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Force10 Introduces Terascale™ E-Series Switch/Routers with Industry's Best Gigabit and 10 Gigabit Ethernet Density, Throughput, and Price

Force10 Networks, the pioneer in Ethernet innovation, today introduced the TeraScale E-Series family of switch/routers that delivers the industry's highest Gigabit and 10 Gigabit port densities, unprecedented price/performance and best-in-class resiliency. The Force10 TeraScale E-Series supports 672 line-rate Gigabit Ethernet or 56 line-rate 10 Gigabit Ethernet ports in a single chassis, more than twice the port density of its nearest competitor. In addition, the TeraScale E-Series can process one billion packets per second, surpassing all competitive benchmarks to rank as the world's first true Terabit switch/router.

"The Force10 TeraScale E-Series, by combining high Gigabit and 10 Gigabit densities with greater resiliency, drives down both capital and operating expenses by reducing the number of switching and routing elements required to build and run a network."

Mark Bieberich
Program Manager
The Yankee Group

"As grid computing power grows, line-rate high density switches and routers become critical to ensuring that our network is both fast and manageable," said Nathaniel Mendoza, lead network test engineer at the San Diego Supercomputer Center (SDSC), which recently deployed the Force10 TeraScale E-Series. "With higher density, we can connect more nodes with fewer switches, significantly simplifying the network by eliminating the interconnecting layer required with lower density equipment."

Continues on page 3, see Best Density, Throughput, and Price

Tolly Group Testing Validates That Force10 Terascale E-Series Sets Benchmark For Gigabit and 10 Gigabit Ethernet Density and Performance

The Force10 TeraScale E-Series switch/routers deliver the foremost Gigabit and 10 Gigabit Ethernet density, according to independent tests from The Tolly Group. During testing, the Force10 TeraScale E1200 achieved 100 percent line-rate throughput across 672 Gigabit and 56 Ten Gigabit Ethernet ports. Based on these results, The Tolly Group named the TeraScale E1200 the "First" Terabit Ethernet switch/router.

The Tolly Group tests also confirm that the Force10 TeraScale E-Series achieves 100 percent line-rate, zero-loss throughput in the following configurations:

- Across 672 Gigabit Ethernet ports at all packet sizes, equating to over 1.34 Terabits per second throughput
- Across 56 Ten Gigabit Ethernet ports at all packet sizes
- While processing 1 billion packets per second
- While handling over 1 million access control lists (ACLs)
- While forwarding IPv6 packets at Gigabit and 10 Gigabit data rates



Continues on page 4, see Tolly Validates Performance



Cornell Theory Center Harnesses Force10 E-Series and DELL PowerEdge Server Technology to Deliver High Performance and Reliability



“The system interconnect is an important piece of the high-performance computing equation.”

Dave Lifka
Chief Technical Officer,
Cornell Theory Center

Many of today’s top research institutions run their most data- and processor-intensive applications on high-performance computing clusters or Grids. With scientific breakthroughs and funding riding on the outcomes of their experiments, the researchers who depend on clusters need always-on availability, whether they’re running theorem calculations or genetic modeling.

To meet the availability needs of its researchers, the Cornell Theory Center (CTC) at Cornell University recently deployed the Force10 Networks E1200 resilient switch/router and DELL PowerEdge 3650 servers in its newest high-performance cluster. The Force10 E1200 links 320 servers in a Windows-based cluster, delivering the availability and port density that enables the CTC to develop new applications across a range of scientific fields.

Researchers Need Application Availability

The CTC is a high-performance computing and interdisciplinary research center located on the Ithaca campus of Cornell University in upstate New York. The center also has additional offices in Manhattan. Scientific and engineering projects supported by the CTC represent a variety of research disciplines including bioinformatics, behavioral and social sciences, computer science, engineering, geosciences, mathematics, physical sciences, and business.

The center currently operates a DELL PowerEdge 3650 Intel/Windows cluster complex consisting of more than 1,500 processors. These clusters allow the more than 100 researchers affiliated with the CTC to run extremely complex simulations to support their research in areas ranging from astrophysics to pollution remediation. For these scientists, high-performance computing is an indispensable tool, and a highly available switching and routing solution is essential. Computational interruptions or even momentary network failure can result in lost calculations, requiring the research segment to be run from the beginning.

