



# Securing the Network's Leading Edge

**Expedient Communications drives innovation forward, with enhanced cloud throughput and security powered by 10GBASE-T and Intel® Ethernet Converged Network Adapters.**



Customers considering cloud-based services need assurances about performance and security. CIOs and IT Administrators alike must reconsider long-standing trade-offs between those two requirements and apply new approaches to reconcile them. Expedient Communications is at the forefront of innovation that helps meet that challenge. Often, when customers encounter challenges building a private cloud or integrating with a public cloud, they find that Expedient has not only faced similar obstacles, but has ultimately engineered a solution.



## Advanced Managed Services and Improved Data Availability from Expedient

Expedient provides cloud services, data center co-location, and a full array of managed services to thousands of clients. The company's eight data centers across the eastern and mid-western United States deliver secure and redundant facilities to fully manage critical applications, backed by the power of an extensive, award-winning Ethernet network. Expedient also maintains a significant focus in cloud computing, particularly in the area of infrastructure as a service. The company's ongoing collaboration with Intel feeds the spirit of innovation at Expedient, which keeps the company and its customers a step ahead of the competition.

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CUSTOMER CHALLENGES	EXPEDIENT SOLUTIONS AND BENEFITS
<ul style="list-style-type: none"> <li>▪ <b>Deliver security in private clouds</b>, without performance impacts from pervasive encryption</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) accelerate encrypt and decrypt performance</b>, providing security without compromise</li> </ul>
<ul style="list-style-type: none"> <li>▪ <b>Increase network throughput</b> to support expanding data-access needs and system memory</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>10GBASE-T drives up bandwidth to 10 gigabits while controlling costs</b> with cost-effective copper cabling and support for connections up to 100 meters</li> </ul>
<ul style="list-style-type: none"> <li>▪ <b>Reduce network complexity</b> and cost from large numbers of cables, possibly using different mediums</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Intel® Ethernet 10 Gigabit Converged Network Adapters reduce power, cabling, and related costs</b>, and include advanced I/O virtualization features that support all major hypervisors</li> </ul>

Expedient helps businesses safely and efficiently benefit from new technologies as they arise, even when those advances may be outside the realm of the end-customer's expertise. Expedient's capabilities and focus on technical innovation allow customers to focus on their core business while still benefiting from technical advances such as cloud computing. Collaborative work with Intel helps Expedient pass the benefits of next-generation network building blocks on to its customers.

### Delivering Performance Wins with High Encrypted Throughput

Expedient's commitment to innovation includes developing unique approaches to customer solutions. For example, the company wanted to deliver secure sockets layer (SSL) tunneling on top of a set of four teamed 10GBASE-T adapters. It also wanted to offer support for Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI), which accelerate encrypt and decrypt operations on the Intel® Xeon® processor E5-2600 product family. While Linux\* supports teaming, OpenSSL in the Linux kernel doesn't support Intel AES-NI, which the company wanted to offer with this package of services. The team's inquiry into this issue eventually led them to build their own custom version of the Linux kernel with a newer version of OpenSSL.

Expedient wanted to quantify the benefits of Intel AES-NI and latest-generation server platforms in its unique set of offerings. As a way of demonstrating that value to its customers, Expedient tested workloads on three generations of Intel® Xeon® processors, both with and without enabling Intel AES-NI. The results are presented in Figure 1.<sup>1</sup>

The results dramatically reflect the value of the company's innovation. In the test system based on the Intel® Xeon® processor 5500 series (which does not support Intel AES-NI), the throughput achieved was just 5.3 gigabits per second (Gbps) out of the effective 40 Gbps port speed of the four teamed Intel® Ethernet 10 Gigabit Converged Network Adapters, or roughly one-eighth. Running the identical workload on the Intel Xeon processor

5600 series without enabling Intel AES-NI more than doubled throughput to 10.9 Gbps. The reduction of processor utilization from 90.8 percent to 85.9 percent further emphasizes this point.

*"We used to deploy hardware-based encryption accelerators—expensive, custom-built ASICs. Now, with Intel AES-NI, we can provide better encryption at far lower cost."*

