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Force10 Networks Introduces the E300 10 Gigabit Ethernet Switch/Router

Force10 Networks redefined Gigabit and 10 Gigabit Ethernet networking with the introduction of the E300. As the industry's smallest and most cost-effective platform, the E300 reduces the entry cost of 10 Gigabit Ethernet technology, bringing line-rate performance and unmatched resiliency to small and mid-size data centers and server farms. With the addition of the E300, Force10 is the first to offer a family of line-rate 10 Gigabit Ethernet solutions designed to deliver superior price performance for a range of advanced networking environments.



The New E-Series E300

"The E300 changes the landscape in high performance networking," said Mark Bieberich, senior analyst for the Yankee Group. "By driving down the entry cost of 10 Gigabit Ethernet with a small form factor solution, the Force10 E300 provides smaller server farms and data centers with

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IBM and Force10 Networks Sign Worldwide Partnership Agreement

IBM and Force10 Networks have signed a worldwide partnership agreement whereby IBM will resell the E-Series E1200/600 high density Gigabit and 10 Gigabit Ethernet product family. In addition, IBM Global Services will provide end-to-end support for the E-Series switch/routers – including consulting, implementation, and technical assistance center (TAC) support – for enterprise customers worldwide.

"IBM is driving the benefits of grid computing beyond its academic and research roots and into business enterprises in key industries such as financial markets, life sciences, aerospace, automotive, and governments, to name a few," said Thomas A. Knapp,

Linux practice principal at IBM. "We have the knowledge and experience to build Linux clusters with large numbers of nodes using IBM technology and are always evaluating innovative Ethernet products. We deployed Force10's E-Series in several grid computing projects. We are pleased with the performance, scalability, reliability and software stability offered by the E-Series platform and will resell them in density and performance-sensitive applications."

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Thomas A. Knapp, IBM Linux practice principal

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“In our heterogeneous campus network, Force10's E-Series has proven to be the most stable and scalable platform in the network, even sustaining line-rate performance during periodic traffic spikes caused by network virus attacks.”

XueNong Li
 Director of the Tsinghua University
 Network Research Center

China's Leading Universities Deploy Force10 Networks

Force10 Networks announced that two of China's leading universities have deployed the E-Series to build highly resilient and predictable 10 Gigabit Ethernet campus networks. Leveraging the resiliency and scalability of the Force10 E-Series, Tsinghua and Shenzhen universities are building advanced networking environments that can deliver new services and applications to students and researchers.

"As one of the top engineering schools in the world, building a robust and scalable campus network with a new generation of technology is a strategic decision that will enable us to offer new services, such as remote multimedia education and grid computing to our students," said professor XueNong Li, director of the Tsinghua University Network Research Center.

Beijing-based Tsinghua University, China's leading engineering university, is building a new 10 Gigabit Ethernet campus network to provide more than 60,000 students and researchers with high-speed Internet and intranet access, the bandwidth to collaborate on data-intensive computing projects and a variety of other advanced networking services. Tsinghua's new 10 Gigabit Ethernet network will connect with the university's existing campus network and to CERNET, the Chinese Education and Research Network.

Shenzhen University City, an educational complex that includes subsidiary campuses for Tsinghua University, Beijing University and the Harbin Institute of Technology, has also deployed the Force10 E-Series as the foundation of its next-generation network. The Force10 E-Series creates an advanced networking infrastructure across the three campuses and provides connectivity and shared resource applications to students, researchers and faculty throughout Shenzhen University City.

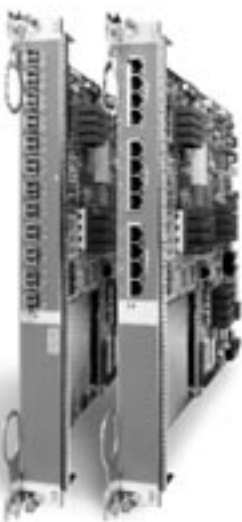
Tsinghua and Shenzhen universities are both located in China's Guangdong province. Shenzhen city, China's first special economic zone, and one of its most economically advanced cities, is separated from Hong Kong by a river in the south. Over the last few years, Shenzhen has become China's major export production base. F10

Hanaro Telecom Deploys Force10 Networks for Major Network

South Korea-based Hanaro Telecom selected CommVerge Solutions to deploy Force10's E-Series switch/routers for 10 Gigabit Ethernet routing and Gigabit Ethernet aggregation services. Hanaro Telecom's network expansion, including increasing high-capacity connectivity for a wide range of broadband services, required the resiliency, fault-tolerance and robust 10 Gigabit routing that Force10's E-Series is uniquely designed to provide.

