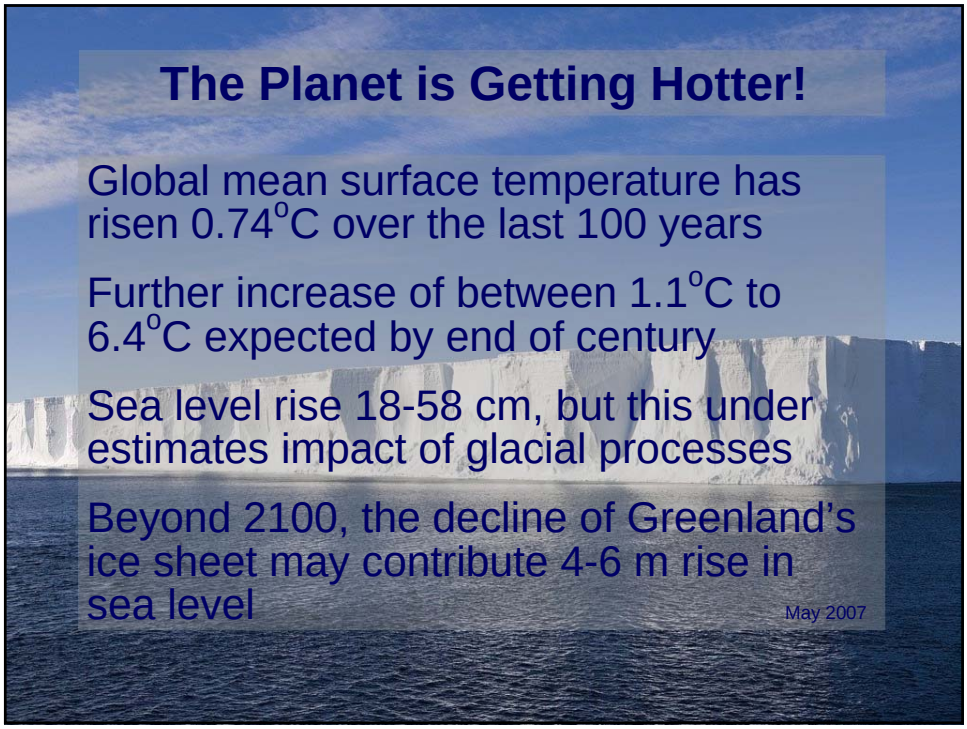
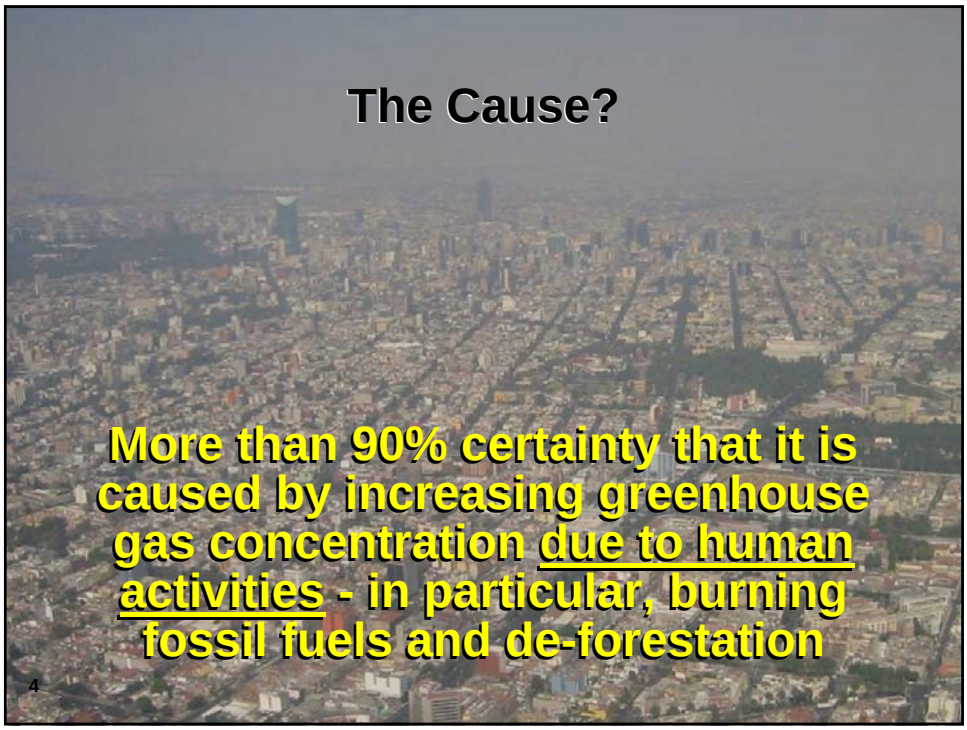
Eco-Efficiency: Where Green Meets Network Realities.

