



Optimizing network bandwidth for secure cloud environments

By Brian Johnson and Rahul Deshmukh

Enterprises can enhance performance and security for cloud-based services by deploying 12th-generation Dell™ PowerEdge™ servers powered by the Intel® Xeon® processor E5 product family and the Intel® Ethernet 10 Gigabit Converged Network Adapter family.

Ongoing adoption of cloud-based systems for delivering applications and services, coupled with a corresponding steady rise in data volume, is driving the demand for increased levels of performance, accelerated throughput, and enhanced security. To help meet the performance needs required for implementing private or public cloud platforms, many organizations are moving to 10 Gigabit Ethernet (10GbE) connectivity in their data centers. 10GbE networks offer increased bandwidth for transmitting large volumes of data. However, existing server deployments are often not able to keep pace with the increased I/O that results from cloud-based transactions and the rise in data flowing through an expanded pipe.

Security is also a paramount consideration in cloud-based delivery systems. The uptick in sensitive information—personal identification, financial transactions, medical histories, proprietary business-critical data, and so on—that is leaving the traditional on-premises IT environment is intensifying the demand for data encryption to meet the expectations of authorized users. The necessary encryption and decryption processing for the 10GbE line rate can also create bottlenecks.

Data centers facilitating cloud computing platforms require enhanced bandwidth and fast encryption capabilities to deliver cloud-based services flexibly, efficiently, and securely.

Working together, Dell and Intel have developed networking innovations for a platform designed to provide both high performance and increased security across a wide array of operating systems. Cost-effective 12th-generation Dell PowerEdge servers powered by the Intel® Xeon® processor E5 product family offer a flexible, easy-to-manage platform for providing agile, secure, and efficient delivery of cloud-based applications and services. These servers can utilize Dell PowerEdge Select Network Adapters based on Intel® Ethernet technology to optimize 10GbE networking and enable balanced, scalable I/O capabilities.

Through a combination of processor-level and platform-level features, 12th-generation PowerEdge servers are designed to improve security and ensure fast encryption and decryption at 10GbE speeds, while also helping simplify management of virtual machines.

Scaling I/O for enhanced performance

To handle the increase in data traffic through their networks, many organizations providing cloud-based services are transitioning to 10GbE connectivity for networks and storage, and 12th-generation Dell PowerEdge servers help simplify this transition. These PowerEdge server platforms are designed to support and adapt to increasingly complex workloads, and are well suited for building efficient, virtualized environments.



In particular, Dell PowerEdge R720 servers based on the Intel Xeon processor E5 product family support integrated 10GbE LAN on Motherboard (LOM) connectivity with flexible networking options. Intel Ethernet-based networking technologies offer low-cost, power-efficient 10GbE bandwidth for next-generation server platforms, while also supporting Gigabit Ethernet (GbE) for elastic networking environments.

For example, the dual-port Intel® Ethernet Converged Network Adapter X540-T2 (Intel® Ethernet CNA X540-T2) provides increased bandwidth and enhanced capabilities for cost-effective 10GbE deployments. Its Intel Ethernet Controller X540 silicon supports 10 Gbps Ethernet server LOM and Intel Ethernet-based Network Daughter Card technology designs. Hot-swappable network daughtercards, such as the Intel Ethernet CNA X540-T2, are included in the family of Dell PowerEdge Select Network Adapters available for 12th-generation PowerEdge servers. This leading-edge 10GBASE-T adapter is backward compatible to GbE connectivity, helping IT organizations ease their transition to a 10GbE infrastructure.

By offering a range of LOM features, the daughtercards are also designed with the flexibility to meet evolving networking needs. The 10GBASE-T standard provides the physical interconnect capability that helps optimize 10GbE networking, while it cost-effectively enables organizations to use their existing Ethernet cable infrastructure. And these 10GbE-capable adapters are also designed to reduce power consumption and cost per port to facilitate a range of usage models such as unified networking, I/O virtualization, and Flexible Port Partitioning (FPP).