"Force10's E-Series enhances our core routing infrastructure, enabling us to extend our IP service offerings to include native Gig and 10 Gig connectivity," said Mr. Park, Chan-Woong, team manager of the Network Planning Team for Hanaro Telecom. "We selected Force10's E-Series because it clearly demonstrated the capacity to meet our customers' current demands and allows us to address the future capacity needs of our customers."

Nearly 30 percent of South Korea's 10 million broadband subscribers are Hanaro customers and the company is expanding its network in order to increase its market share. Force10's switch/routers provide the added capacity that will enable Hanaro to expand its customer base throughout South Korea while the resilient architecture that characterizes the E-Series ensures line-rate performance. With Force10's E-Series, Hanaro can reliably deliver multi-megabit connectivity to its current and future subscribers.



**E-Series High-density
 Line-Rate Modules**

Sixty-five percent of South Korea's 16 million households have broadband connections – the world's highest broadband penetration. According to the International Telecommunications Union, 94 percent of all Internet subscribers in South Korea subscribe to broadband, a rate that is approximately three years ahead of the global average. F10

Enterprise Consolidation and Remote Disaster Recovery: The Path to Lower TCO and Higher Reliability

In order to minimize total cost of ownership (TCO) for server/data center consolidation and optimize disaster recovery and backup operations, enterprises must carefully consider the real costs of using older generations of switches compared to the economies and new functionalities enabled by next-generation switch/routers designed for high-performance Ethernet applications:

- Next-generation switch/routers with high-capacity Ethernet services will substantially reduce network complexity and cost
- Feature-rich, line-rate performance simplifies network design, security, and control, eliminating the need for complex traffic engineering analysis and management
- Next-generation equipment incorporating multiple levels of high-availability drastically reduces the likelihood of "single-component" catastrophic failures, providing better protection than previously afforded by existing equipment
- 10 Gigabit Ethernet for data center/disaster recovery/backup interconnect using Dark Fiber or individual wavelengths (lambdas) enables high-speed transport services at significant cost savings to the enterprise today

Enterprise Consolidation

Today, several enterprises plan to consolidate the number of data centers, resulting in significant reductions in TCO. Replacing multiple outdated servers with fewer high-performance servers saves on space and power as well as on operations and maintenance.

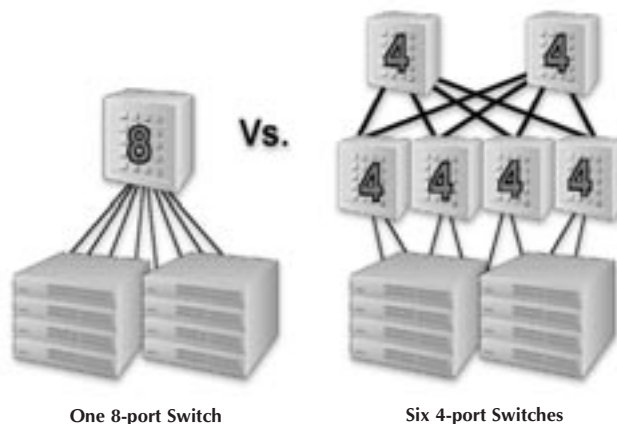
Too often enterprise consolidation planning examines the effects of server consolidation looking only at the price-

per-port of a network interface while overlooking the hidden costs of interconnecting and managing these solutions. Without a holistic approach, including the networking infrastructure, TCO gains made by consolidating servers alone can be negated by other factors including:

- Network equipment failure
- Human error
- Rogue user activities
- Natural and unnatural disasters

Continues on next page

8 Server Nodes



Twice the capacity at 1/6 the complexity

Consider a switch with eight GE ports. For an eight-node server cluster, all eight of these ports are available to connect to the servers. If switches with four ports were used instead, only half of the ports on each switch would now be needed for server connections. This is because half of the ports on each switch would now be needed for switch connections. Thus, in this example of non-blocking interconnection, six times as many 4-port switches and three times as many ports are needed to connect the same eight servers.

Customer Challenges and Force10 Solutions

Challenge: When the size of a server cluster grows beyond the capacity of a single switch/router, retaining non-blocking connectivity between servers becomes a very large problem – the size of the aggregation network increases non-linearly and its cost rises dramatically.