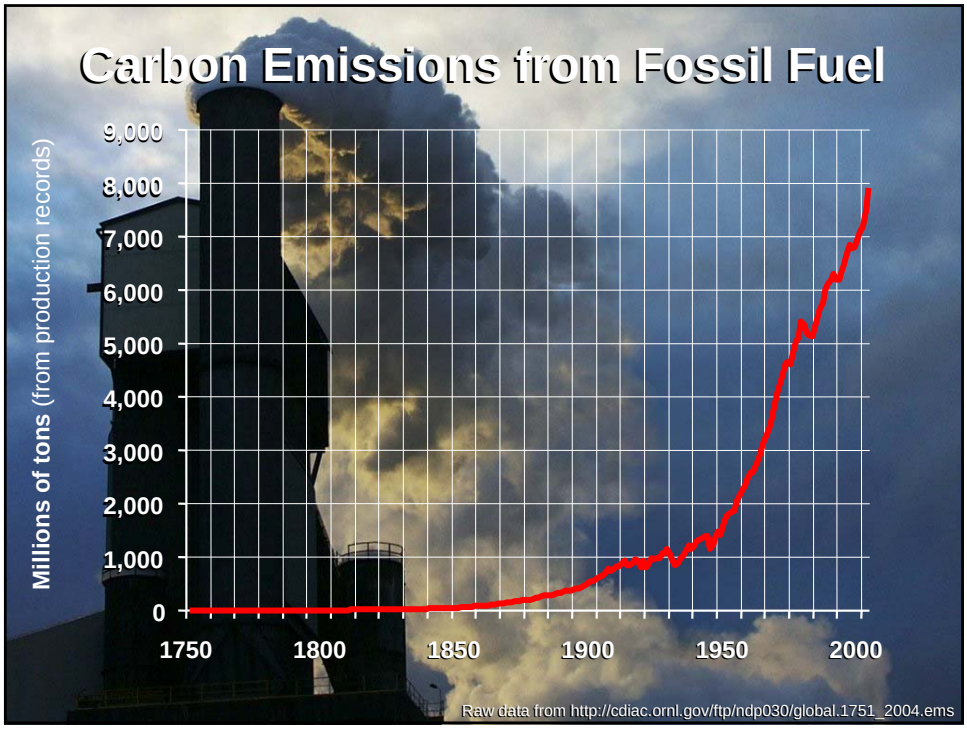
Gavin Muldoon
Regional Manager ANZ

Topics of Discussion

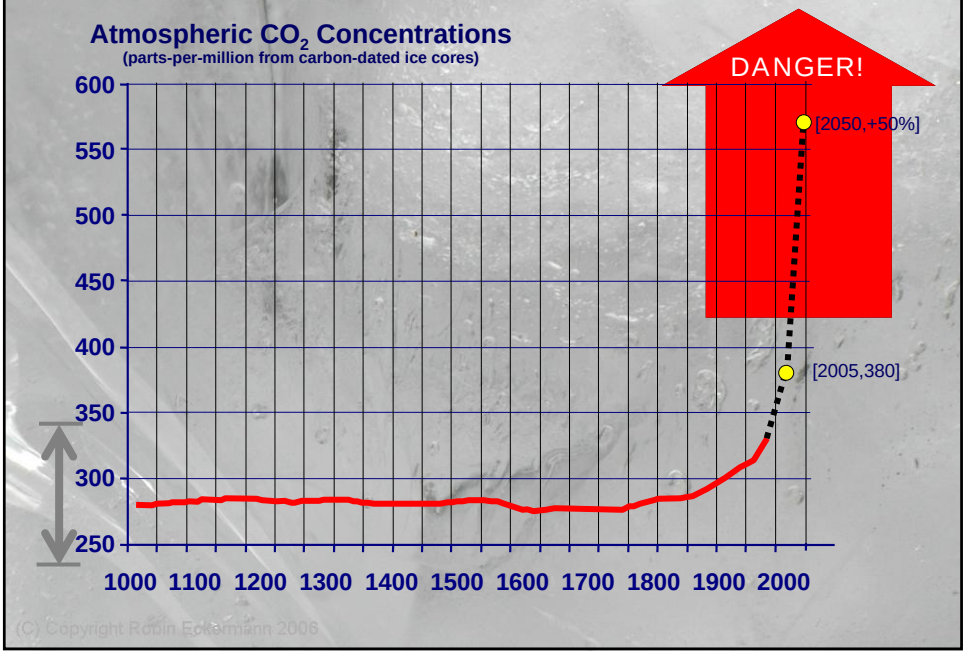
- **Green … and Why??**
- Eco-Efficiency explained
- The Network Impact
- Force10 Networks
- Questions & Summary


The Planet is Getting Hotter!
Global mean surface temperature has risen 0.74°C over the last 100 years
Further increase of between 1.1°C to 6.4°C expected by end of century
Sea level rise 18-58 cm, but this under estimates impact of glacial processes
Beyond 2100, the decline of Greenland's ice sheet may contribute 4-6 m rise in sea level
May 2007


The Cause?
More than 90% certainty that it is caused by increasing greenhouse gas concentration due to human activities - in particular, burning fossil fuels and de-forestation


Carbon Emissions from Fossil Fuel
Millions of tons (from production records)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1750
1800
1850
1900
1950
2000
Raw data from http://cdiac.ornl.gov/ftp/ndp030/global.1751_2004.ems

Future projections for CO^2



What sort of a future are we handing over to our children and their children?