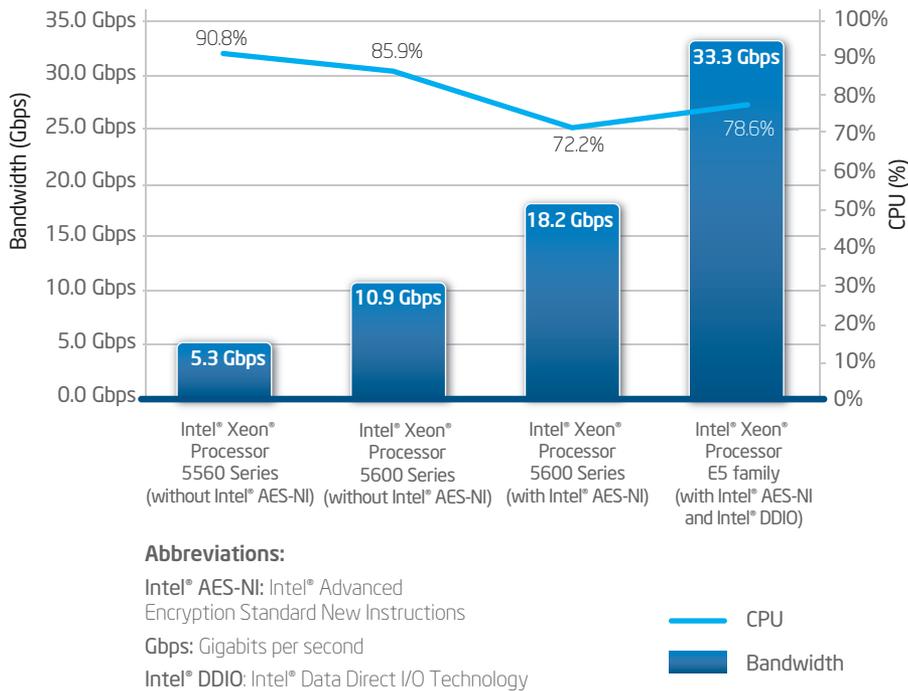
*- Alex Rodriguez, VP, Systems Engineering and Product Development, Expedient*

When Intel AES-NI was enabled on the Intel Xeon processor 5600 series-based server, throughput nearly doubled again to 18.2 Gbps, with an accompanying decrease in processor utilization from 85.9 percent to 72.2 percent.

The Intel Xeon processor E5 product family includes new I/O innovations, including Intel® Integrated I/O, which incorporates the I/O hub into the processor, and Intel® Data Direct I/O Technology (Intel® DDIO), which allows Intel Ethernet controllers and adapters to talk directly to processor cache, increasing system bandwidth, reducing power consumption, and lowering latency. Using an Intel Xeon processor E5 product family-based server, throughput again nearly doubled, increasing to 33.3 Gbps.

These results demonstrate the value of the whole platform solution to network throughput. The increase in throughput is valuable to overall solution performance, as is the freeing of compute resources due to lower processor utilization, which allows those resources to be used for work that is more valuable to the solution as a whole.

**256-Bit AES-Encrypted Throughput and Processor Utilization (Multi-Threaded Platform)**



**Figure 1.** Expedient test results.<sup>1</sup>

Said Alex Rodriguez, Expedient VP for Systems Engineering and Product Development, "Processor capacity is an important resource in the cloud. Intel AES-NI allows us to provide more of that resource to our customers while maintaining our encryption standards."

### Simple, Robust Networking with 10GBASE-T

With the increased data sizes being used in the cloud, Expedient is fast to adopt 10GbE, and its connectivity of choice is 10GBASE-T, which combines the cost-effectiveness and broad deployment of copper with the robust throughput of 10GbE. As such, 10GBASE-T represents a sweet spot between fiber, which allows for long connectivity distances in the data center but is more expensive to deploy, and SFP+ Direct Attach/Twinax, which has a lower cost but is limited to just seven-meter connections. 10GBASE-T supports 100-meter connections over Cat-6A twisted-pair cabling with standard RJ-45 connectors, making it suitable for links throughout the data center, at relatively low cost.

10GBASE-T's backward compatibility with previous generations of Ethernet limits the scope of the upgrade necessary for its implementation. Alex Rodriguez states, "Expedient believes that 10GbE is the most efficient technology for its cloud-based platforms, and 10GBASE-T based on Intel Ethernet Converged Network Adapters is the backbone of our next-generation clouds." Accordingly, Mr. Rodriguez credits Intel Ethernet

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- Alex Rodriguez, VP, Systems Engineering and Product Development, Expedient

10GBASE-T Converged Network Adapters with the following benefits to Expedient:

- Network simplification
- Faster throughput
- Easier configuration and management
- Lower equipment total cost of ownership (TCO)

Intel engineering around 10GBASE-T continues to drive down costs and power consumption. The Intel® Ethernet Controller X540 is the industry's first fully integrated 10GBASE-T converged network solution. It is designed for low-cost, low-power LAN on Motherboard (LOM) designs for Intel® Xeon® processor E5 product family servers. This controller also powers the Intel® Ethernet Converged Network Adapter X540 and flexible LOM cards for major server manufacturers.

