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BROCADE DATA CENTER NETWORKS UPDATE

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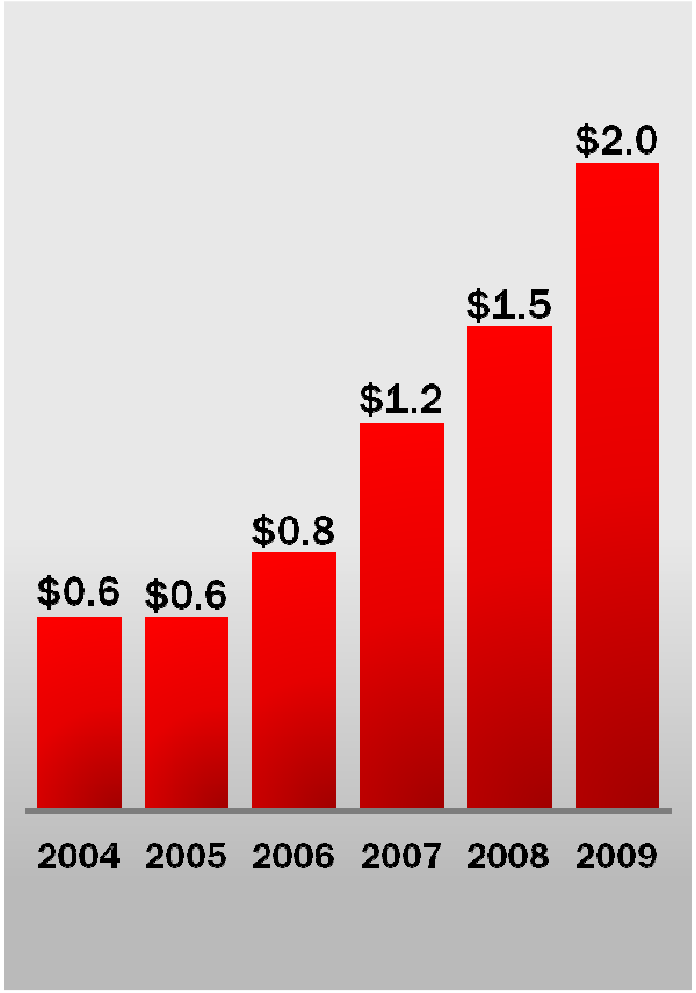
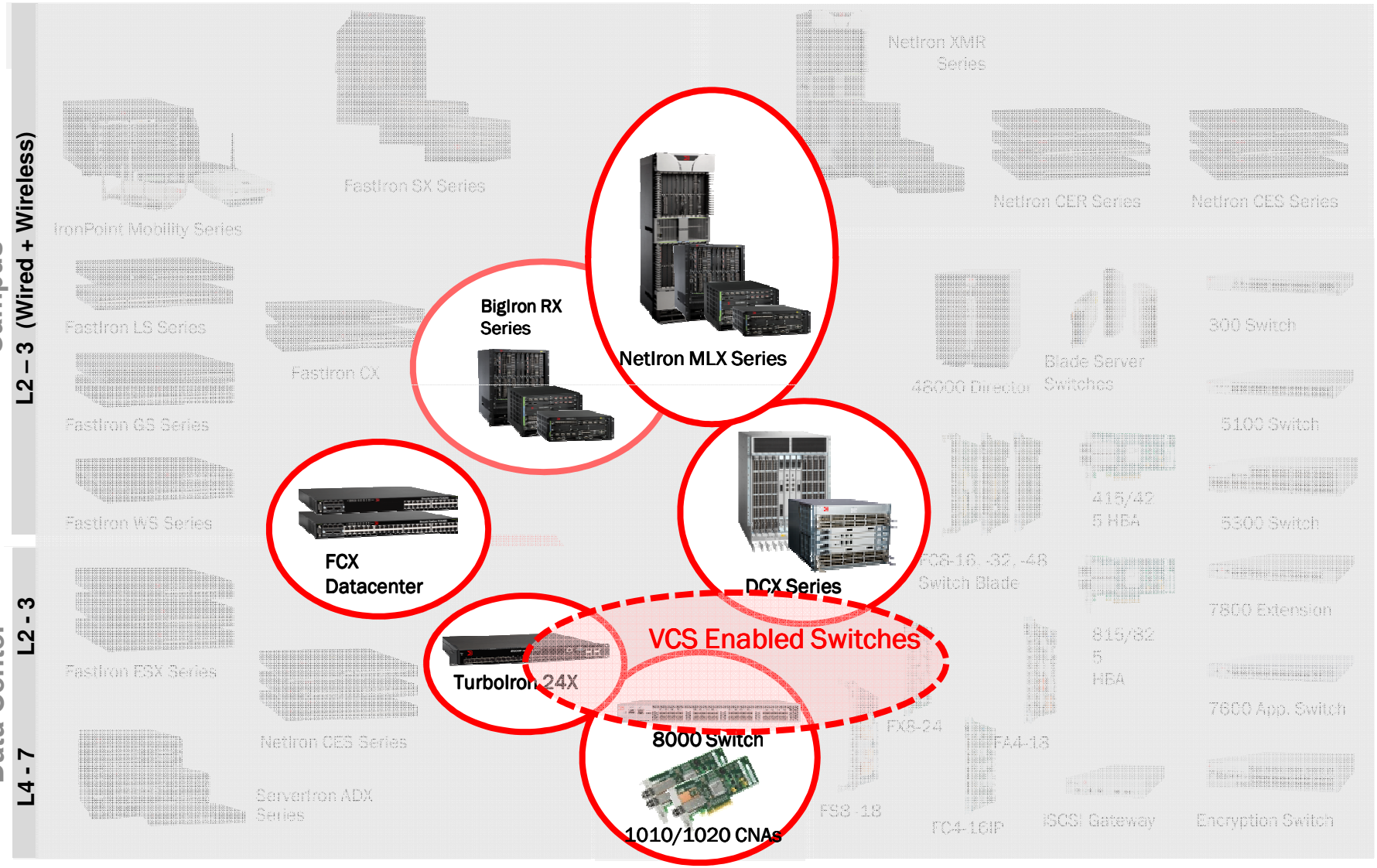
Brocade Background