You can make a difference!

Understand the Threat
Promote Awareness
Demand Action
Reduce, Reuse, Recycle
Exploit ICT as a tool
Be Eco concious and efficient with IT

The future of the planet need not be bleak!

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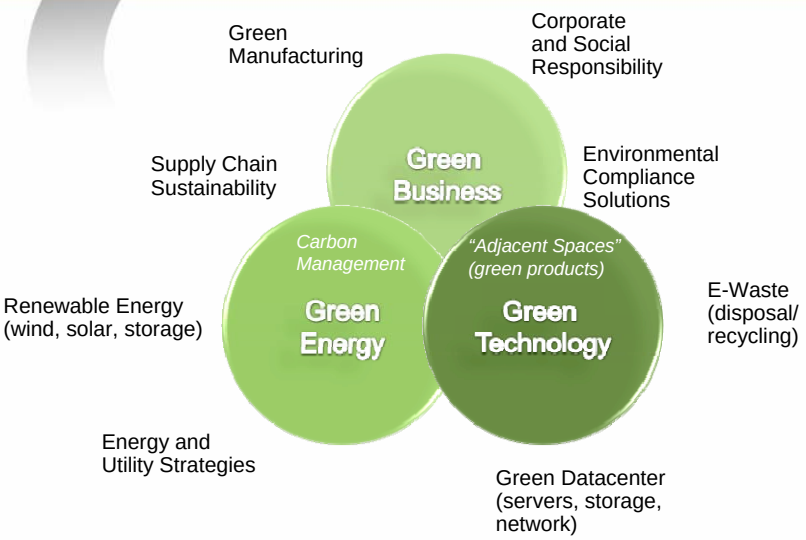
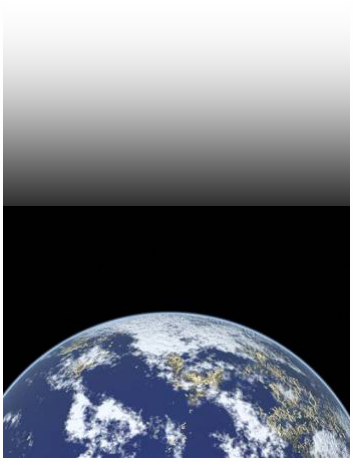
Green IT Overview

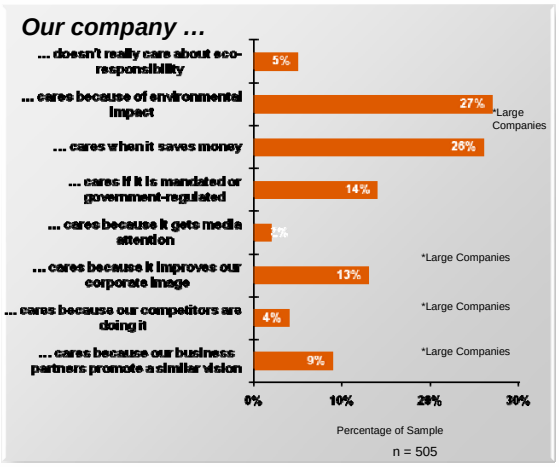


Source: IDC's *Datacenter Trends Survey*, January 2007.

The Green Datacenter Is a Challenge

Q. Which of the following best describes your organization's approach to environmental responsibility?



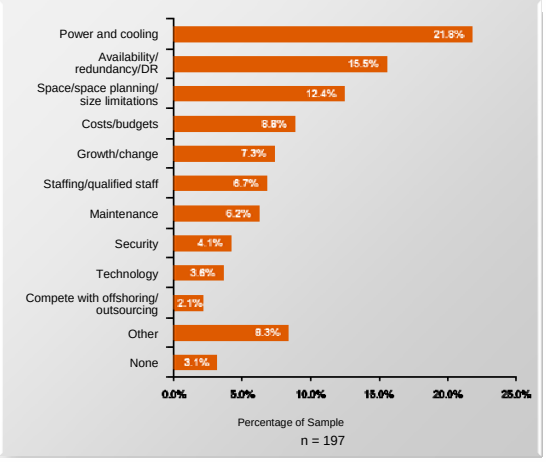


Note: Multiple responses; Source: IDC's *Datacenter Trends Survey*, January 2007.

