
			  − 430-4422 (LP)
			• Dell Part Numbers (without Server)
			  − 430-4415 (FH)
			  − 430-4414 (LP)

		QLogic 57810S Dual-Port 10GBASE-T Converged Network Adapter	• 10GbE/Two Ports
			• L2 Networking, iSCSI Host Bus Adapter, FCoE[1]
			• Dell Part Numbers (with Server)
			  − 430-4419 (FH)
			  − 430-4420 (LP)
			• Dell Part Numbers (without Server)
			  − 430-4413 (FH)
			  − 430-4412 (LP)

1. To provide FCoE features, QLogic Converged Network Adapters with 10GBASE-T connectivity require MFW 7.10.11 or later and matching drivers for the operating system in which the adapters are installed.

QLogic 10GbE Adapters for Dell 13th Generation PowerEdge Servers			
Dell PowerEdge Select 10GbE Network Adapters Powered by QLogic Technology			
Server Type	**Photo**	**Description**	**Details**
Rack Servers (Rack NDC)		QLogic 57800S Quad-Port SFP+ Rack Converged Network Daughter Card	• 10GbE/Two Ports + 1GbE/Two Ports • L2 Networking, iSCSI Host Bus Adapter, FCoE • Dell Part Number (with Server): 430-4428 • Dell Part Number (without Server): 430-4410
		QLogic 57800S Quad-Port BASE-T Rack Converged Network Daughter Card	• 10GbE/Two Ports + 1GbE/Two Ports • L2 Networking, iSCSI Host Bus Adapter, FCoE • Dell Part Number (with Server): 430-4427 • Dell Part Number (without Server): 430-4409
		QLogic 57840S Quad-Port 10GbE SFP+ Rack Converged Network Daughter Card	• 10GbE/Four Ports • L2 Networking, iSCSI Host Bus Adapter, FCoE • Dell Part Number (with Server): 540-BBCN • Dell Part Number (without Server): 430-5141
Blade Servers (Blade NDC and Mezzanine Cards)		QLogic 57810S Dual-Port 10GbE KR Blade Converged Network Daughter Card	• 10GbE/Two Ports • L2 Networking, iSCSI Host Bus Adapter, FCoE • Dell Part Number (with Server): 430-4398 • Dell Part Number (without Server): 430-4458
		QLogic 57810S Dual-Port 10GbE KR Blade Converged Mezzanine Card	• 10GbE/Two Ports • L2 Networking, iSCSI Host Bus Adapter, FCoE • Dell Part Number (with Server): 430-4401 • Dell Part Number (without Server): 430-4457
		QLogic 57840S Quad-Port 10GbE KR Blade Converged Network Daughter Card	• 10GbE/Four Ports • L2 Networking, iSCSI Host Bus Adapter, FCoE • Dell Part Number (with Server): 540-BBCQ • Dell Part Number (without Server): 407-0021

THE NEXT WAVE: 10GBASE-T

10GBASE-T over structured UTP cabling solves the cabling and backward-compatibility problems, making 10GbE available to a much broader market. In 2006, IEEE 802.3an, which specified the use of 10GBASE-T over UTP cabling, was ratified. 10GBASE-T with UTP structured cabling is the most flexible solution for most established data center 10GbE networking applications. The raw cost of the cable itself is far less than either optical fiber or SFP+DAC cables, and with its extended reach, can be used without the need for a Top-of-Rack switch. This flexibility and compatibility with existing equipment facilitates the transition from 1GbE to 10GbE in a more phased approach. By solving these key challenges with 10GbE deployment, 10GBASE-T has become the catalyst that makes 10GbE affordable and effective for use across the data center.

ADVANCES IN ETHERNET TECHNOLOGY

As a leading supplier of network and storage solutions, QLogic has made major advancements in 10GbE controller technology. With a variety of network adapter configurations available for Dell's popular rack and tower server models, QLogic technology makes it easier than ever to deploy 10Gb Ethernet throughout the data center.

CONVERGED INFRASTRUCTURE

When implementing a converged storage + data network infrastructure, Dell's Active System Matrix helps you address your unique concerns—on your own or with the assistance of Dell Consulting Services. It provides prescriptive guidance on the Dell enterprise products and components that are engineered and optimized for converged infrastructure. Now you can deploy easy-to-use and holistic converged infrastructure solutions that satisfy your specific use cases. The Active System Manager 7.0 easily discovers, configures and manages each element in the Active System Matrix. Leveraging templates, this intelligent and intuitive converged infrastructure manager automates infrastructure and workload deployment. Dell's 10GbE adapters based on QLogic technology are the exclusive converged network adapters approved for the Converged Infrastructure program.

SUMMARY

The 10GbE standards are mature, reliable, and well understood. 10GbE has proven itself for use in core network backbone and ISL trunking applications. Key data center initiatives to reduce floor space, reduce energy consumption, optimize utilization, and improve flexibility and manageability are driving the need for greater levels of server virtualization. These densely populated data centers require greater bandwidth and fewer cables, which 10GbE delivers. Dell offers high performance network adapters for PowerEdge servers—based on the market proven QLogic technology—your best choice for mission-critical data center LANs.

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