



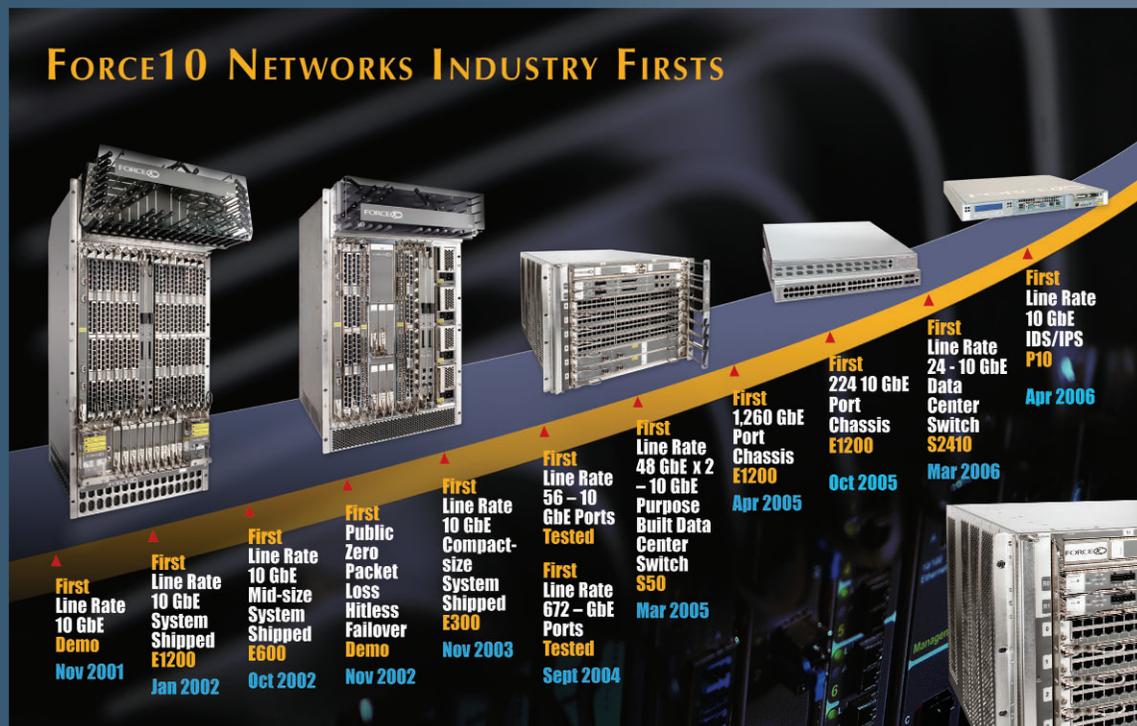
## THE FORCE10 NETWORKS TERA SCALE™ E-SERIES

Setting a New Standard for  
Gigabit and 10 Gigabit Ethernet  
Density, Resiliency and Performance



# THE NEW GENERATION OF 10 GIGABIT ETHERNET TECHNOLOGY

Over the last decade, the rise of bandwidth-intensive applications has created a recurring cycle of multi-billion dollar markets — first Ethernet, then Fast Ethernet, followed by Gigabit Ethernet and now 10 Gigabit Ethernet.



## Ethernet's Humble Beginnings and Rapid Advancements

Developed in the early 1970s, Ethernet was first standardized in 1983. It remained basically unchanged until the early 1990s when the demand for advanced applications began to outpace Ethernet capacity. The rise of high-speed communications ignited efforts in the standards bodies to develop an Ethernet technology with greater capacity. In 1995, Fast Ethernet, with 10 times the capacity of Ethernet, was standardized. Three years later the market for Fast Ethernet exceeded \$1 billion.



