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April 12-15, 2010 | Rosen Shingle Creek Resort | Orlando, Florida



Unified Storage Networking

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Demartek Company Overview

- Industry analysis with on-site test lab
- Most projects involve use of the lab
- Lab includes servers, networking and storage infrastructure
 - Fibre Channel: 4 & 8 Gbps
 - Ethernet: 1 & 10 Gbps (with FCoE)
 - Servers: at least 8 cores, up to 48GB RAM
 - Virtualization: ESX, Hyper-V, Xen
- Web: www.demartek.com



Agenda

- The Problem
- Buzzwords and Acronyms
- Key protocols and standards
- Technologies available now
- Advantages and disadvantages
- Affect on currently installed storage networks
- Demartek lab test results
- Futures, Commentary, Roadmaps

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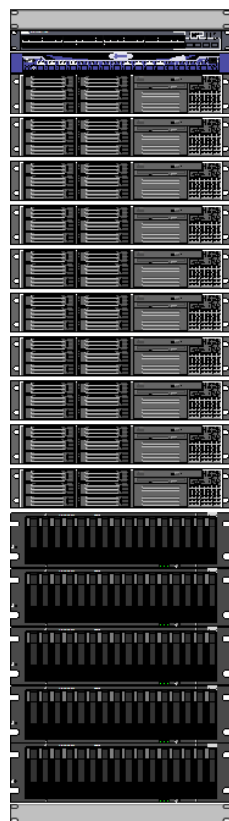


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The Problem: Too Many Parts



48-port Ethernet switch

32-port FC switch

10 rack servers
(2U each)

Disk array, 5 shelves
(3U each)

- Rack Servers (each)
 - 4 NIC ports (1Gb)
 - 2 FC ports (4Gb)
- Disk Array
 - 2 NIC ports (1Gb)
 - 4 FC ports (4Gb)
- What are the totals?
 - Cables & switch ports
 - Adapter cards
 - Maximum bandwidth



The Solution: Converged Network

- **Combine lossless features of Fibre Channel with ubiquity of Ethernet**
 - Within a rack (short-term)
 - Entire infrastructure (long-term)



New Buzzwords & Acronyms

- **Converged Network: combined LAN and SAN network**
- **Data Center Bridging (DCB)**
 - CEE: Converged Enhanced Ethernet
 - DCE: Data Center Ethernet (Cisco trademark)
 - EEDC: Enhanced Ethernet for Data Center
- **FCoE: Fibre Channel over Ethernet**
 - FCoCEE: FC over CEE
- **CNA: Converged Network Adapter**



How Can This Work?

- Enhance Ethernet so that it properly handles storage traffic
- Data Center Bridging (DCB)
 - An architectural collection of Ethernet extensions designed to improve Ethernet networking and management in the data center
- FCoE is the first major application for DCB



Data Center Bridging (DCB)

- **Traffic Differentiation**
 - Can distinguish LAN, SAN and IPC traffic
- **Lossless Fabric**
 - Required for SAN traffic
- **Optimal Bridging**
 - Allows shortest path bridging within data center
- **Configuration Management**
 - Works with existing systems



Key Protocols & Standards


- Ethernet
 - IEEE 802.1
 - 802.1aq Shortest Path Bridging
 - 802.1Qau Congestion Notification
 - 802.1Qaz Enhanced Transmission Selection
 - 802.1Qbb Priority-based Flow Control
 - DCB standards ratification expected in 2010
- Fibre Channel (FC)
 - INCITS T11: FCoE & FC-BB-5
 - Approved June 2009




FCoE

Fibre Channel over Ethernet

- **FCoE places the FC protocol on a new physical link**
 - Uses Lossless Ethernet (DCB) physical links
 - Protocol and behavior is the same as traditional FC
- **FCoE fabrics must be built with FCoE/DCB switches**
 - Interoperate with traditional FC fabrics
 - Support all FC advanced features
 - Operate identically on FCoE and FC fabrics





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Storage and the OSI Model

Operating System and Applications					
SCSI Layer					
FCP	FCP	FCP	FCP	iSCSI	SRP iSER
		FCIP	iFCP		
		TCP	TCP	TCP	
	FCoE	IP	IP	IP	
FC	Ethernet				IB



Switch Technology Available

- **Converged Ethernet switches**
 - Blade form factor: Convergence-Ready
 - Switches from traditional FC director-class switch vendors
- **Contain technology for:**
 - 10Gb Enhanced Ethernet (lossless)
 - Optional: 4 or 8Gb Fibre Channel
 - Support for FCoE traffic
 - Support for iSCSI traffic



Adapter Technology Available

- **Converged Network Adapters (CNA)**
 - From the same vendors who make FC HBAs
- **10GbE NICs**
 - From the same vendors who make NICs
- **These require PCI-Express bus slots**



Adapter Technology Available

- Offload characteristics
 - CNAs: FC & FCoE supported in hardware
 - 10GbE NICs: FC & FCoE supported by software
 - Ethernet: Similar to good server-class NIC
- Connectors
 - Copper: CX4
 - Optical: SFP+



CNA Generations

- **Generation 1**
 - Separate Ethernet and FC ASICs on card
 - 10GbE and 4GbFC
 - From some of the FC HBA vendors
- **Generation 2**
 - Single, combined Ethernet & FC ASIC
 - 10GbE and 8GbFC (or higher)
 - From some of the FC HBA vendors
 - Expect others to announce



Vendor FCoE Announcements

- Announcements from
 - Server vendors
 - Storage vendors
 - Adapter vendors
 - Switch vendors
- Several announcements in 2009
- Expect more announcements in 2010



Advantages & Disadvantages

- **Advantages**
 - Reduced number of cables
 - Reduced number of adapters
 - Reduced number of switches
 - Retain existing management software
- **Disadvantages**
 - Possible single points-of-failure
 - Organizational issues



