



New Cisco Storage Networking Products and Solutions



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Cisco Storage Networking: Strategic Focus Areas

Consolidation



- Fabric Consolidation – Density, Performance, and Scalability
- Server Consolidation - Blade Servers and Virtual Servers
- Multi-services platforms

Virtualization



- Enable data/information lifecycle management
- Data Center virtualization of fabrics, end-devices, and network services

Automation



- Services-Oriented Fabric Applications
- Dynamic provisioning - policy-based
- Application integration - open, standard APIs (SMI-S and SNMP)

MDS-based Fabric Offers Platform for Intelligent SAN Services

The MDS 9000 Family

Small and Medium Business

Enterprise and Service Provider

Multilayer Fabric Switches

Multilayer Directors

Blade Switch
IBM,HP



MDS 9124



MDS 9140



MDS 9216
and 9216i



MDS 9506



MDS 9509



MDS 9513

Systems

Modules

Software



Supervisor-1



16 / 32 port
FC Linecards
1/2 Gbps



Supervisor-2



12 / 24 / 48 port
FC Linecards
1/2/4 Gbps



4-port
FC Linecard
10 Gbps



Multiprotocol
Services (14+2)



8-port IPS
iSCSI + FCIP



Storage Services
Module

Virtualization
FAIS, SANTap
Intelligent Services

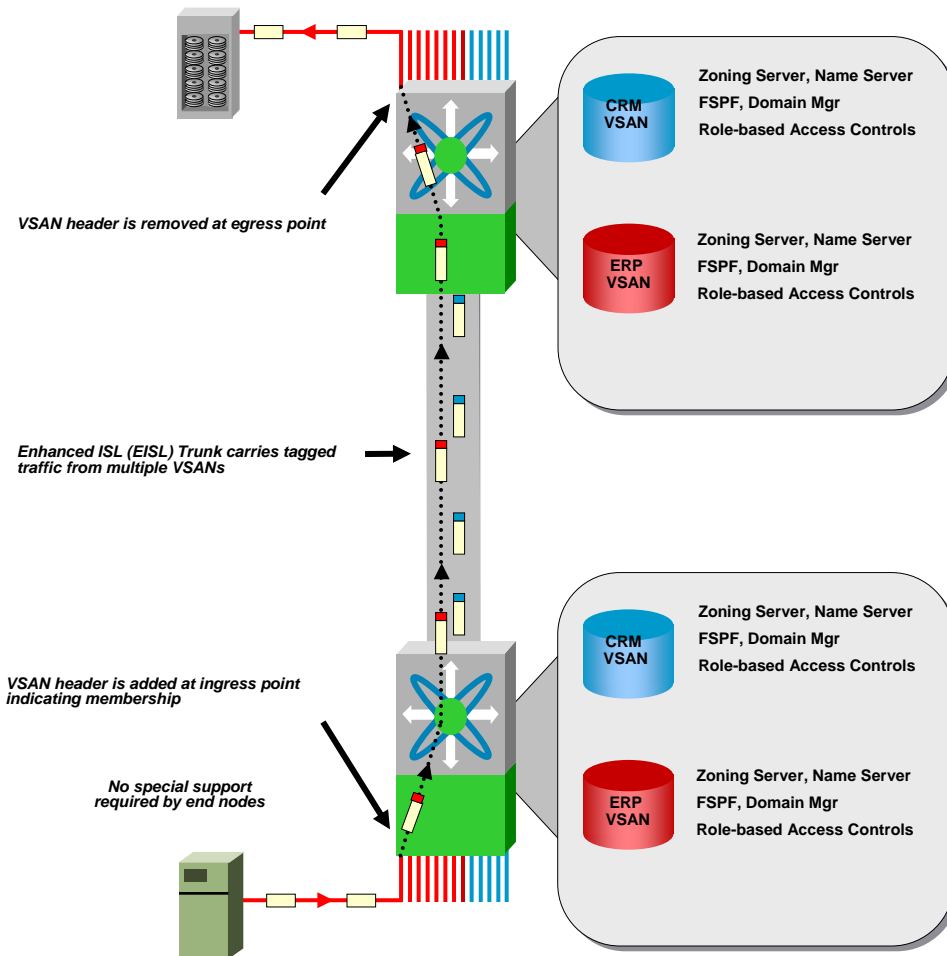
Device and Fabric Manager, Performance Manager, Traffic Analyzer