The growing use of Fast Ethernet in the local area network created the need for an even more powerful technology at aggregation points in networks. This drove the standardization of Gigabit Ethernet — 10 times faster than Fast Ethernet — in 1998, and the rise of another multi-billion dollar market. In fact, the Dell'Oro Group estimates that the Gigabit Ethernet market will reach \$5 billion in 2004, and projects that it will grow to \$9 billion by 2008. Just as the prevalence of Fast Ethernet created the need for Gigabit Ethernet, Gigabit Ethernet is giving rise to a new and yet again 10 times faster technology — 10 Gigabit Ethernet. In 2004, the Dell'Oro Group estimates the 10 Gigabit Ethernet market will reach \$358 million, growing to \$2 billion by 2008.

Standardized in 2002, 10 Gigabit Ethernet, like many new networking technologies, found initial traction in research and laboratory environments but has quickly spread to large corporations, service providers and Internet exchange carriers. In these high performance environments, architectural changes, such as server consolidation, Grid/cluster computing, as well as bandwidth-intensive applications, such as voice and video are driving demand for 10 Gigabit Ethernet.

With 10 Gigabit Ethernet providing the bandwidth, advances in ASIC technology are enabling new density and resiliency standards. Increased system-level density allows network operators to run more links through a single switch or router, reducing the number of systems in the network. In turn, fewer systems reduce capital and operational costs while simplifying management. But as system density increases, so too does the cost of catastrophic failure. As fewer elements assume more responsibility in the network, resiliency becomes crucial. It is the combination of higher density and resiliency that ensures the benefits of reduced capital and operating expenditures are not lost to network downtime.

### **Force10 Networks is a Pioneer in Ethernet Technology.**

Over the last several years, every major innovation in Ethernet has come from Force10 Networks. Force10 was first to demonstrate line-rate 10 Gigabit Ethernet (by nearly two years), the first to ship 336 ports of line-rate Gigabit Ethernet (still unmatched in the industry), as well as first to support key resiliency features, such as zero packet loss hitless failover and 10 Gigabit Ethernet link aggregation.

Force10 has once again set the bar with its flagship product line, the TeraScale E-Series, which delivers an unprecedented 1,260 Gigabit or 224 10 Gigabit Ethernet ports while extending security and resiliency to previously unreachable heights.

# Industry Firsts

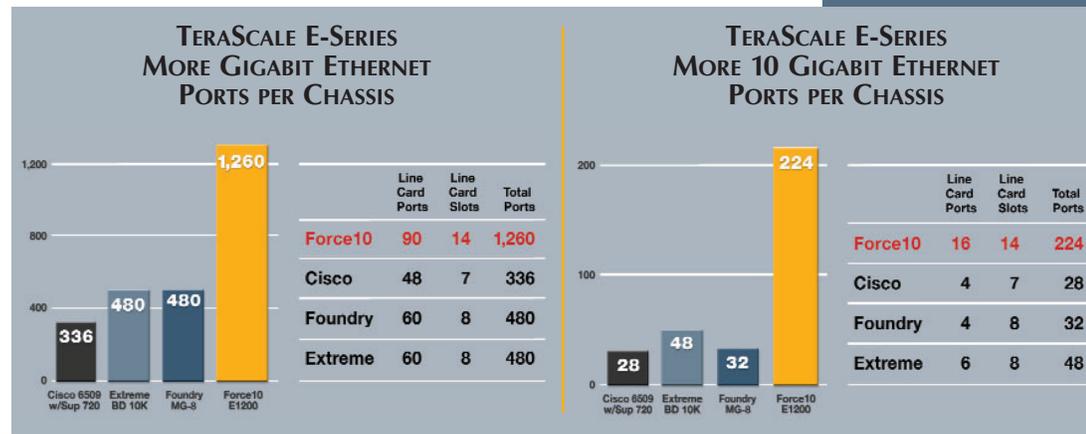
## What is TeraScale?

The Force10 TeraScale E-Series is the world's first true Terabit switch/router.

The TeraScale E-Series family delivers the industry's highest density, unprecedented price/performance and best-in-class resiliency. Scaling to 1,260 Gigabit or 224 10 Gigabit Ethernet ports and processing more than 1 billion packets per second, the TeraScale E-Series surpasses all competitive benchmarks.