Data Center Challenges

Q. What is the number one challenge your datacenter faces today?

- The most often-cited top-of-mind challenge for the datacenter is environmental — power and cooling
  - Space is the number three challenge and is often linked with power and cooling issues
- As companies become increasingly connected to IT, availability is paramount

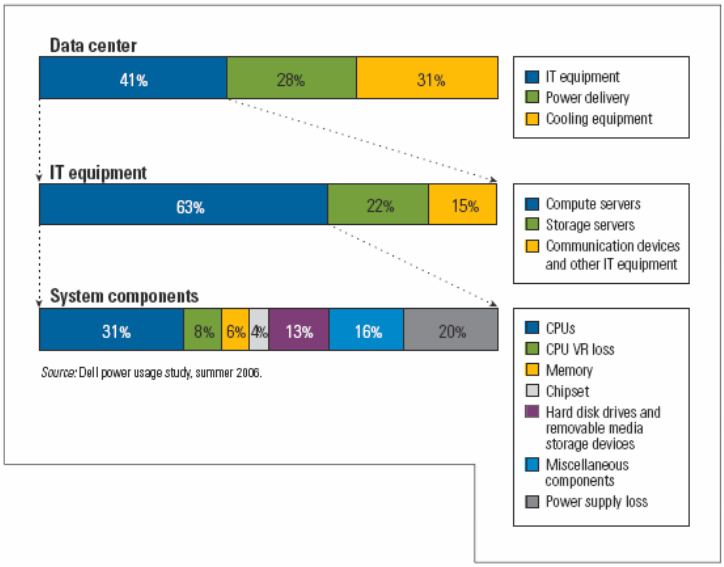


Source: IDC's *Datacenter Trends Survey*, January 2007.

When Is Networking Green?

- Data Centers and Networks use power!
- Alternative Energy Usage
- Zero Carbon Footprint
- Eco-friendly best practices
  - Reduce power consumption

Power consumption at the data center, IT equipment, and system component levels



Market Forces and Influencers

Regulatory

Green buildings

EU's RoHS Directive for Hazardous Materials

EPS's Report on Server and Data Center Energy Efficiency Public Law 109-431

Energy Star Compliance

Industry Consortia

climate savers smart computing

the green grid

WWF

Manchester City Council

- Consumers
- Investors
- Business partners
- Media

Data Center Crisis:
Power/Cooling

Moore's Law: More Transistors…
More MIPs… More Watts… More BTUs

1 watt of power consumed requires 3.413 BTU/hour of cooling to remove the associated heat

IDC Analyze the Future

3 Year Costs of Power and Cooling, Roughly Equal to Initial Capital Equipment Cost of Data Center

AFCOM

By 2010, potentially half of all data centers will have to relocate to new facilities or outsource some applications due to power demands

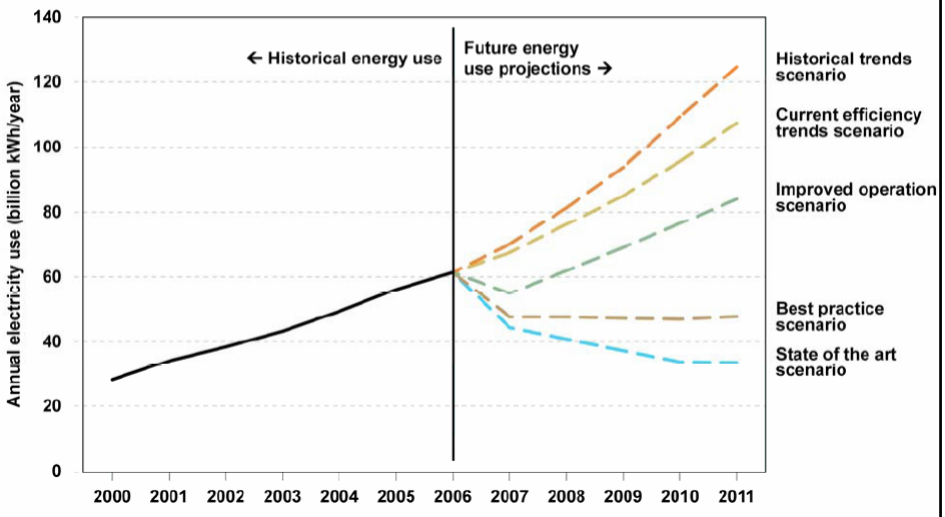
Data Center Goal (environmental)

- Improved Operations – policy, eg. Turn off unused resourses, consolidate, etc…(up to 30% efficiency improvement)
- Best Practice – current and future design, technologies, etc…(up to 70% efficiency improvement)
- State-of-the art – new technologies, policy, etc…(up to 80% efficiency improvement)
- Use Less
  - Eg. Blade servers, storage systems, network, cabling, cooling, power, etc..

  So where is this leading us……..
- Virtualisation
  - Exploit technology, efficiency & automate

EPA Report to Congress on Server and Dater Center Efficiency Public Law 109-431

Figure ES-1. Comparison of Projected Electricity Use, All Scenarios, 2007 to 2011



Some Fun Facts….. (USA)

- Data Centers represent 1.5% of total USA energy consumption ($4.5b)
- DC Power requirements doubled in the past 5 yrs and will double in the next 5yrs
- 10 NEW power plants will be required in 5 years just to sustain current DC growth
- DC's use more power than ALL the national TV's
- Energy consumed is equivalent to 5.8m homes
- Power Failures and limits on availability will affect 90% of ALL companies over the next 5yrs
- DC can be up to 40 times more energy intense than a traditional building