Massive Scalability

For the cluster interconnect, the CTC team required line-rate, non-blocking Gigabit Ethernet on all ports, with no congestion either into or out of the cluster. With critical research depending on the cluster, the CTC turned to Force10 Networks. The center knew that Force10’s E-Series resilient switch/routers provide line-rate, non-blocking Ethernet switching and routing to some of the world’s largest high-performance computing clusters and Grid networks.

The CTC selected the Force10 E1200 switch/router based on several key factors. Massive density and scalability were at the top of the list. With up to 336 Gigabit Ethernet ports or 28 ten Gigabit Ethernet ports per chassis, the Force10 E-Series delivers the line-rate copper Gigabit Ethernet ports the CTC requires to link its 320 dual-processor cluster servers at 1.503 teraflops per second.

In addition, the ability to support the entire cluster with a single Force10 system reduces configuration and maintenance time, as well as the physical space, power and cabling requirements, resulting in cost savings and lowered total cost of ownership (TCO). The Force10 E-Series switch/routers combine full Layer 2 switching and Layer 3 routing functionality on a single platform, allowing the CTC to reduce the complexity of its network architecture and the overall number of devices in its network, thereby simplifying operations. Force10’s partnership with DELL enabled easy design and implementation of both the E-Series interconnect and DELL’s PowerEdge servers for the computing fabric.



Force10 TeraScale E-Series
E600/E1200 Modules

Continues on page 5, see Cornell High-Performance Cluster

Best Density, Throughput, and Price [Continued from p. 1]

The TeraScale E-Series significantly increases resiliency and performance by expanding upon Force10's robust switching and routing features with hardware-based port mirroring, quality of service, security and link aggregation enhancements. Additionally, the Force10 TeraScale E-Series features hardware-based IPv6 forwarding at line-rate and supports an industry-leading one million access control lists (ACLs), providing scalable protection against denial of service attacks.

"For industries with rapidly growing bandwidth needs, higher density switches provide the capacity to accommodate future network growth and long-term investment protection," said Mark Bieberich, program manager at the Yankee Group, a global leader in communications and networking research and consulting. "The Force10 TeraScale E-Series, by combining high Gigabit and 10 Gigabit densities with greater resiliency, drives down both capital and operating expenses by reducing the number of switching and routing elements required to build and run a network."

The unprecedented density and throughput of the TeraScale E-Series provides exceptional capital and operational savings. For example, to build a line-rate 270-node data with four 10 Gigabit uplinks, the Force10 solution uses one TeraScale E-Series with a list price of \$380,000. A similar competitive solution requires up to five separate switching platforms with an estimated list price of nearly \$1.5 million.

"With the introduction of the TeraScale E-Series, Force10 is once again setting the industry bar with a new generation of product that enables higher performance with lower cost of ownership," said Marc Randall, president and CEO of Force10 Networks. "The Force10 TeraScale E-Series is in a category of its own with unheard of density, security and resiliency."

The Force10 TeraScale E-Series provides the capacity to support several generations of density increases, delivering long-term investment protection.

The Force10 TeraScale E-Series delivers industry-leading density and resiliency to enterprises, service providers, government organizations, data centers research facilities and educational institutions. As 10 Gigabit Ethernet adoption grows beyond the research and laboratory environments, Force10 is continuing to expand its customer base, which includes MCI, the Department of Homeland Security, NASA, NTT-ME, Veritas DGC and the Cornell Theory Center.

Force10's TeraScale E-Series comes to market as 10 Gigabit Ethernet port prices are becoming increasingly competitive with Gigabit Ethernet, driving new deployments beyond the early adoptors. According to Dell'Oro Group, component cost reductions and increased line card densities will drive further 10 Gigabit Ethernet price reductions and widespread adoption of the technology in enterprises. The industry research firm estimates that the 10 Gigabit Ethernet market will reach \$2.4 billion by 2008. **F10**

TeraScale Module Pricing — All available now

List Price

Route processor module	\$30,000
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TeraScale E-Series E600/E1200