### Next-Generation Networking with 10GBASE-T Intel Ethernet Converged Network Adapters

Expedient uses the latest Intel Ethernet Converged Network Adapters to help its customers simplify their data center environments by moving to 10GbE. For example, consider the case of a virtualized server with 10 network ports based on Gigabit Ethernet, compared to the same server using just two 10GbE ports. While doubling overall network bandwidth from 10 Gigabits per second (Gbps) to 20 Gbps, Expedient also saw the following benefits:<sup>2</sup>

- 23-percent reduction in cables and number of switch ports<sup>3</sup>
- 14-percent reduction in total infrastructure costs
- 150-percent improved bandwidth per server

To deliver excellent performance for cloud deployments, these adapters also incorporate Intel® Virtualization Technology for Connectivity (Intel® VT-c), which helps ensure very high levels of throughput by offloading network-traffic management functions from the processor to the network hardware.

Intel VT-c capabilities built into Intel Ethernet Converged Network Adapters include two different I/O virtualization modalities for high compatibility with leading hypervisors:

- **Virtual Machine Device Queues (VMDq)** supports Microsoft Hyper-V\* and VMware vSphere\* environments. VMDq improves throughput by offloading packet sorting from the hypervisor virtual switch to the Intel® Ethernet controller.
- **Single-Root I/O Virtualization (SR-IOV)** supports Citrix XenServer\*, KVM, and Red Hat Enterprise Linux\* environments. Support for this PCI-SIG\* specification increases throughput by enabling direct I/O connectivity to virtual machines, bypassing software-based traffic mechanisms.

In addition to these technologies, Intel Ethernet customers also benefit from Intel's three decades of leadership as a provider of Ethernet solutions. That experience supports Intel Ethernet Converged Network Adapters in tangible ways, such as having mature drivers that deliver the performance and stability customers need. Because these adapters are engineered along with the rest of the server stack, they also deliver highly optimized performance that complements the latest features of Intel® Xeon® processors and other platform components.

### Blazing Fast Encryption with Intel® Advanced Encryption Standard New Instructions

Robust data encryption is a prerequisite for many of Expedient's customers to consider putting their critical data into the cloud, particularly for industries that must comply with regulations such as the Health Insurance Portability and Accountability Act (HIPAA), Sarbanes-Oxley, and Payment Card Industry (PCI) standards. Expedient delivers excellent support for those requirements, overcoming the traditional

compromises between security and performance that their customers would otherwise have to regard as a simple fact of life. The company innovates around Intel AES-NI, a core technology supported in the latest Intel Xeon processors that dramatically accelerates encryption and decryption performance.

Support for Intel AES-NI was introduced with the Intel Xeon processor 5600 series for mainstream two-way servers and the Intel® Xeon® processor E7 family for scale-up servers with four processors or more. This technology removes the temptation by end customers to use weaker or more limited encryption, delivering better protection for secure web transactions and enterprise applications. Moreover, because the instructions are executed

“As a cloud service provider, Expedient regularly has large, sensitive data sets in motion. Because of this, Expedient requires a significant amount of cost-effective bandwidth coupled with high-end encryption—that’s why we’ve standardized on Intel® Ethernet 10 Gigabit Converged Network Adapters and Intel AES-NI.”

- Alex Rodriguez, VP, Systems Engineering and Product Development, Expedient

in hardware, many software-based vulnerabilities are avoided, providing an extra measure of protection from software-based attacks.

Expedient offers Intel AES-NI functionality as a key component of its ability to help its customers secure their data wherever it resides while also maintaining the ability to adopt forward-looking solutions such as those based on cloud computing.

The continuing cadence of Intel design advances such as Intel Ethernet and Intel AES-NI supports innovation by Expedient and other implementers. As that progress continues, joint solutions will deliver new value to end customers and drive advances in cloud computing and other usage models to improve performance, cost-efficiency, and the capabilities of the computing industry as a whole.

For more about Expedient, see [www.expedient.com](http://www.expedient.com)

For more about Intel Ethernet, see [www.intel.com/go/ethernet](http://www.intel.com/go/ethernet)

SOLUTION PROVIDED BY:



<sup>1</sup> Results reported by Expedient Communications. Test Configurations:

- Dell PowerEdge® R710 Server based on two Intel® Xeon® processors E5520 at 2.26 GHz, 72 GB RAM
- Dell PowerEdge R710 Server based on two Intel® Xeon® processors X5650 at 2.66 GHz, 144 GB RAM
- Dell PowerEdge® R720 Server based on two Intel® Xeon® processors E5-2680 at 2.7 GHz, 64 GB RAM

<sup>2</sup> Results reported by Expedient Communications.

<sup>3</sup> Internal Intel testing has demonstrated reductions in cabling and switch ports of up to 80 percent.

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