ABSTRACT
Deploying server virtualization in today’s data centers drives data demand that challenges traditional 1Gbps throughput capabilities. These consolidated virtual servers are typically configured with multiple 1Gbps ports in order to keep up with I/O demands. Deploying a 10Gbps network eliminates these 1Gb/s bandwidth bottlenecks, while dramatically simplifying cabling and management requirements and reducing power and cooling demands. 10GBASE-T over common CAT6a unshielded twisted pair (UTP)—priced less than optical media solutions—enable rapid, large-scale adoption of 10GbE throughout the data center.

10GbE SOLUTION
Dell’s PowerEdge™ servers enable users to increase the number of virtualized servers (and therefore, the number of applications) running on a single server, which leads to a significantly increased demand for I/O. This accelerated adoption of server virtualization and convergence technologies allows the running of multiple workloads in order to consolidate physical servers, and often increases the I/O demands well beyond the capabilities of 1 Gbps Ethernet ports.

Migrating to 10GbE fully addresses this I/O bandwidth bottleneck issue. In recent years, data center managers have started migrating portions of their data center to 10GbE networks using a combination of Direct Attach Copper (DAC) cables for short distances (up to 7 meters for Top-of-Rack connections) and fiber-optic cabling for longer distances (for End-of-Row connections). The connectivity from the 10GbE port on the server often involves a Top-of-Rack switch used to aggregate the DAC connectivity to the servers, with fiber-optic connectivity to the End-of-Row switch.

This deployment of 10GbE—using SFP+ connections to accommodate either fiber optics or DAC connectivity—improved the I/O capabilities for virtualized servers, but the costs associated with a Top-of-Rack switch and expensive cabling and optics limited the widespread adoption, especially in data centers where 1GbE is already broadly deployed.
**10GbE Networking Made Simple with 10GBASE-T**

**10GbE PROVIDES ECONOMIC RELIEF**

Using 10GBASE-T with structured UTP cabling addresses the cost and cabling issues associated with 10GbE networks, making 10GbE available to a much broader market. 10GBASE-T with CAT6a UTP cabling is the most flexible solution for most data center 10GbE networking applications. The raw cost of the cable itself is far less than either optical fiber or SFP+DAC cables.

**ADDITIONAL BENEFITS**

1. **Longer Reach than SFP+ DAC**
   
   While twinaxial Direct Attach Copper (DAC) cables have been successful over very short distances, the more familiar UTP cabling—which has become so ubiquitous in today's data centers—affords an even lower cost solution with much longer reach, up to 100 meters. This makes CAT6a UTP cabling the best universal solution for 10GbE requirements in today's data centers.

2. **Lower Deployment Cost than Optical Cabling**
   
   CAT6a UTP cable is low cost and widely available. While optical fiber cable is a great solution for long distance (hundreds of meters or more) 10GbE network backbone requirements, for connections less than 100 meters—typical for data center installations—CAT6a cabling provides the optimum low-cost, easy-to-use solution.

3. **Easier to Install than Optical or DAC Cabling**
   
   CAT6a cabling is inexpensive and easy to install with common wire-cutting and crimping tools. Familiar UTP wiring and RJ-45 connectors are compatible with existing 1GbE switches and NICs.

4. **Ease of Migration**
   
   CAT6a UTP cabling is backward compatible with existing 1000BASE-T networks, allowing the cabling to be upgraded before upgrading the network switches and adapters. This allows a smooth transition path for data centers with an installed base of CAT5e cabling that they need to upgrade. Switches that support 10GBASE-T also support 1GbE, allowing for a controlled transition to 10GbE over time.

5. **Lower Power**
   
   Energy Efficient Ethernet (EEE) lowers power up to 27% by not toggling the I/O in the absence of a signal.

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“10GbE deployment has done very well inside blade servers where there are no natural barriers of distance or media cables to consider. For the larger population of rack and tower servers, the migration to 10GbE has been a bit slower, due to the higher costs and limited compatibility of solutions using fiber-optic or twinax Direct Attach Copper cabling. Dell’s 10GBASE-T adapters — powered by QLogic® Ethernet technology — address these barriers head-on, enabling 10GbE deployment with conventional CAT6a UTP cabling. This provides the lowest cost and most flexible solution for migrating to 10GbE in established data centers because you can actually upgrade servers independently of switches, for a more controlled phase-in of 10GbE.”

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

“With QLogic’s latest generation of 10GBASE-T solutions using familiar CAT6a UTP cabling, the costs for power and equipment have been dramatically reduced, paving the way for 10GbE deployment throughout the data center. These 10GBASE-T solutions are available today with Dell’s PowerEdge rack and tower server offerings.”

– Greg Scherer, CTO Office, Product Strategy, QLogic Corporation
“A key consideration in data center investments is the total cost of ownership to manage and maintain that facility over its lifetime. We must give our customers the “knobs” they need to fine tune and manage their networks efficiently and reliably. Dell’s 10GbE adapters—featuring QLogic’s Ethernet technology—combined with our Integrated Dell Remote Access Controller with Lifecycle Controller are the exclusive adapters chosen for use with Dell’s Converged Infrastructure initiative.”