4-port 10 Gigabit Ethernet line card (XFP optics)	\$48,000
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48-port Gigabit Ethernet line card (SFP optics)	\$47,500
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48-port 10/100/1000Base-T line card (RJ-45 interfaces)	\$37,500
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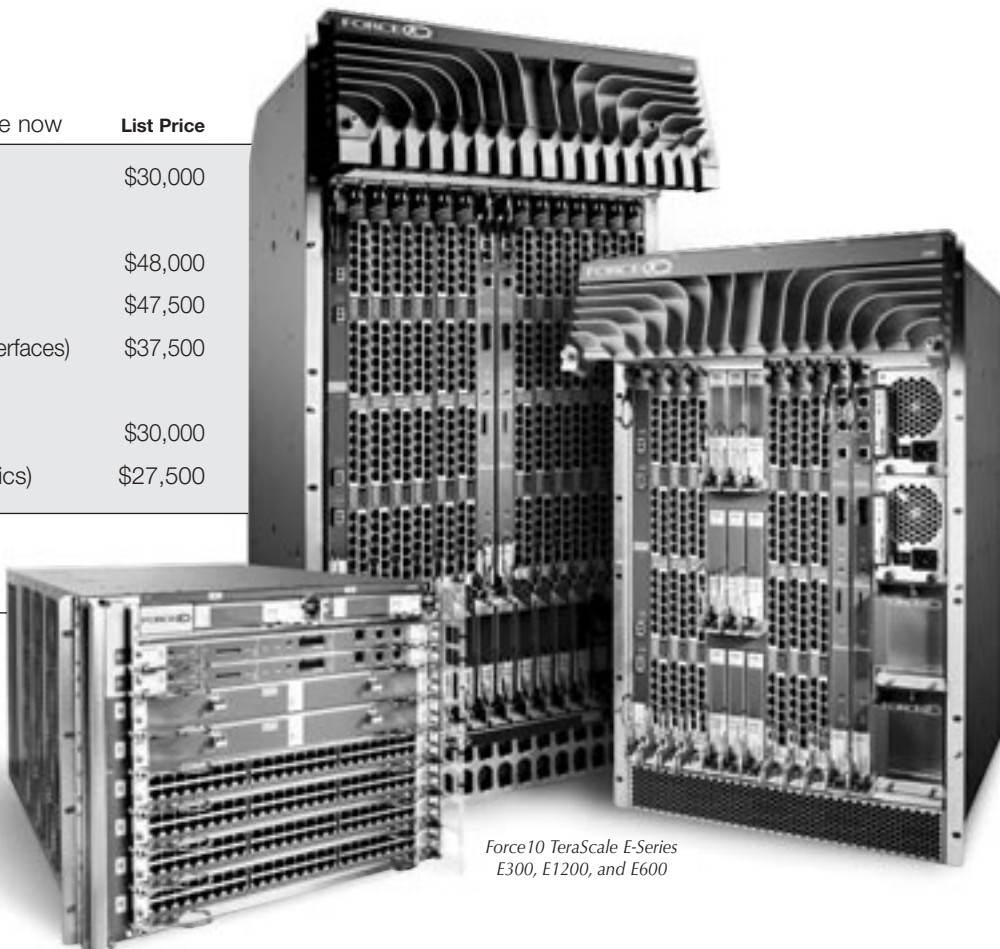
TeraScale E-Series E300

24-port Gigabit Ethernet line card (SFP optics)	\$30,000
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2-port 10-Gigabit Ethernet line card (XFP optics)	\$27,500
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"With higher density, we can connect more nodes with fewer switches, significantly simplifying the network."

Nathaniel Mendoza,
Lead Network Test Engineer
San Diego Supercomputer Center



Force10 TeraScale E-Series
E300, E1200, and E600

Building Scalable Digital Media Post Production Networks

The film, broadcast and music industries historically have been dependent upon analog media production technology. Though analog devices are still pervasive in the industry, media development schedules continue to be impacted by the inherent physical limitations such as processing time, linear editing, inability to re-purpose, and eventual media decay. The effects of these limitations add costs and time to media development and distribution.

The film, broadcast, and music industries have accepted these limitations and borne these extra costs purely out of necessity. However, over the past few years, the advent of high-performance, low-cost computers, non-proprietary software applications, and open standards has mitigated these limitations. These technologies are ushering in a new revolution in media creation that is breathing new life into existing film/audio catalogs, reducing the cost of production, shortening time to market, and providing an ever-expanding palette of special effects.

In the music industry, the revolution began with the advent of digital recording media including CDs, DVDs, and MP3. Now, over the next few years, digital technology will also revolutionize the television and motion picture industries, completing an on-going process that started with the first definition of digital TV standards in 1996 and the emergence of computer-generated special effects as an adjunct to traditional filmed cinema in the late 1980s and early 1990s and continued with the definition of digital TV standards in 1996.