Topics of Discussion

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- Eco-Efficiency explained
- **The Network Impact**
- Force10 Networks
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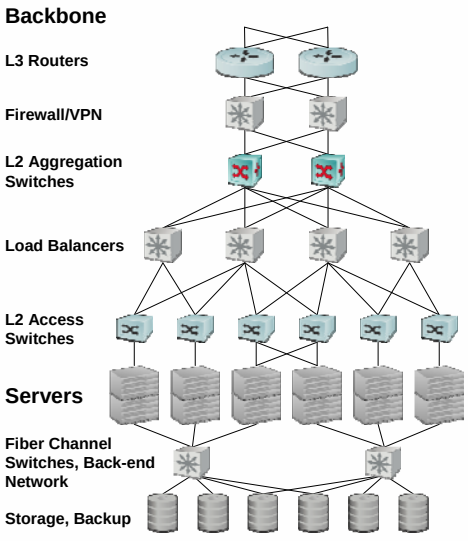
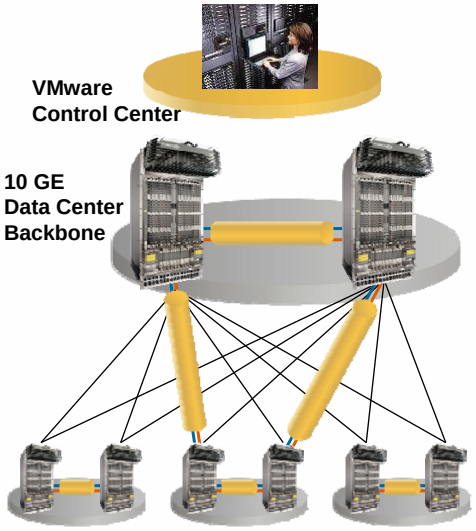
The Server & Network Sprawl

- Legacy Pods
  - Horizontal and Vertical growth unmanageable
  - Too many devices and layers
  - Every Pod is application specific
  - Complex traffic engineering
  - High cost of ownership (power, cooling, space, management, downtime)
  - Poor utilization



Want Virtualization: Get 10 GbE Virtualized Pods

- Massive bandwidth ensures no network congestion
- High availability through full sweet of NIC teaming capabilities
- Network simplicity & agility
- Leading switch port density & resiliency delivers lowest TCO
- Each Pod looks the same (cookie-cutter approach)

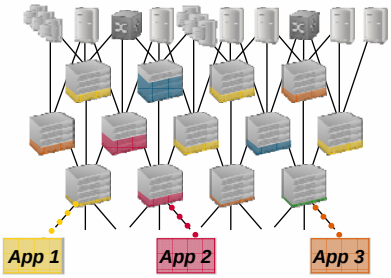


Gigabit or 10 Gigabit server direct connect

What Virtualization Delivers

Virtualization: in simplistic terms?

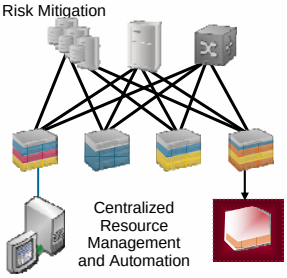
Before Virtualization



- Server Sprawl
- Low Utilization
- Synchronous Deployment
- Capacity Planning by Application
- Network Complexity
- Resource Management by Server
- Disaster Recovery by Duplication
- Management Downtime

After Virtualization

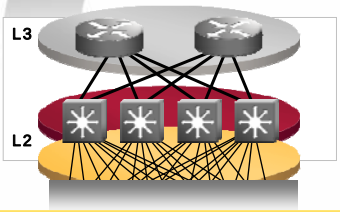
- Asynchronous Deployment and Rapid Provisioning
- Integrated Infrastructure Planning Processing, Data, Access
- High Availability
- Live Migration
- Risk Mitigation



Centralized Resource Management and Automation

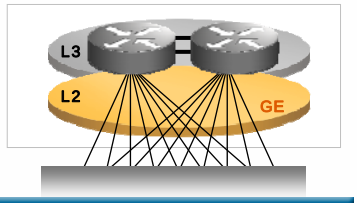
Single Site Disaster Recovery w/out Duplication

Drives New Requirements



Legacy Solution

- Availability through device level redundancy — buy more boxes
- Scalable through adding higher speed ports
- Increasing performance by building layers into the network

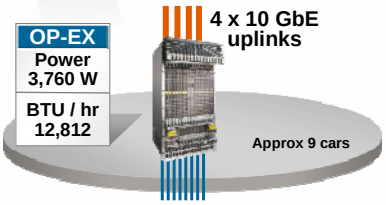


The New Solution

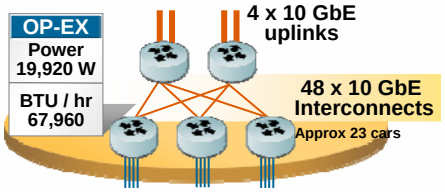
- ***More*** resilient systems with ***less*** cost
- Fewer systems that are easier to manage, trouble shoot and isolate faults
- Fewer layers—reducing risk in guaranteeing application performance

New Network Economics

Remove Wasteful Interconnects



270 line-rate nodes



90 90 90
270 line-rate nodes

CAP-EX

- ✓ 75% lower up front cost, > $1 million savings
- ✓ One device, versus five
- ✓ 28 less line cards