- Founded 1995, ~4100 employees worldwide, operating in more than 160 countries
- Customers in all major industries, in 90% of Global 1000 Datacenters
- Annual revenues of ~$2 Billion
- HQ: San Jose, California
- Best of Breed SAN: Brocade, McDATA, CNT, Inrange
- Storage Area Network (SAN) Pioneer and Leader (75% market share)
- Foundry Networks acquisition completed in December 2008
- Going Beyond SAN with IP/Ethernet, Server Attachment (HBA), and DCB/FCoE



Brocade Products for the HPC interconnect & storage market

low latency, scalable & converged



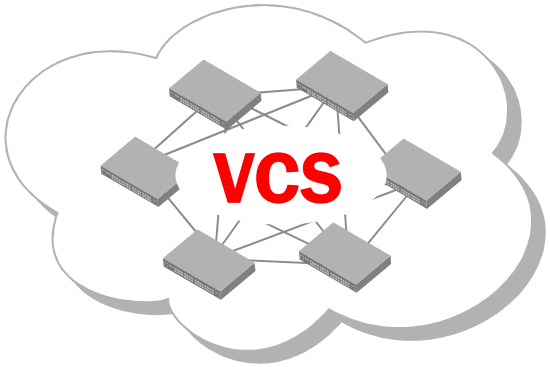
Brocade HPC Products Summary

Product Name	Standard Ethernet	DCB / CEE and FCoE	FC Storage Networks	Product Summary
FCX Data Center	1 GbE	--	--	Compact 1U, high performance, low-latency 24/48 10/100/1000 RJ45 ports, ToR, up to 4x10 GbE uplinks
TurboIron 24X	10/1 GbE	--	--	Compact 1U, low-latency, cut-through, high-performance, 24 10/1 GbE dual-speed plus 4 10/100/1000 ports, ideal as ToR and aggregation switch
NetIron MLX	100/10/1 GbE	Yes	--	Advanced routers with industry-leading 10 GbE (up to 256 ports) and 1 GbE (up to 1,536 ports), wire-speed performance. 4, 8, 16 or 32 slot chassis