The ability to capture, store, edit, search and translate digital content among various distribution formats is going to have an enormous impact on all media-related businesses and industries. In particular, the television and motion picture industries will benefit from

*Continues on back page,
see Scalable Digital Media Networks*

Tolly Group Validates Performance [Continued from p.1]

"The need for greater scalability, performance and network simplicity is driving the demand for high Gigabit and 10 Gigabit Ethernet densities, particularly as Gigabit Ethernet is beginning to replace Fast Ethernet," said Kevin Tolly, President/CEO of



The Tolly Group. "To date, the Force10 TeraScale E1200 has the highest densities and throughput we have ever tested, earning it Tolly's First & Foremost certification as the First Terabit Ethernet switch/router and for Foremost 10 Gigabit Ethernet Density."

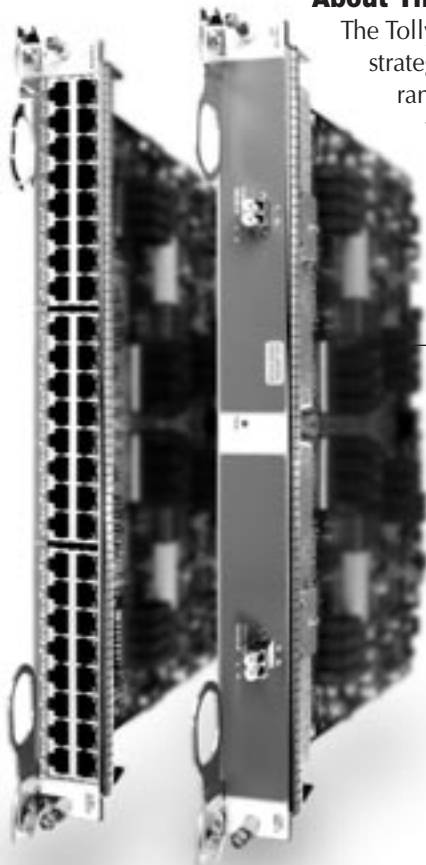
In addition to confirming the performance metrics, The Tolly Group also validated the advanced features of the Force10 TeraScale E-Series. During the tests, the Force10 TeraScale E-Series processed more than one million ACLs with no performance degradation. The Tolly Group also confirmed line-rate IPv6 forwarding at Gigabit and 10 Gigabit rates. The complete report, including testing methodology and results, is available at www.force10networks.com/products/reports.asp.

"Today's independent testing demonstrates that Force10 delivers twice the performance of any of its competitors," said Stephen Garrison, Force10 vice president, corporate marketing. "By combining the industry's highest port densities with leading resiliency and availability features, Force10 has radically reduced the cost of owning and operating Gigabit and 10 Gigabit networks."

The Force10 TeraScale E-Series combines unmatched scalability with best-in-class resiliency to provide a new level of network and application predictability. Leveraging three distinct processing units for switching, routing and management functionality, the Force10 E-Series delivers reliable line-rate Gigabit and 10 Gigabit throughput across all ports regardless of traffic conditions.

About The Tolly Group

The Tolly Group, an independent testing and strategic consulting organization, offers a full range of services designed to furnish both the vendor and end-user communities with authoritative and unbiased information. The Tolly Group is recognized worldwide for its expertise in assessing leading-edge technologies. F10



"To date, the Force10 TeraScale E1200 has the highest densities and throughput we have ever tested, earning it Tolly's First & Foremost certification as the First Terabit Ethernet switch/router and for Foremost 10 Gigabit Ethernet Density."

Kevin Tolly
President and CEO
The Tolly Group

Force10 TeraScale E-Series E300 Modules



Marc Randall
President and CEO

The "More" Syndrome Brings New Challenges to Networks

More applications. More users. More point-to-point connections. More point-to-many connections. More nodes. The latest networking trends, whether in the enterprise or the data center, all call for more connections with more bandwidth. Now, to satisfy the demand for more, the industry is setting new density and resiliency standards.

But how can density best address the "more" syndrome of a growing network? And how can resiliency make density even more efficient? Those were the challenges we set for ourselves as we designed Force10's TeraScale E-Series.

TERASCALE

TeraScale technology comes in at the system level — greater resiliency translates into built-in redundancy, separation of data and control planes and zero packet loss hitless failover.