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

“Networking is a very complex job that must be done well so that it is flexible to meet the changing needs of an enterprise, is easy to manage, and works right every time. QLogic worked very closely to design in the key features that allow our 10GbE solutions to integrate seamlessly with Dell’s management solutions. We are happy to be recognized as the default choice for Converged Network Adapters in Dell’s PowerEdge servers.”

– Greg Scherer, CTO Office Product Strategy, QLogic Corporation

By solving these key technical, backward compatibility, and cost challenges with 10GbE deployment, 10GBASE-T has become the catalyst that finally makes 10GbE affordable and effective for use across the data center. 10GBASE-T is forecast to exceed all 10GbE fiber-optic port shipments by 2014.

INTEGRATED MANAGEMENT FEATURES
Dell’s embedded server management solution, the Integrated Dell Remote Access Controller (iDRAC) with Lifecycle Controller, is supported on all QLogic 10GbE adapters. iDRAC helps IT administrators get more done faster when doing essential management tasks; it increases overall availability of servers, and it reduces IT operational expenses. With powerful, easy-to-use, remote management and configuration options, iDRAC with Lifecycle Controller alerts IT administrators when an issue occurs, enables streamlined local and remote server management, and reduces or eliminates the need for administrators to physically visit the server, even if the server is not operational.

10GBASE-T ADAPTERS FOR DELL POWEREDGE 13G RACK AND TOWER SERVERS
The QLogic 10GBASE-T adapters from Dell include these benefits:

• Backward compatibility—the adapters can be deployed on existing 1GbE and 10GbE networks, providing easy migration to 10GbE
• Higher bandwidth and superior server virtualization than existing 1GbE
• Use familiar CAT6a cabling in the data center

• Cable distance support up to 100 meters
• Cable and port consolidation vs. multiple 1GbE connections
• Eliminate the need for Top-of-Rack switches

The Dell 10GBASE-T adapters are available in two styles: the Converged Network Adapter (CNA) and the Dell Rack Network Daughter Card (NDC) Converged Adapter.

DELL 10GBASE-T ADAPTER PART NUMBERS AND KEY FEATURES:

• 10GBASE-T 2-port CNA part numbers:
  – Full Height (FH) or Low Profile (LP) PCI bracket
  – Dell Server Option P/N: 430-4419 (FH), 430-4420 (LP)
  – Dell Stand-Alone P/N: 430-4411 (FH), 430-4412 (LP)
• 4-port (2x1GbE+2x10GBASE-T) Rack NDC part numbers:
  – Dell Server Option P/N: 430-4427
  – Dell Stand-Alone P/N: 430-4409
  – An added feature of this NDC adapter is the inclusion of four Ethernet ports, with two ports of 1GbE and two ports of 10GbE. Using this adapter gives networks transitioning from 1Gb to 10Gb the best of both worlds without paying for a wholesale uplift to 10Gb, all with the convenience of a familiar interface.

• x8 PCIe™ Gen 2 (5 GT/s) host bus interface
• Supported on Dell PowerEdge 13G servers
• Compatible with CAT6a/7 UTP cabling up to 100 meters and CAT6 cabling up to 40 meters
• Inbox driver support for Windows®, Linux®, Citrix®, and VMware®
• Converged network data and storage traffic
• Full iSCSI hardware offload
• Full FCoE hardware offload
• Virtualization support including Single Root IO Virtualization (SR-IOV), Microsoft® VMQ, and VMware NetQueue™, and Network Virtualization using Generic Routing Encapsulation (NVGRE) packet task offloads, Virtual Extensible LAN (VXLAN) packet task offloads, and Message Signaled Interrupt (MSI-X)
• Switch-Independent Partitioning, A maximum of 8 partitions can be created per adapter. A dual-port 10GbE adapter can support up to four partition assignments per 10GbE link. A quad-port 10GbE adapter can support up to two partition assignments per 10GbE Link. These partitions give the appearance of multiple adapter ports to the operating system, and each can be customized to allocate bandwidth as needed.
• VLAN support with VLAN tagging
• Stateless Offload support including Large Send Offload (LSO), Large Receive Offload (LRO), Gigantic Send Offload (GSO), Receive Segment Coalescing (RSC), Interrupt Coalescing, TCP segmentation offload (TSO), receive-side scaling (RSS), transmit-side scaling (TSS) as well as IPv4 and IPv6 TCP/UDP checksum offloads
10GbE Networking Made Simple with 10GBASE-T

- Jumbo frame support for frames larger than 1500 bytes
- Superior small packet performance
- Integration into Dell’s embedded management framework (iDRAC8 and Lifecycle Controller)

THE TIME FOR 10GbE IS NOW
The industry has embraced 10GbE as mature, reliable, and well understood. The availability of 10GBASE-T breaks through important cost and cable installation barriers associated with 10GbE deployment, and provides investment protection via backward compatibility with 1GbE networks. 10GBASE-T simplifies data center networking deployments by providing an easier path to migrate Dell 13th generation of PowerEdge servers to a 10GbE infrastructure, which supports the higher bandwidth needed for virtualized servers. With simplified cabling and powerful management support, the QLogic-powered 10GBASE-T adapters are the right solution for data center managers considering the migration to 10GbE networks, and they are available today!