BigIron RX	10/1 GbE	--	--	Advanced switches with high port density of 10 GbE (256 ports, 4:1 oversubscribed or 64 ports 1:1 non-oversubscribed) and 1 GbE (768 ports 1:1 nonoversubscribed). 4, 8 or 16 slot chassis
DCX and DCX-4S Backbones	10 GbE (w/ 10-24 blades)	Yes	Yes	DCX: up to 512 8 Gbps FC ports; DCX-4S: up to 256 8 Gbps FC ports, up to 3 per rack; FC and DCB/CEE/FcoE blades
FCoE 8000 switches and 10-24 blades	10 GbE	Yes	Yes	Compact 1U, 24 ports low-latency 10 GbE and 8 port 8 Gbps FC, cut-through, non-blocking, ToR and blade switch
CNA adapters	Yes	Yes	--	Dual mode, NIC & CNA, high-performance adapters, 1 or 2 port SFP+ configurations.
VCS Enabled Switches	10/1 GbE	Yes	(Future)	Low-latency, cut-through 1U, 24 ports, and 2U, 60 ports, 10/1 GbE converged switch, supports DCB- and TRILL-based plug-and-play Ethernet fabric
Network Management INM and DCFM	Management Products for all of the above			

For additional information on Brocade products, solution briefs, white papers and news please visit us at www.brocade.com/hpc or write us at hpc_info@brocade.com

Brocade Virtual Cluster Switching (VCS)

VCS



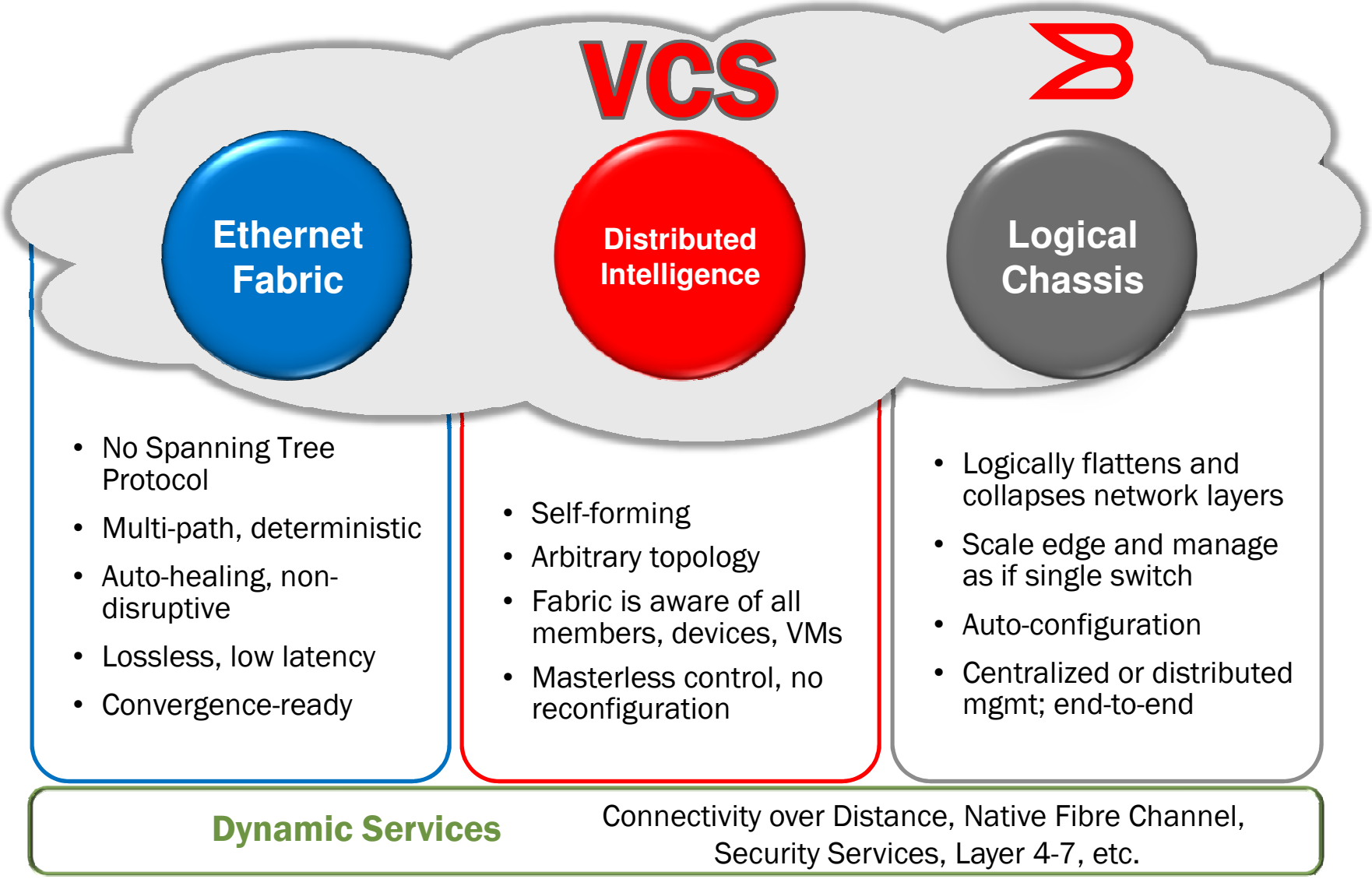
Brings data center-proven Brocade fabric technology to Ethernet