SAN-OS Operating System

Our Differentiators

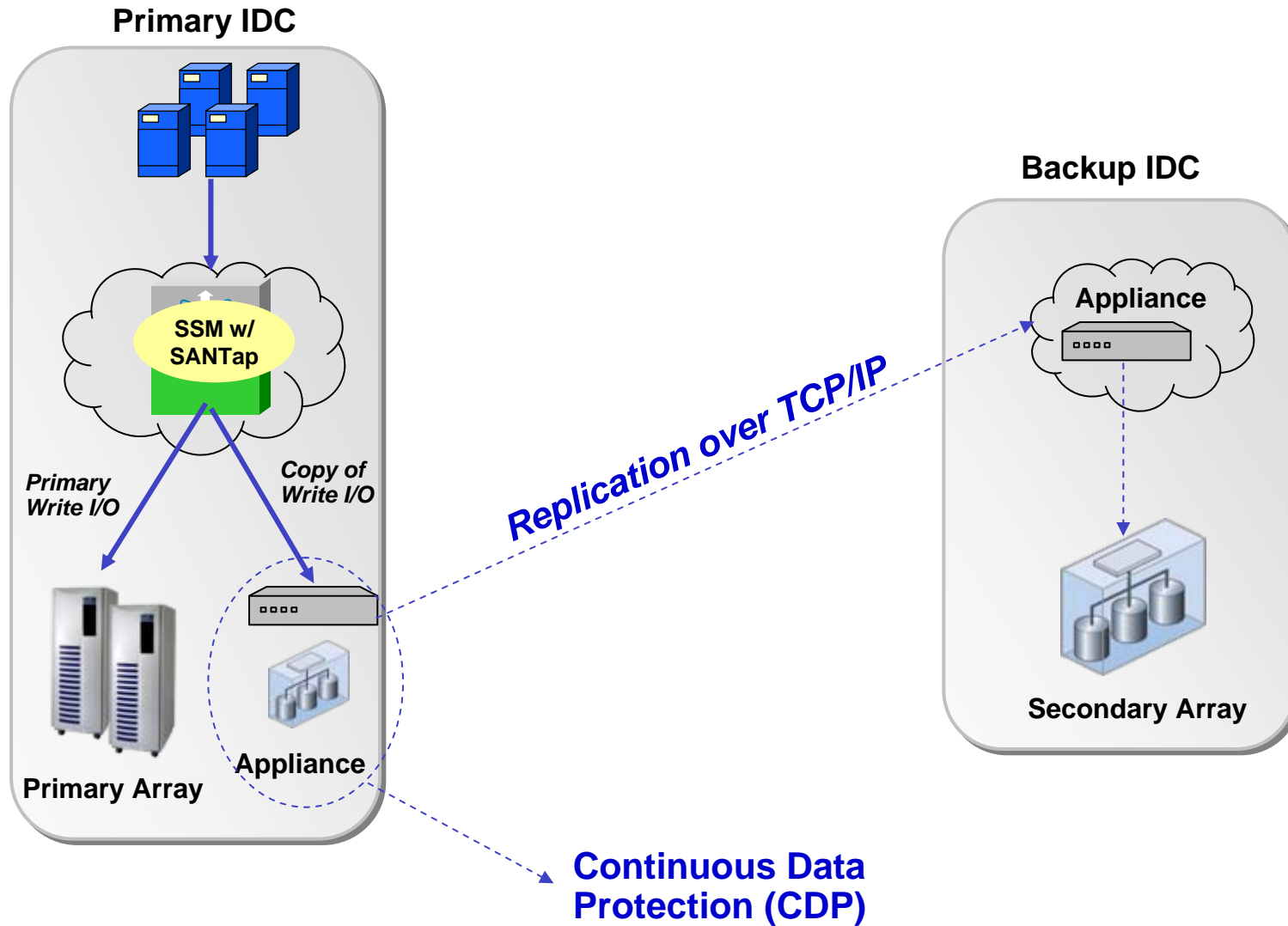
- Architecture (1,2,4,10 Gbps Today, 8 Gbps Ready)
- VSAN / Trunking
- Port- Channels (up to 16 ISL's)
- Multiprotocol (FCP, FCIP, iSCSI, FICON)
- SAN Extension over Optical, SDH and TCP/IP
- Control Plane (Pentium III, 1.2 GHz)
- Scalability / Investment Protection
- Traffic Engineering / QoS
- Management (FM/DM)
- Security (Radius/Tacacs+, SNMPv3, Encryption Data at rest/flight)
- Support
- Innovation (SANTap, X-Copy, Virtualization)