## What New Industry Benchmarks Does the Force10 TeraScale E-Series Set?

- First to deliver 1,260 Gigabit Ethernet ports
- First to deliver 224 10 Gigabit Ethernet ports
- First 90 port Gigabit Ethernet card
- First 16 port 10 Gigabit Ethernet card
- Industry's highest throughput, processing 1 billion packets per second at line rate
- Industry's most scalable security, supporting 1 million Access Control Lists at line rate



## These are Big Numbers. Have They been Independently Verified?

Yes. According to Tolly Group tests, the Force10 TeraScale E-Series delivers line-rate throughput across 672 Gigabit (48 port card, 14 I/O slots) or 56 Ten Gigabit Ethernet ports at all packet sizes. The Tolly Group also verified that Force10 leads the industry in scalable security, supporting more than 1 million Access Control Lists (ACLs) while processing 1 billion packets per second at line rate. Additionally, The Tolly Group confirmed Force10's hardware-based IPv6 forwarding, and hitless failover features perform at line rate while processing millions of flows.

For the complete Tolly Group report, please visit [www.force10networks.com](http://www.force10networks.com).

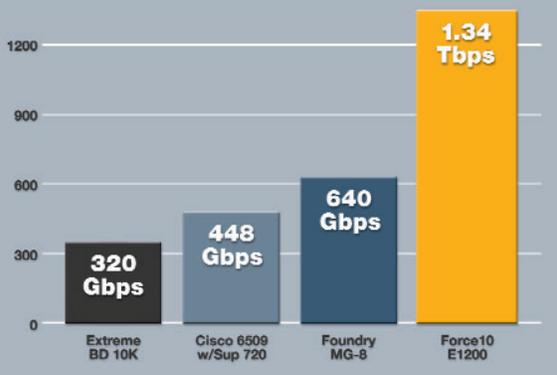


## Are Density and Throughput the Only Dimension that Sets the Force10 TeraScale E-Series Apart from the Competition?

Beyond doubling the nearest competitor's Gigabit and 10 Gigabit Ethernet densities, the Force10 TeraScale E-Series stands apart on three simple dimensions — scalable performance, resiliency and security.

- **Scalable performance:** The Force10 TeraScale E-Series processes more than 1 billion packets per second at line rate – the highest in the industry. Additionally, with a switching capacity of 1.34 Terabits per second, the TeraScale E-Series is the industry's first true Terabit switch/router.
- **Resilient architecture:** The Force10 TeraScale E-Series is fully redundant with no single point of failure. The unique architecture of the TeraScale E-Series separates the forwarding path and the control plane for maximum efficiency. And within the control plane, switching, routing and management functionality is distributed between three separate CPUs to ensure maximum uptime and best-in-class resiliency.
- **Embedded security:** The Force10 TeraScale E-Series supports one million access control lists (ACLs) at line rate, providing protection against distributed denial of service attacks and an unprecedented level of security scalability. Additionally, the Force10 operating system (FTOS) is fully modular to isolate and contain rogue traffic.

COMPETITIVE SWITCHING  
CAPACITY COMPARISONS



# Greatest Resiliency

# Why TeraScale

## Why is the TeraScale E-Series Combination of Density, Resiliency and Security Important?

As switch/router density increases, so too does the amount of traffic flowing through each individual switch/router. Whereas in the past tens or at most hundreds of users would be affected by an outage, with Gigabit and 10 Gigabit Ethernet technology, thousands of users are affected when a single switch/router goes down, increasing the penalty for downtime.

Historically, network architects were unable to depend on their switch/routers. To achieve the necessary density and uptime, redundant network layers were added. This was an extremely expensive alternative, but there was little choice.

The Force10 TeraScale E-Series changes this by combining massive density with previously unattained levels of resiliency.

The TeraScale E-Series enables network architects to simplify network designs, driving down capital and operational costs. Put simply, fewer systems are cheaper to buy and cheaper to manage than multiple systems.