Revolutionizes Layer 2 networking

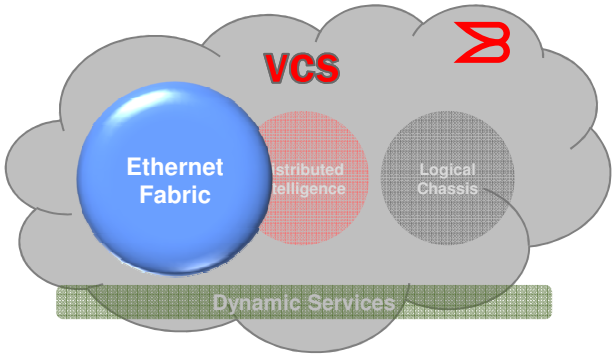
Increases scalability of virtual server environments and sphere of mobility

Maximizes network performance—reduces network complexity

Virtual Cluster Switching - Components



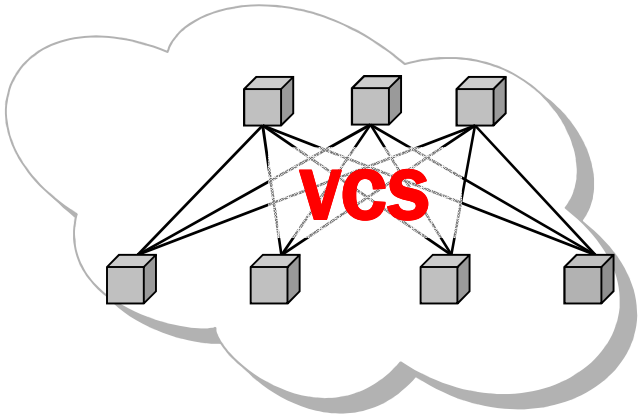
Ethernet Fabric Details



- 1st true Ethernet fabric
  - Layer 2 technology
- Link speed agnostic
- Data Center Bridging (DCB)
  - Lossless, deterministic
  - Priority-based Flow Control (PFC)
  - Enhanced Transmission Selection (ETS)
  - Data Center Bridging Exchange (DCBX)
- Transparent Interconnection of Lots of Links (TRILL)
  - Active multi-path
  - Multi-hop routing
  - Highly available, sub-250ms link recovery
- LAN/SAN Convergence Ready
  - FCoE and iSCSI traffic
- Standards-based
  - Extends existing Ethernet infrastructure