Solution: Replacing older servers and their 10/100 Ethernet connections with a smaller number of new, higher-performance servers with Gigabit Ethernet (GbE) connectivity is the clear choice. Force10 Networks E-Series is a capable choice for building scalable, cost-effective clusters. Unlike past generations of Ethernet switches, the E-Series enables GbE-attached clusters of up to 312 nodes (including uplink connections). As the cluster grows, the E-Series, with its capacity of 80 Gbps per slot, has enough headroom to double its port density without requiring a forklift upgrade.

Challenge: Vendors of previous generation switches address their lack of capacity by increasing port densities without providing proportional increases in total system bandwidth or performance.

Solution: Force10 Networks' EtherScale architecture. EtherScale ASICs have line-rate support for filtering, statistics collection, QoS, rate policing, and limiting. EtherScale ASICs also deliver protocol-specific hardware support at line-rate for L2 switching, L3 routing, and MPLS.

Challenge: A direct result of server consolidation is fewer server clusters running more applications and serving more users. Here, the impact of any downtime, scheduled or not, is magnified. This multiplies the importance of network availability for server access.

Solution: The E-Series maximizes network uptime by supporting extensive redundancy, availability, and serviceability features. To quickly restore forwarding stability in the event of a failure, the network must allow fast convergence. For this reason, the E-Series RPM provides innovative methods of filtering and rate limiting control-traffic as well as dedicated 100 Mbps switched control links to every line card.

Challenge: High-speed interconnect for disaster recovery and data backup operations used to be the exclusive realm of Gigabit Ethernet (individually or grouped together using link aggregation) or by implementing some form of SONET-based service. Today, 10 Gigabit Ethernet allows IT managers to back up and mirror data faster while placing mirrored sites farther apart.

Solution: Force10 10 GbE WAN PHY (physical layer) ports connect directly to existing SONET Add/Drop Multiplexers (ADMs) and Dense Wavelength Divisional Multiplexers (DWDM) devices at 1/10 the cost of traditional (and bandwidth equivalent) OC-192 Packet over SONET (POS) interfaces.

Remote Disaster Recovery

To ensure the near 100% uptime required by enterprises, the overall consolidation design must incorporate additional high availability, disaster recovery, and data backup considerations at every level, starting with the networking infrastructure and extending through the data transport system. Enterprises must carefully consider the real costs of using older generations of switches compared to the economies and new functionalities enabled by next-generation switch/routers designed for high-performance Ethernet applications.

Critical Switch/Router Consolidation Considerations

1. What is the ultimate capacity of the switch/router? Is there enough internal capacity in the chassis and chassis slots today or will I be forced into upgrading or replacing my existing products to accommodate my future changing requirements?
2. Does the system offer line-rate performance when implementing all the QoS, control, and security features, or must I implement "vendor specific" wiring configurations to overcome line card limitations? In other words, can the line cards actually support all the bandwidth introduced by the ports or am I limited to "local switching" capacities only?
3. What happens if a critical system element fails? Can it be hot swapped? Does the chassis reboot? How long does it take the system to restore to full 100% operation? Does the vendor support both the LAN and WAN ports for 10 Gigabit Ethernet purchased today? Will they operate at full line rate?

Summary

Today, Force10 Networks' E-Series provides the needed capacity, functionality, and reliability for the largest and most advanced networking implementations.

The Force10 E-Series provides massive capacity, line-rate support, and "built from the ground up" high availability. The E-Series is high-performance Ethernet for consolidation. F10

See www.force10networks.com/applications/server.asp for complete text.

National Center for Supercomputing Applications Chooses Force10 for TeraGrid Deployment

The National Center for Supercomputing Applications (NCSA) at the University of Illinois has selected Force10 Networks E-Series E1200 high density Gigabit and 10 Gigabit Ethernet (GbE) switch/routers for Phase II of NCSA's portion of the TeraGrid project.



Sponsored by the National Science Foundation (NSF), TeraGrid is a multi-institutional effort to build and deploy the world's most comprehensive computing infrastructure for open scientific research. IBM provided integration services for the Phase II deployment.

Force10's E-Series switch/routers have already been deployed in Phase I of the project at NCSA as well as at the three other original TeraGrid sites: Argonne National Laboratory (ANL), the Center for Advanced Computing Research (CACR) at the California Institute of Technology, and the San Diego Supercomputer Center (SDSC).