First, density. Increased density at the system-level is the natural evolution of an industry guided by an 18-month cycle of data rate increases. With greater density, network operators can deploy fewer elements that handle more traffic, allowing enterprises to expand capacity without the expense of purchasing additional systems. Higher density also introduces long-term investment protection into the network by providing a scalable capacity ramp.

But, with great density, comes great responsibility. As more traffic passes through fewer elements, a failure in any one element can be catastrophic to the network, and, in turn, to the business. For businesses that rely on their networks, downtime can result in millions of dollars in lost revenue.

This is where the resiliency of the TeraScale E-Series comes in. Always important, resiliency now takes center stage as fewer elements assume greater roles in the network. At the system level, greater resiliency translates into built-in redundancy, separation of data and control planes and zero packet loss hitless failover. With these features, the benefits of increased density are not lost in network downtime or spiraling management costs.

During a time when the call to action for the network is "more," it's welcome news that, with greater density and resiliency, the answer can be, "less is more." F10

Cornell High-Performance Cluster *[Continued from page 2]*

Reliable, Line-rate Performance

Force10's innovative E-Series architecture delivers line-rate, non-blocking forwarding across all line cards. Throughput and line-rate performance are guaranteed, even with features like Access Control Lists (ACLs) and Quality of Service (QoS) enabled. In addition, the E-Series switch fabric provides advanced queuing, multicast and jumbo frame support.

Multicast support on the Force10 E1200 was especially important to the center, since some of the CTC's bioinformatics applications require full-motion video capabilities. To ensure predictable performance even under tremendous traffic loads or intensive processing tasks, the unique E-Series architecture features separate control and data planes, distributing routing, switching and system management between three CPUs.

Predictable Cluster Performance

Force10 worked closely with the CTC to configure the physical and logical links between the DELL PowerEdge server cluster and the Force10 E1200 to ensure that everything worked together. Leveraging the advanced hardware and software reliability of the Force10 E-Series, the CTC can run the advanced computing and processing applications that enable it to develop advanced treatments for diseases such as Alzheimer's and Cystic Fibrosis, investigate new optimization algorithms for large-scale portfolio analysis and predict the structural integrity of a wide range of engineered and natural structures.

The Force10 E-Series, as the foundation of the CTC's high-performance cluster, delivers guaranteed predictability and availability to advance scientific research and position the CTC as a world-class research organization. F10

See www.force10networks.com/ctc for the complete story.

"Gigabit Ethernet switching and routing from Force10 enables CTC to meet our users' needs who expect reliable availability and stellar performance."

Dave Lifka
Chief Technical Officer,
Cornell Theory Center

UPCOMING EVENTS

SEPTEMBER

GGF12 – The Twelfth Global Grid Forum
September 20–23, 2004
Brussels, Belgium

OCTOBER

SEG 2004
October 10–15, 2004
Denver, CO, USA

NANOG 32
October 17–19, 2004
Reston, VA, USA

NOVEMBER

SC2004
November 6–12, 2004
Booth 1335
Pittsburgh, PA, USA

For a complete list of events, see:
force10networks.com/news/events.asp

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Scalable Digital Media Networks [Continued from page 4]

changes in the way content is created.

This revolution leverages the flexibility and power of information technology as the dominant aspect of the media production workflow. The technology has the potential to dramatically reduce the cost of media production, as well as expand the types of content that can be created and re-purposed for disparate distribution techniques.

While semiconductor, computer processing, digital storage, and networking technologies have been enjoying geometric rates of improvement in performance and capacity, they have only recently arrived at the threshold where they can meet the highest demands of digital image-related media. If the current rate of technological progress continues, computer technologies will soon be capable of exceeding all the requirements of media production and distribution as it is presently envisioned.

As the digital media revolution unfolds, production of content will be increasing based on five key information technologies:

- Storage of digital content on multi-terabyte, high reliability disk storage subsystems accessible via high performance SANs
- High performance, high reliability Ethernet networking (at GbE, 10 GbE, and eventually 100 GbE) to provide high speed access to the content
- Distributed computing software to facilitate collaboration, parallel access, and parallel computing for rapidly and efficiently processing content
- 64 bit computing to support higher computational performance and extremely large address spaces for highly complex data structures
- Zero-loss compression techniques for higher resolution universal masters to be employed **F10** See www.force10networks.com/digitalmedia for the complete story.