OP-EX

- ✓ 81% less power
- ✓ 81% less cooling needed (air conditioning)
- ✓ 80% less rack space

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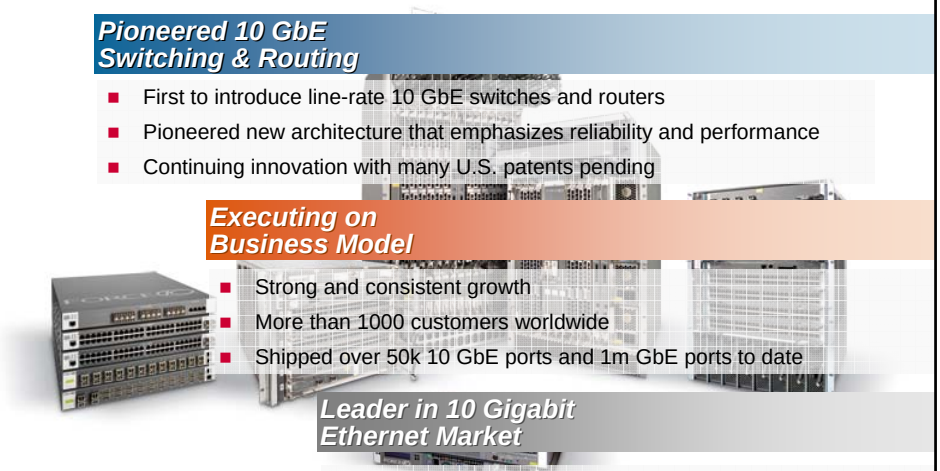
Force10 Networks



Pioneered 10 GbE Switching & Routing

- First to introduce line-rate 10 GbE switches and routers
- Pioneered new architecture that emphasizes reliability and performance
- Continuing innovation with many U.S. patents pending

Executing on Business Model

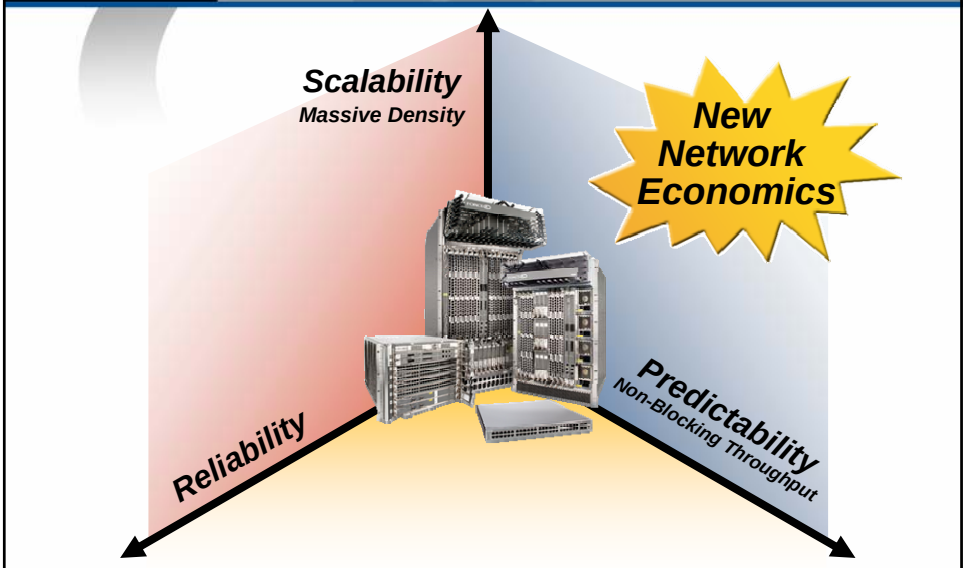
- Strong and consistent growth
- More than 1000 customers worldwide
- Shipped over 50k 10 GbE ports and 1m GbE ports to date

Leader in 10 Gigabit Ethernet Market

- Second in 10 GbE by sales, according to Dell'Oro
- Positioned as a leading "Visionary" vendor by Gartner
- Manical focus on High Performance and Reliable Ethernet

High Performance Ethernet

Why We Win: Innovating in Three Dimensions



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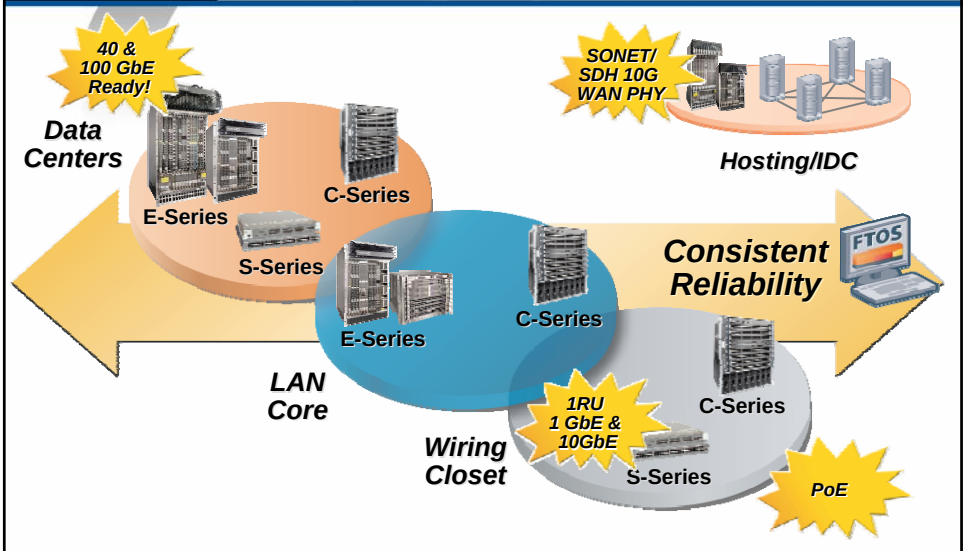
Building Reliable, High-Performance, Simplified Networks