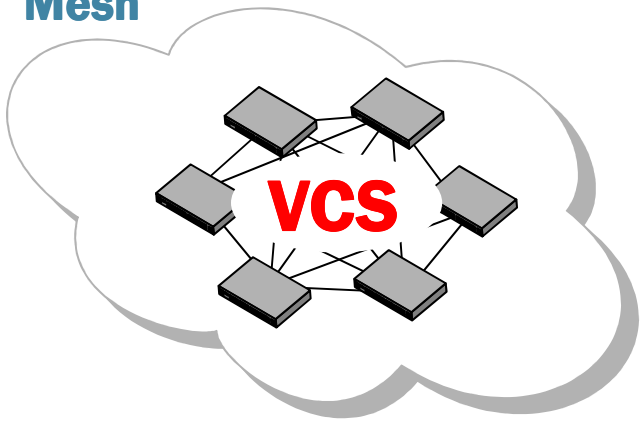
VCS – Flexible Fabric Design

Clos



- Scalable architecture
- Consistent hop counts (max 3)
- Two Tiered Fat Tree fabric
- Multiple paths (L2 ECMP)

Mesh



- Resilient architecture
- Consistent hop counts (max 2)
- Full Mesh Fabric
- Multiple path (L2 ECMP)

- Flexibility to chose any design (Clos, Mesh, Cube, etc....)
- Each switch is fully aware of the entire network
- Shortest path forwarding

Examples - 10GbE VCS fabrics for lowest latency and best price/performance

- Low latency, non-oversubscribed & optimal cost network fabrics using Brocade's 24 and 60-port VCS-enabled switches:
  - for up to 156 10GbE servers – use full Mesh fabric with the 24 ports switch. Max 2 switches for server-to-server connectivity, total 13 switches.
  - for up to 930 10GbE servers – use full Mesh fabric with the 60 ports switch. Max 2 switches for server-to-server connectivity, total 31 switches.
  - for up to 1800 10GbE servers – use Clos fabric with the 60 ports switch. Max 3 switches for server-to-server connectivity, total 90 switches.

- Many designs are possible function of the server connectivity (1/10GbE), desired network oversubscription level, number of servers, and target latency - please write us at hpc_info@brocade.com for more information and visit our booth at SC10.

Brocade MLX Router Series

960 Gbps FDX per Full-Slot

480 Gbps FDX per Half-Slot

Removable Partitions

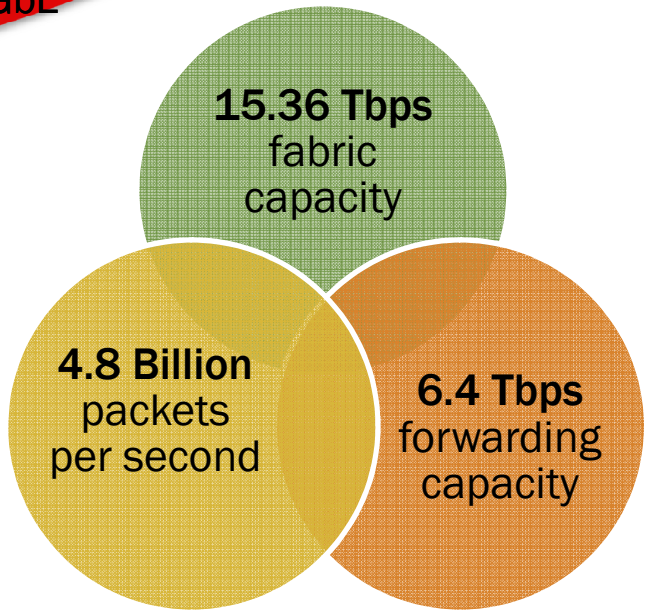
64 10 GbE (2006)

128 10 GbE (2007)

256 10 GbE (2010)

32 100 GbE

> 256 10 GbE (Future)



Brocade MLXe Routers

Product Highlights

A Unified Platform That Scales From Data Center Core to Service Provider Core

Industry-leading 10GbE wire-speed density of 256 ports

Industry-leading 100GbE wire-speed density of 32 ports

Supports MLX and XMR modules

64 x 10 GbE links in a LAG

Multi-Chassis Trunking (MCT) - active/active links with instantaneous node failover

Terabit trunks, 1.6 Tb/s per trunk.