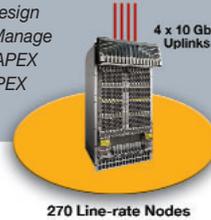
The Force10 TeraScale E-Series family of switch/routers provides high performance Gigabit and 10 Gigabit Ethernet solutions for networks large and small. As a family of three chassis, the TeraScale E-Series matches bandwidth needs with customer budgets to provide the most cost-effective solution.

## THE BENEFIT OF HIGH LINE-RATE DENSITY: A 270 NODE DATA CENTER

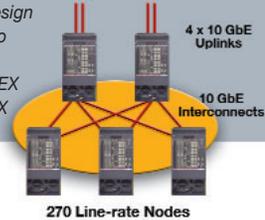
Force10 Networks Solution			
	Quantity	Unit List Price	Item Subtotal
Chassis	1	\$90,000	\$90,000
10 GbE Cards	1	\$48,000	\$48,000
GbE Cards	6	\$37,500	\$225,000
10 GbE Optics	4	\$4,000	\$16,000
<b>Total List Price</b>			<b>\$379,000</b>

Cisco Systems Solution			
	Quantity	Unit List Price	Item Subtotal
Chassis	5	\$75,995	\$379,975
10 GbE Cards	26	\$27,500	\$715,000
GbE Cards	9	\$22,500	\$202,500
10 GbE Optics	52	\$4,000	\$208,000
<b>Total List Price</b>			<b>\$1,505,475</b>

- Simple Design
- Easy to Manage
- Lower CAPEX
- Lower OPEX



- Complex Design
- Nightmare to Manage
- Higher CAPEX
- Higher OPEX

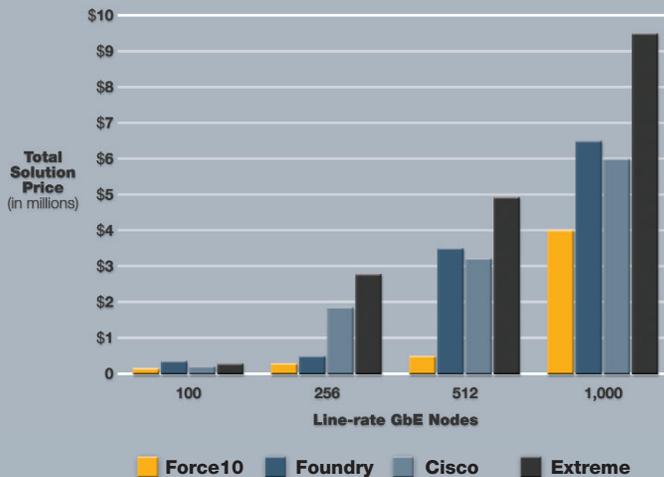


## PLANNING FOR 100 GIGABIT ETHERNET AND BEYOND

History teaches that the very success of each Ethernet technology plants the seeds for the new, faster generation — higher speed Ethernet begets higher speed Ethernet. With Gigabit Ethernet established as a multi-billion dollar market and 10 Gigabit Ethernet steadily growing, what will be next?

While 40 Gigabit Ethernet, which can be directly mapped into a SONET/SDH OC-768 trunk, is sometimes proposed as the Ethernet heir, it is far more likely that 100 Gigabit Ethernet will emerge as the next Ethernet technology. Ethernet performance has always increased an order of magnitude. Never when the IEEE was developing a 10 Gigabit Ethernet standard did it consider a 4 or 8 Gigabit Ethernet standard. Likewise, moving to 40 Gigabit Ethernet would not be logical. It is only with an order of magnitude increase in performance that the effort and cost behind the move is justified.

**COMPETITIVE PRICE COMPARISONS:  
THE BENEFIT OF HIGH DENSITY**



While still several years away from customer deployments, forward looking companies must ensure that today's equipment is prepared for tomorrow's requirements, which means support for 100 Gigabit Ethernet. The Force10 TeraScale E-Series, with a backplane tested to 5 Terabits per second (Tbps), delivers 330 Gigabits per second (Gbps) to each slot.

And, if the history of Ethernet offers any insight, we don't have long to wait until 100 Gigabit Ethernet will be a multi-billion dollar market.

# Ethernet Future



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