Cisco's Virtual SANs (VSAN): Strict Isolation for Fabric Consolidation



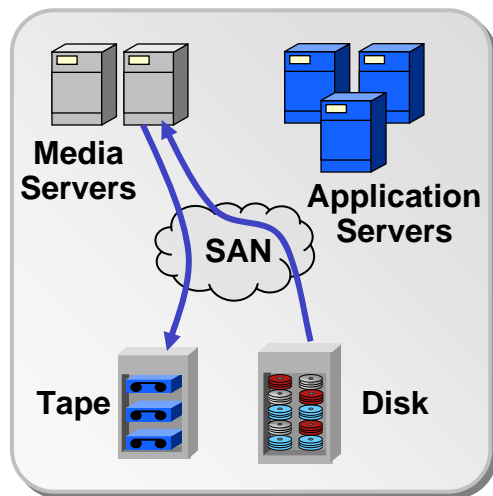
- VSANs, defined as Virtual Fabrics, are ANSI T11 Standard
 - FC-SW-4 and FC-FS-2 specifications
- With VSANs, a SAN can be partitioned into *multiple* virtual SANs
- Each VSAN has *independent FC services* with hardware-based isolation
 - Zoning Server with separate zone sets
 - Name Server
 - Domain Manager
 - Roles-based Access Controls (RBAC)
 - FC Addresses i.e. FC-IDs
 - FSPF Routing
- VSAN can be assigned on a per port basis
- ISLs can carry traffic for multiple VSANs

SANTap Applications



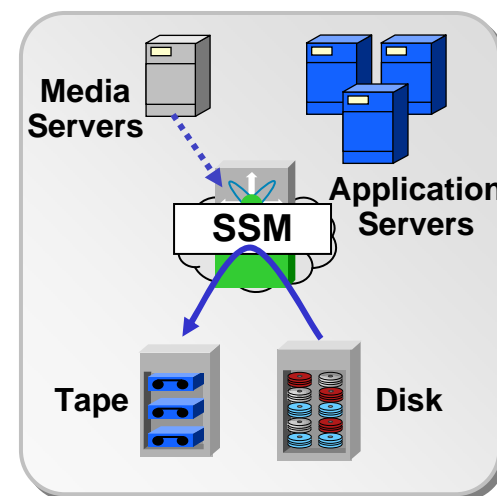
Network-Accelerated Serverless Backup (NASB)

Serverless Backup - Today



Network-Accelerated Serverless Backup

Instead of Media Servers, MDS with SSM moves data from Disk to Tape



Customer Benefit	Benefit Description
Lower TCO	<ul style="list-style-type: none"> Offload I/O and CPU work from Media Servers to SSM Reduces server administration and mgmt tasks
Higher Performance & Reliability	<ul style="list-style-type: none"> Each SSM delivers up to 16 Gbps throughput SSM integrated in highly available MDS platform
Investment Protection	<ul style="list-style-type: none"> No changes to existing backup environment SSM data movement can be enabled w/ software