The Intel Xeon processor E5 product family includes additional innovations for enhancing I/O in 12th-generation PowerEdge servers. For example, Intel® Integrated I/O and its key Intel® Data Direct I/O Technology (Intel® DDIO) feature avoid data traffic bottlenecks and significantly help to reduce latency. Intel DDIO technology allows Intel Ethernet-based controllers and adapters to talk directly with the processor cache to enhance system bandwidth utilization while minimizing power consumption. These performance enhancements are designed to avoid the need to move and store data in memory before transferring it to cache for processing. The Intel Xeon processor E5 product family provides a large cache of up to 20 MB, and Intel DDIO can set aside a portion of this cache for I/O, which allows data to bypass memory and flow from the network adapter silicon to the cache.

The Dell PowerConnect™ 8024 high-density 10GbE switch is designed to further augment network performance and throughput in densely virtualized cloud computing deployments. The PowerConnect 8024 switch also helps IT organizations ease the transition to 10GbE networking by providing Data Center Bridging (DCB)-supported





How a cloud provider boosts throughput without compromising security

Long-standing trade-offs between performance and security and advanced approaches to reconcile them are important considerations for decision makers in organizations considering the transition to a cloud computing environment. Expedient Communications—a provider of cloud-based services, data center co-location, and managed services for enterprise and commercial organizations—helps organizations meet this challenge.

Expedient operates a network of eight data centers in the United States that utilizes extensive Ethernet connectivity designed to deliver secure and redundant facilities for comprehensively managing applications. The company also maintains a significant focus in cloud computing by providing infrastructure as a service.

Expedient helps organizations focus on core business operations by providing capabilities and technical innovation, such as cloud computing. Expedient advances its commitment to innovation by developing specific approaches to customer solutions. For example, Expedient wanted to deliver Secure Sockets Layer (SSL) tunneling on top of four teamed 10GBASE-T adapters and offer support for Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI), which

accelerates encryption and decryption on the Intel® Xeon® processor E5-2600 product family.

To help achieve this goal, Expedient deployed Dell PowerEdge R710 servers running a custom version of the Linux® OS, and then put its approach to the test by running workloads on three generations of Intel Xeon processors with and without Intel AES-NI enabled. The testing showed Expedient the value of its platform solution to network throughput. A significant increase in throughput for each later generation with corresponding enhanced processor utilization, particularly when Intel AES-NI was enabled, helped provide performance gains while freeing compute resources for other important workloads. (For more information, visit qrs.ly/nh1tx4g.)

Building on this success, Expedient is now refreshing its PowerEdge R710 servers with 12th-generation Dell PowerEdge R720 servers designed to take advantage of enhanced performance, throughput, and security capabilities. “Processor capacity is an important resource in the cloud,” says Alex Rodriguez, vice president for systems engineering and product development at Expedient. “Intel AES-NI allows us to provide more of that resource to our customers while maintaining our encryption standards.”

10GBASE-T ports that enable reliable, high-throughput 10GbE connectivity for converged Ethernet environments. The switch supports up to 24 ports of 10GbE connectivity along with four combination ports, and it advances scalability by managing multiple wire-speed switches as a single unit. Hot-swappable, redundant power supplies and convenient stacking features help further simplify data center networking. In addition to providing robust security and enterprise management capabilities well suited for high-volume data center environments, the PowerConnect 8024 switch enables IT organizations to leverage existing LAN infrastructure without requiring additional components such as cables, switches, and adapters.

Keeping pace with encryption demands for 10GbE networks

In addition to requiring high levels of performance and throughput to help manage the escalation of large workloads, private and public cloud computing deployments also demand robust security to help ensure that organizational data is not compromised. Specifically, many organizations require rock-solid data encryption and decryption to help secure the rising volumes of data that are transmitted outside the data center. The Intel® Ethernet 10GbE Network Daughter Card capabilities available with 12th-generation Dell PowerEdge server platforms powered by the Intel Xeon processor E5 product family enable organizations to achieve significant throughput performance enhancements without incurring a security trade-off.