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Topics of Discussion

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- **Summary & Questions**

Why go Green?

- Corporate and Social Responsibility!!!!
  - But the real reason people care - Cost!
  - In the Future it may be Compliance!

Summary

- Comprehensive vision and strategy that combines Network performance, reliability, scalability and Security
- Leadership in Technology Innovation
- Demonstrated ability to execute across multiple fronts
- Deployed in the world's largest and most complex networks
- Most Eco-Friendly network gear on the planet – 50%+ less power than most competitors
- Driving down Cost and increase technology adoption
- Commitment at ALL levels

Force10's Market Disruptions

Industry Leading Reliability and Scalability

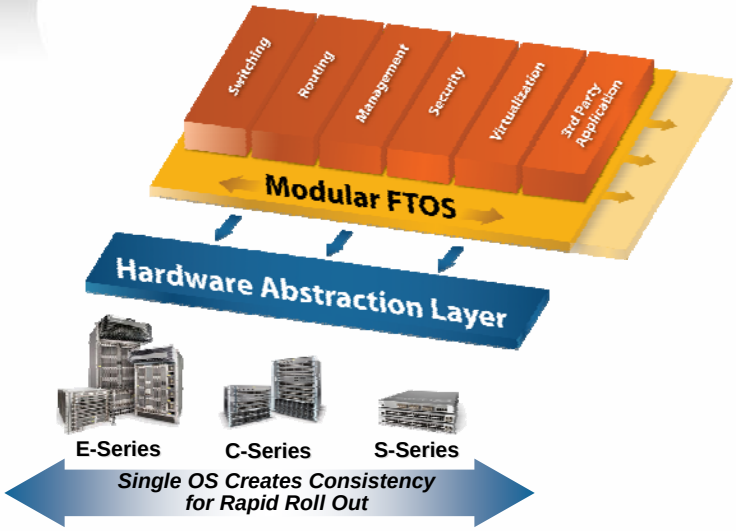
Lessons Learned in Large Data Centers

- **Business doesn't exist without the network**
- **Reliability is key**
- **Global support**
- **Integrated ecosystem**

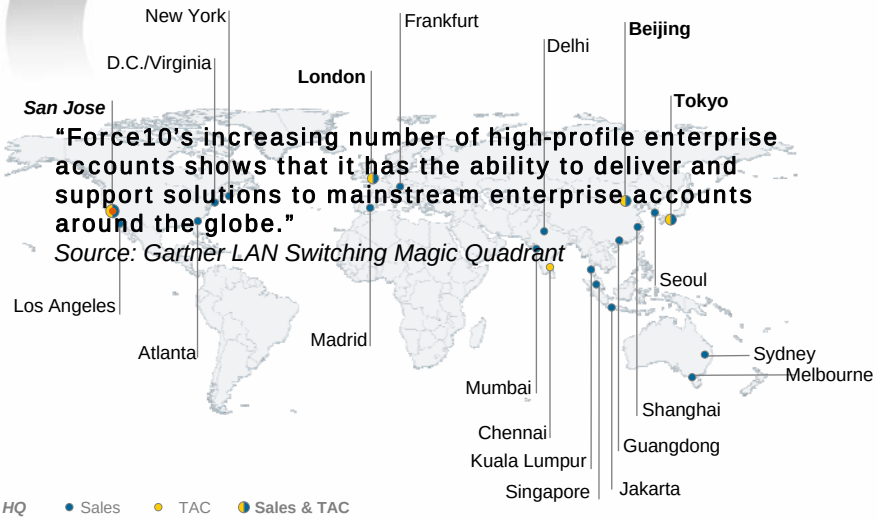
FORCE10™

Thank You

Industry Leading Technology - sw



Force10's Global Presence and Support



"Force10's increasing number of high-profile enterprise accounts shows that it has the ability to deliver and support solutions to mainstream enterprise accounts around the globe."