"NCSA selected Force10 Networks' E1200 platform for our TeraGrid cluster aggregation solution for two key reasons. First, the E1200 was, and continues to be, the highest density Gigabit Ethernet switch available in the marketplace. Second, the E1200 delivers upon its promise of line-rate performance across all ports," said Patrick Dorn, NCSA Technical Program Manager. "Since the time of NCSA's initial selection of the E1200, Force10 Networks has continued to impress me with their commitment. Their level of support has been very good throughout the deployment process. Additionally, Force10 has met their proposed timelines for all key hardware and software enhancements."

"The National Center for Supercomputing Applications is one of a small group of institutions that will define the future of high performance computing," said Stephen Garrison, vice president, corporatemarketing at Force10 Networks. "The TeraGrid project is one of the largest and most demanding network environ-

ments in the world, and this deployment is testament to the massive scalability and reliability of the E-Series."

Research centers such as NCSA are driving the expansion of cluster grid computing, the next IT revolution. Ultimately, computational grids will allow users to access enormous 'virtual supercomputers' – computers at different locations linked together to work as one – that will provide CPU cycles on demand. The NSF TeraGrid project uses a dedicated 40 Gbps wide area backplane to connect computers, storage facilities, visualization systems and applications at NCSA and other TeraGrid sites to create the most comprehensive grid computing environment for open scientific research in the United States. Clusters connected over this grid are using 10 GbE interconnections between Gigabit Ethernet-attached Linux server clusters. F10

E300 *[Continued from page 1]*

cost-effective access to next generation solutions."

As the newest addition to the E-Series, the E300 delivers the same performance and reliability as the E600 and E1200. The built-in redundancy that characterizes the Force10 E-Series simplifies network topology, management and troubleshooting while line-rate Gigabit and 10 Gigabit throughput, regardless of traffic conditions, enables predictable and resilient application performance.

Joining the E1200 and E600, the E300 extends scalable and cost-effective 10 Gigabit Ethernet technology to mid-size data centers, clusters and Fortune 1000 campus networks. The E300 is a six slot chassis measuring 14 inches tall and can be deployed with as many as 72 Gigabit Ethernet ports or six 10 Gigabit Ethernet ports per chassis, providing the scalability that allows network operators to expand their networks according to performance needs. F10



Marc Randall
President and CEO

Clusters Transforming the Enterprise

As my children often remind me, sometimes the best solutions to complicated problems begin with simple ideas.

Researchers at the National Center for Supercomputing Applications (NCSA), theorizing that the Sony Playstation 2 (PS2) could be used for scientific computation, recently assembled a supercomputer using 70 PS2 game consoles running as a cluster over a standard Ethernet network. Requiring no hardware engineering other than connecting the Playstations with a high speed network switch, the cluster was built for about \$50,000.

While high performance computing has traditionally relied on expensive supercomputers that have remained the domain of research institutions, the NCSA has illustrated how enterprises can now cost effectively cluster servers to harness their processing power, producing dramatic cost savings and improved network performance. By interconnecting commodity computers, servers or even PS2 game consoles through a scalable, high performance Ethernet network, enterprises can build a supercomputer for a fraction of the cost of standard supercomputing infrastructures.

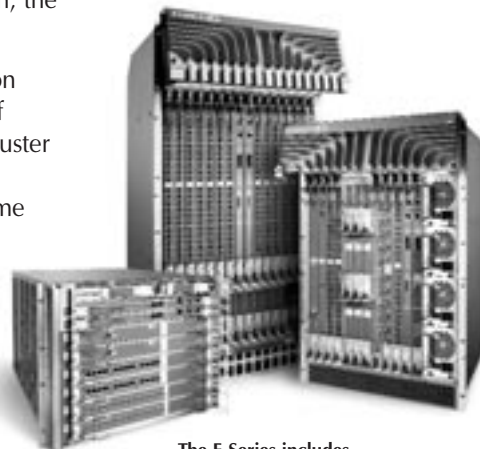
The Advantages of Clusters

For corporations with increasing computing needs, a cluster network based on commodity computers or servers is the answer. As long as the interconnecting Ethernet network can keep pace with the processing power of the servers, clusters have the advantage of being able to scale according to demand with the simple addition of more servers.

For example, imagine a printing company with production facilities in Asia, North America and Europe – each with its own server farm – that is seeking innovative ways to lower operating costs. Using a cluster configuration, the company can now consolidate the servers into one location, and shift processing power between the three production facilities according to the peak demand periods of each region.