Organizational Issues

- In large shops, networking and storage are separate departments
 - Networking: Dynamic (more changes)
 - Storage: Stable (fewer changes)
- Other areas of convergence
 - Remember analog & digital telephony
 - Consider voicemail & email
 - Consider physical and virtual servers



Effect on Current Storage Networks

- Can use and coexist with existing storage networks
 - Converged switches can pass FC traffic to existing FC SAN switches or to FC targets
 - Existing storage management software should work with FCoE technology



Probable Deployment Phases

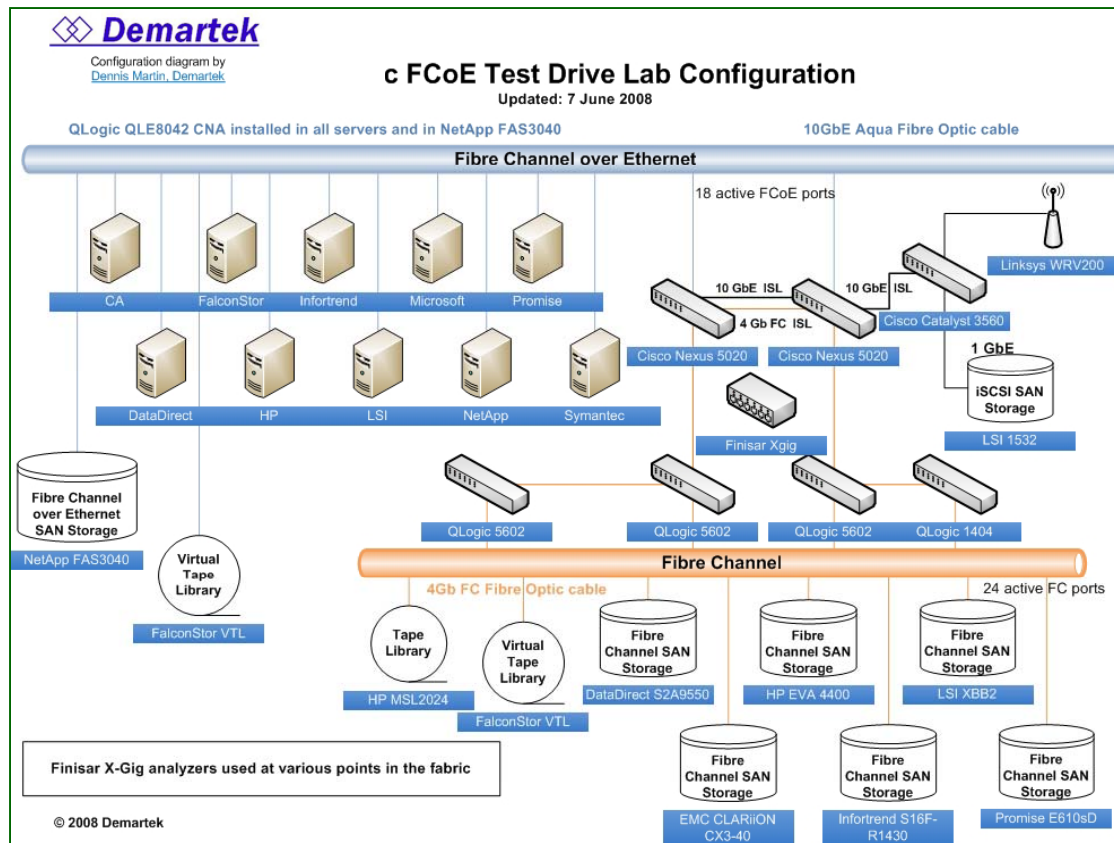
- Expecting a slow, deliberate process
 - 2008 - 2009
 - Early adopters, top-of-rack-switch, connects to existing storage networks
 - 2010 - 2011
 - Begin to see core networking support and wider adoption of FCoE adapters
 - 2011+
 - See more native FCoE storage targets



Demartek Lab Test Results

- **Past Testing:**
 - Conducted FCoE “First Look” in 2008
 - Participated in FCoE “Test Drive” in 2008
 - Evaluated a native FCoE storage solution in 2010
- **Current Testing:**
 - Testing with various adapters, switches and storage in the Demartek lab in 2010
- **Link:** www.demartek.com/fcoe.html

FCoE Test Drive



Servers
 connected
 via CNAs to
 FCoE switch
 connected
 to native
 FCoE
 storage and
 FC storage



Futures and Commentary

- Storage infrastructure changes slowly
- Should be considered in long-term planning, new equipment acquisitions and data center build-outs
- FCoE is now a Standard (June 4, 2009)

Roadmaps

- **FC: 16-Gbps by 2011 or 2012**
 - SAN interface has a future
 - Disk drive interface approaching end-of-life
- **Ethernet: 40 & 100-Gbps standards specifications expected to be completed in 2010**
- **FCoE will follow Ethernet roadmap**
- **Infiniband: 10, 20, 40 Gbps now, expecting 80 Gbps and higher**





Future Technology Comments

- Higher-speed adapters will require servers with PCI-Express 2.0 slots
- Vendors are scrambling for LOM
- As interface speeds increase, expect increased usage of fiber-optic cables and connectors for most interfaces
 - At higher Gigabit speeds, copper cables and interconnects become too “noisy” except for short distances



Compare Before and After

- Compare parts list with DCB & FCoE
 - Cables & switch ports
 - Adapter cards
 - Maximum bandwidth
- What can be eliminated?





Storage Interface Comparison

- Demartek has compiled a free comparison reference guide of FCoE and the other storage networking interfaces, which is updated periodically.

www.demartek.com/Demartek_Interface_Comparison.html



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