MLXe Modules

Same chassis, different scalability options

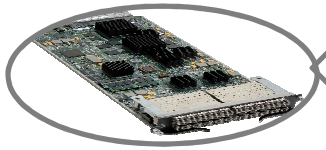
MLX scalability

MLX management module

2-port 100 GbE

48 port 10/100/1000 Mini –RJ21

4-port 10 GbE



20-port FE/GE

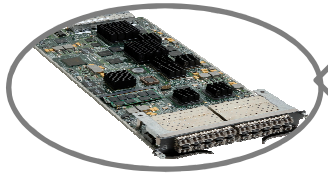
8-port 10 GbE

Enhanced scalability

XMR management module

2-port 100 GbE

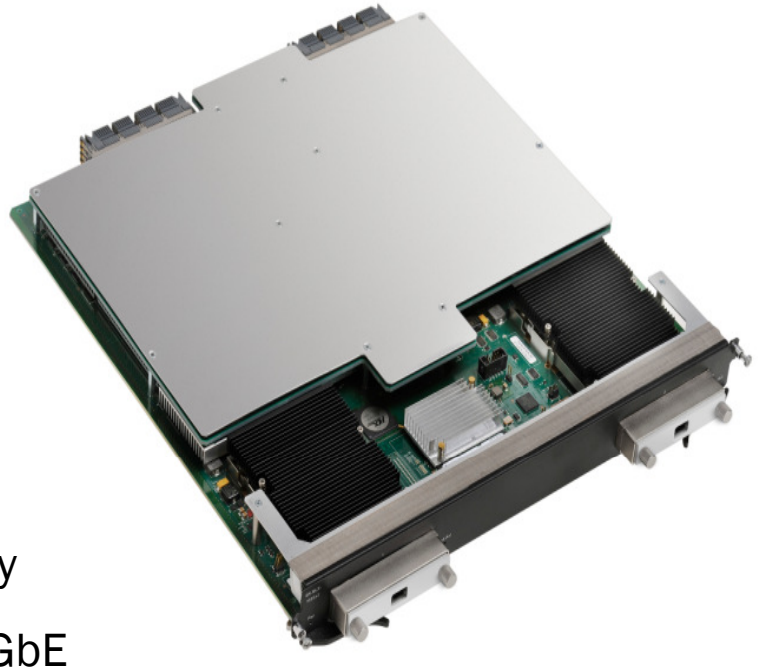
XMR 4-port 10 GbE



XMR 20-port FE/GE

100 GbE Module

Product Highlights



Industry's first 2 port 100 GbE module

Massive 100 GbE density of 32 wire-speed ports

Multiple full 100 Gigabit packet processors.

Terabit trunks with 1.6 Tb/s per trunk.

Ports on Demand enabling pay as you grow strategy

Classic XMR and MLX chassis support 1-port 100 GbE

Full featured card with Advanced MPLS and IPv4/IPv6 capabilities

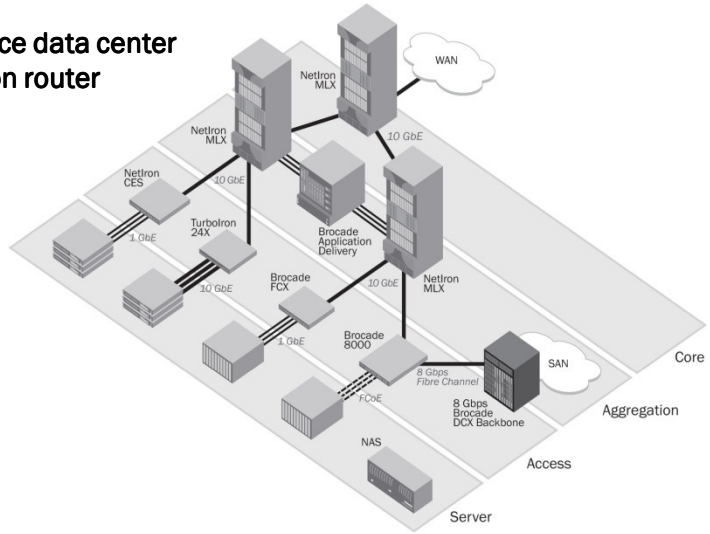
1 million IPv4 and 240 K IPv6 FIB capacity