We've built the Force10 E-Series switch/routers to optimize cluster performance. The E-Series utilizes high density, non-blocking Gigabit and 10 Gigabit Ethernet ports while modular software and unique security features combine to ensure that enterprises can effectively harness the processing power of their entire network.

As institutions like the NCSA and others pave the way for cluster computing in the enterprise, Force10 Networks will be there to deliver the technology to implement this new vision. F10



The E-Series includes
the E300, E1200 and E600
Switch/Routers

Force10 Networks Welcomes Bahman Sohrabi

Bahman Sohrabi has been named Force10's vice president of global services. Sohrabi, an industry veteran with more than 17 years of experience in customer support and service, will be responsible for all aspects of Force10's global services organization.

"Bahman brings a wealth of experience in developing and implementing customer support, service and advocacy programs," said Marc Randall, president and CEO of Force10 Networks. "As Force10 rapidly expands its customer base, Bahman will be responsible for maintaining what all of our customers have come to expect: best-in-class service and support."

Bahman also brings over 17 years of Internetworking and data communications experience to Force10 Networks' Global Services organization. Prior to joining Force10, Bahman spent 2 years at Procket Networks, where he led the worldwide technical support organization and implemented Procket's Service Intelligence strategy. Prior to Procket Networks, Bahman spent 10 years at Cisco Systems in the Customer Advocacy organization in various technical and leadership roles. He led the development teams focused on service and support automation with emphasis on creating highly valued services through Cisco's eSupport and NSA programs. Bahman is a graduate of Rutgers University with a Bachelor of Science degree in Electrical Engineering. F10



UPCOMING EVENTS

FEBRUARY

InfoTechPharma 2004
February 3-4, London, UK

NANOG 30
February 8-10, Miami, FL, USA

PFLDnet 2004
February 16-17, Argonne, IL, USA

MARCH

Data Center Futures Europe
March 8-9, London, UK

Network Outlook Conference
March 9-10, Redwood City, CA, USA

Global Grid Forum 10
March 9-12, Berlin, Germany

APRIL

ClusterWorld Expo
April 6-8, San Jose, CA, USA

Grid World 2004
April 27-28, Tokyo, Japan

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

CONTACT INFO

FORCE10 NETWORKS

1440 McCarthy Blvd., Milpitas, CA 95035-7438
www.force10networks.com

408-571-3500 PHONE
866-600-5100 PHONE (U.S. ONLY)
408-571-3550 FACSIMILE

Sales:

sales.americas@force10networks.com AMERICAS
sales.europe@force10networks.com EUROPE
sales.china@force10networks.com CHINA
sales.japan@force10networks.com JAPAN
sales.korea@force10networks.com KOREA

Customer Support: support@force10networks.com

Employment: jobs@force10networks.com

General Information: info@force10networks.com

Press Inquiries: pruzicka@force10networks.com



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IBM and Force10 Partnership [Continued from page 1]

"The E-Series have connected hundreds of nodes containing IBM servers and storage systems in numerous grids over the past year," said Marc Randall, president and CEO, Force10 Networks. "We have been able to demonstrate high-availability performance and the ability to scale network capacity to meet the high standards set by IBM and its customers. We believe that Force10 is well-positioned to serve the grid/clustering needs of Fortune 500 companies by combining best in class technology with the proven customer support delivered by IBM – the world's largest information technology services provider."



Force10 Networks E-Series are purpose-built for high-performance grid, clustering, and utility computing applications. Grids allow geographically distributed organizations to share applications, data and high-capacity computing resources. The network fabric that connects the vast number of computing and storage resources plays a critical role in successful operation of the grid. The E-Series addresses these requirements by offering ultra-high density, line-rate Gigabit and 10 Gigabit Ethernet switching and routing ports, along with a platform that delivers high-availability as well as modular software stability.

Force10 Networks and IBM also entered a manufacturing partnership whereby IBM builds the EtherScale™ ASICs used within the E-Series platform. In addition, Force10 augments the E-Series system with IBM's PowerPC processors. Together, IBM and Force10 deliver high density, high performance solutions, from networking infrastructure through deployment and on to frontline support. **F10**

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SAN FRANCISCO, CA
PERMIT NO. 11882

FORCE10 NETWORKS
1440 McCarthy Boulevard
Milpitas, CA 95035-7438