Source: Gartner LAN Switching Magic Quadrant

Force10's Market Disruptions

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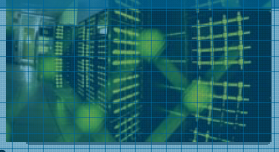
Force10 Customers

Data Center Power Considerations

1. Prime mover in budgets
2. Network 15% of power budget…**Biggest relief by increasing density and utilization**
3. Ethernet becoming unifying framework



Yahoo! Case Study

Client Requirements

- Bandwidth doubling every year
- Expects 10 GbE server scale in 1-3 years
- 20 Gigabit bandwidth in metro transport
- Explicitly dual-vendor – interoperability a must

Solution

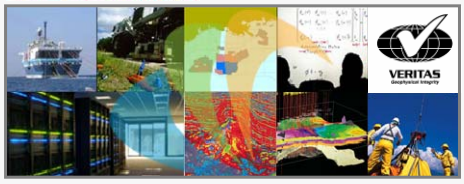
- Running 80 KM WDM optics
- "POD" design with 300+ GbE nodes
- Massive Gigabit densities

Benefits

- Power footprint of 2.5 KW per 300 nodes
- 1/3 the cooling budget of previous switch and over $2.5M in power & cooling savings in 3 years
- Substantial (4-8x) saving over SONET

Customer Proposition
Eco Data Center and Eco Innovation

CGGVERITAS



Veritas Implements their Dream Data Center Design with Force10 E-Series Switch/Routers

Veritas, headquartered in Houston, Texas, is a leading provider of integrated geophysical information and services to the petroleum industry worldwide.

Due to the enormous amount of processing capacity and network bandwidth required to manipulate such complex data, Veritas' IT infrastructure is key to its ability to generate revenue. Making that infrastructure ever more efficient is a challenge for IT. "We have to be able to drive down our costs so we can reduce costs to customers," notes Phil Gaskell, Veritas' Global Network Manager. "If we can deploy a network for $3 million as opposed to $5 million, we can deliver a more cost effective solution and improve our bottom line."

"Fewer devices in the network means lower power consumption and cooling costs, for example, and less management overhead. We're always pushing the edge with new technologies," notes Gaskell. "Flexibility was one of the main things we were looking for

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Eco DC and Eco Innovation

1. Force10 solutions consume half of equivalent Cisco products
2. Network automation - power down line-cards via Server based Virtualization
3. Increased port density + Power efficiencies = tangible saving for the customer
4. Extending Eco Initiatives to the network for another dimension of savings

MareNostrum–Barcelona Super Computing Centre

Client Requirements

• Build #1 super computing center in Europe to focus on computational, earth and life sciences
• Location -TorreGironaChapel
• 153 sqm with 2,560 GbE nodes - 94.21 terra flops
•Non-blocking supercomputing
•Create a scalable, flexible environment

Solution

•Raised floor to accommodate high flow reqs
•Cooling water storage tanks
•IBM blue gene and 1350 blade servers drove massive Gigabit densities

Benefits

High density Ethernet (8 watts/gbe)
Supports 21KW/rack (400 W/sq ft) of cooling
Flexibility for the future –supercomputing performance upgrade underway
World's most beautiful supercomputing center

Force10 C300
A Competitive Comparison

	Cisco 4510R	Force10 C300	Cisco 6509
Line Card Slots	8	8	7 / 8
Industry Standard CLI	Yes	Yes	Yes
Modular OS	No	✓ Yes	Yes
Servic[illegible]ity	Yes	Yes	Yes
Syste[illegible]nd	[illegible]	[illegible]-1	+1
Switching Capacity (Gbps)	136	✓ 1536	720
Slot Capacity (Gbps)	6	96	40
Line-rate GbE Ports	56	✓ 384	384
Line-rate 10 GbE Ports	*4 (Management Module)*	32	32 *(No Redundant Control)*

Next Generation Value

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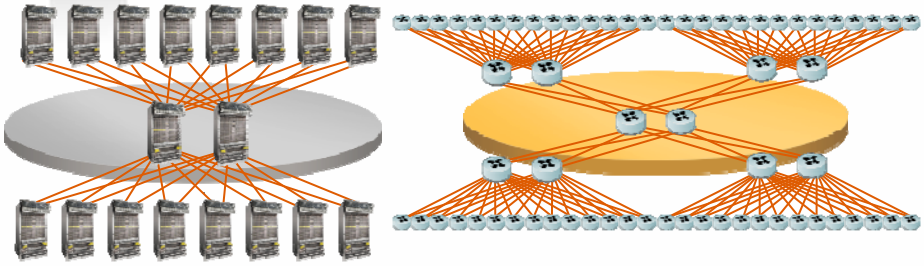
Switch/Routers— Is There Really a Difference?

- Little difference in Gbps/watt for fixed configuration and stackable switches
- Considerable differences for modular switch/routers due to backplane technology and box-level densities
  - Heavy copper traces reduce backplane resistance and wasted power consumption
  - Force10 E-Series uses patented 4 layer, 4 ounce copper backplane that has power efficiency of 4.5 Gbps / Watt (= backplane capacity/ power consumption)
  - 10-20x less resistance

Economics of Line-Rate Density

A Real-World Example

16,000 Node Data Center



CAP-EX	OP-EX
✓ 15% lower up-front eqpmnt cost, > $1.5 million savings	✓ 58% less power
✓ 16 devices, vs 66 devices!	✓ 58% less cooling needed (air conditioning)
✓ 218 fewer linecards	✓ $1.2M Annual Savings