802.3ba compliant and supports CFP based optics

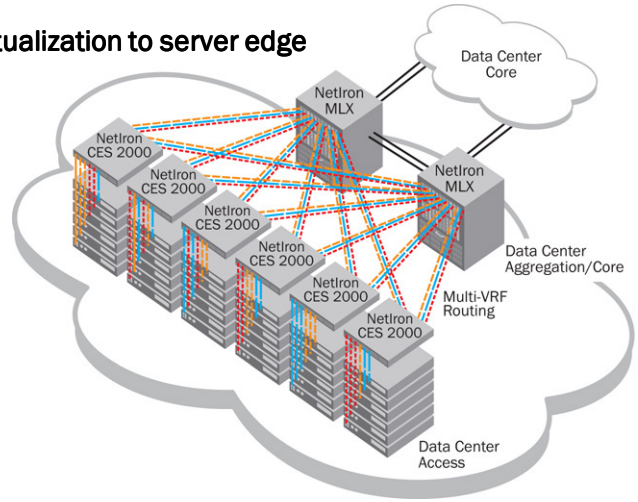
MLX Customer Deployments Examples

Data Center and Enterprise IP Networks

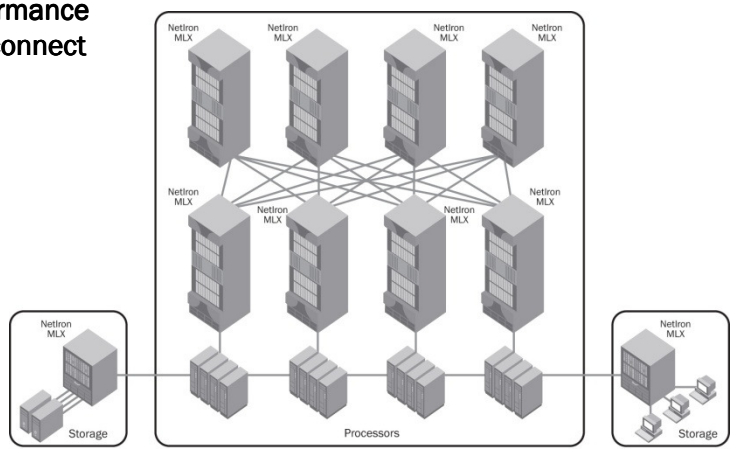
High-Performance data center core/aggregation router



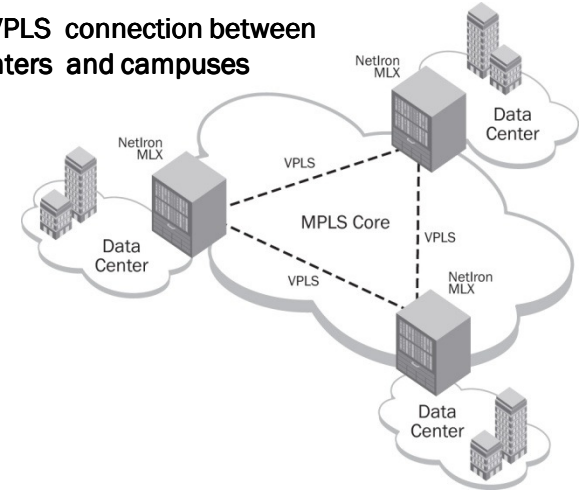
Network virtualization to server edge



High-Performance R&D interconnect



MPLS/ VPLS connection between data centers and campuses



Brocade HPC - More Information

- Brocade's **HPC site:** www.brocade.com/hpc

- **Visit us at SC10** to hear about our customers and see our demos
  - Brocade booth and briefings
  - SCinet (XMR 10GbE, TORs), SCinet Sandbox (100GbE)
  - Exhibitor Forum talks (100GbE and VCS - Thu afternoon)
  - Disruptive Technologies booth(VCS)

- **Contacts:**
  - Maria Iordache – Sr. Bus Dev Manager - HPC, Product Management, Data Center: maria.iordache@brocade.com
  - Help and more information: hpc_info@brocade.com

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Thank You