Expanding on the existing Advanced Encryption Standard (AES), the Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) included in the Intel Xeon processor E5 product family enables accelerated encryption and decryption capabilities. AES-NI comprises a new set of instructions that helps improve data protection by performing

compute-intensive parts of the AES algorithm. It delivers fast data protection and security cost-effectively through hardware-based encryption and decryption. (For information on an innovative approach to balancing performance and security, see the sidebar, "How a cloud provider boosts throughput without compromising security.")

Providers of cloud-based services need to be particularly vigilant in protecting their infrastructures from malicious software programs or malware. The Intel Xeon processor E5 product family includes Intel® Trusted Execution Technology (Intel® TXT) hardware-based security. Intel TXT is a highly scalable architecture designed to insulate systems from the threat of hypervisor, BIOS, and firmware attacks and software-based attacks. In addition to addressing evolving security threats, Intel TXT enables organizations to comply with government and industry data protection standards and regulations.

Streamlining systems management for secure virtual environments

The virtualized environments that facilitate cloud computing provide IT administrators with a range of alternatives for effectively managing cloud computing platforms. The Intel Ethernet Converged Network Adapter family provides Intel® Virtualization Technology for Connectivity (Intel® VT-c) that is designed to deliver high levels of throughput by offloading network traffic management functions from the processor to the Ethernet controller. In VMware® virtualization environments, for example, Virtual Machine Device Queues (VMDq) built into these adapters support both Microsoft® Hyper-V® hypervisor and VMware vSphere® virtualized environments.

As production workloads and manual workflows in virtual and cloud environments rise, so does the likelihood that human error may cause unexpected delays in the operational environment. The Dell Management Plug-In for VMware vCenter provides centralized, consolidated management of 12th-generation Dell PowerEdge servers in cloud infrastructures supporting VMware virtualization environments. This plug-in enables IT managers to define and automate server provisioning, automate

BIOS and firmware updates, enhance security through zero-touch hypervisor deployment, and perform many other management tasks for virtualized environments.

The Dell OpenManage™ systems management portfolio also provides powerful enhancements for virtualized environments supporting complex, cloud-based workloads. This systems management tool suite includes the embedded Integrated Dell Remote Access Controller 7 (iDRAC7) with Lifecycle Controller, which helps IT administrators manage 12th-generation PowerEdge servers in physical, virtual, local, and remote environments with or without a systems management software agent. Dell OpenManage integrates with and connects to third-party systems management offerings, allowing IT managers to maintain a single point of control and capitalize on existing investments.

Enhancing performance and security for the cloud

Traditional server platforms often present a security and performance trade-off for organizations striving to deliver secure, cloud-based applications and services. Increasing volumes of data traffic in cloud-based workloads are driving the move toward the expanded bandwidth available with 10GbE networking. However, processors in existing server platforms often cannot encrypt and decrypt data at the 10GbE line rate.

Dell and Intel have worked together to innovate cost-effective 10GbE throughput-enhancing capabilities by offering an integrated 10GbE LOM design that works with Category 6 copper cabling. The dual-port Intel Ethernet CNA X540-T2 supporting Ethernet server LOM—together with Intel Ethernet-based Network Daughter Card technology—integrates 10GbE networking with 12th-generation Dell PowerEdge servers. These features are designed to enable IT organizations to operate high-performing, flexible data centers that scale as specific networking needs change. In addition to avoiding I/O bottlenecks, they facilitate data encryption and decryption to provide the heightened security required for delivering cloud-based applications and services. 

Authors

Brian Johnson is a product marketing engineer at Intel for 10 Gigabit Ethernet products and virtualization technologies.

Rahul Deshmukh is a senior technical marketing manager at Dell specializing in server peripheral devices.

Learn more

Intel and Dell Ethernet connectivity:
intelethnet-dell.com

Dell and Intel:
dell.com/intel