SANOS v3.2.1 License Packages

SAN Extension	Enterprise	Fabric Manager Server	Storage Services Enabler	Mainframe
<ul style="list-style-type: none"> ▪ FCIP ▪ Inter-VSAN Routing (IVR) for FCIP ▪ Compression for FCIP ▪ Disk Write Acceleration for FCIP ▪ Tape Read/Write Acceleration for FCIP ▪ SAN Extension Tuner ▪ Network Simulator 	<ul style="list-style-type: none"> ▪ Inter-VSAN Routing (IVR) for FC ▪ LUN Zoning ▪ Read-only Zones ▪ FC Port Security ▪ FC-SP authentication ▪ VSAN-based Access Control ▪ FC QoS ▪ Extended BB_Credits ▪ FC Write Acceleration ▪ SCSI Flow Statistics for SSM ▪ IPsec & IKE for IPv4 ▪ Digital Certificates ▪ Fabric Binding for open systems ▪ SAN Device Virtualization (SDV) 	<ul style="list-style-type: none"> ▪ Centralized, Multi-fabric Management ▪ Historical Performance Monitoring ▪ Threshold Monitoring ▪ Continuous Health & Event Monitoring ▪ Web-based operational view ▪ Roaming User Profiles ▪ FMS Proxy Services over TCP ▪ Traffic Analyzer for SCSI Flow Statistics ▪ Fabric Analysis Reports 	<ul style="list-style-type: none"> ▪ Network-based Storage Virtualization ▪ Network Accelerated Serverless Backup (NASB) ▪ SAN Tap 	<ul style="list-style-type: none"> ▪ FICON ▪ CUP ▪ VTS ▪ XRC ▪ VSAN Intermix ▪ Switch Cascading ▪ Fabric binding for FICON ▪ Port swap, block, prohibit ▪ Persistent FCIDs for FICON ▪ Tape Read Acceleration for FICON ▪ Config locking for FICON

SAN-OS 3.2 New Hardware and Software Summary



SAN-OS 3.2: Delivering Secure Information Management

MDS 9000 Family of Multilayer Directors and Fabric Switches



New Hardware Platforms

MDS 9222i Multiservice Modular Switch
MDS 18/4-Port Multiservice Module
MDS 9134 Multilayer Fabric Switch

New Feature Set

Storage Media Encryption (SME)
Data Mobility Manager (DMM)
N-Port Virtualizer (NPV)

Cisco MDS 9222i Multiservice Modular Switch

Disaster Recovery/Business Continuance

- FCIP SAN Extension
- HW-based Compression/Encryption
- FC SAN Extension
- FCIP/FC Acceleration

Data-At-Rest Encryption

- Storage Media Encryption
- Tapes and VTLs
- Transparent Fabric Service
- Key Management

Modular High Density

- 18 4-Gbps FC, 4 GE Ports
- Scales up to 66 FC Ports
- Only 3 RU



SAN Routing

- Inter VSAN Routing

SAN Consolidation

- Virtual SANs (VSANs)
- Multiprotocol Integration – FC, FICON, FCIP, iSCSI

Continuous Remote Replication / Continuous Data Protection

- Immediate Data Recovery
- Reduced WAN Expenses

Data Migration

- Online Data Migration
- Ease-of-Deployment

Storage Virtualization

- Volume Management
- Data Migration
- Copy across Heterogeneous Tiers

MDS 18/4-Port Multiservice Modules

Optimized Form Factor

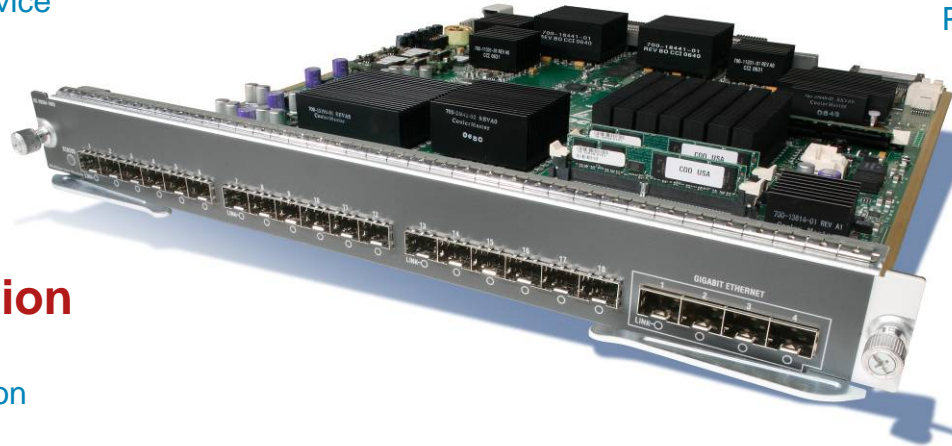
18 4-Gbps FC Ports
4 GigE Ports

Data-At-Rest Encryption

Storage Media Encryption
Tapes and VTLs
Transparent Fabric Service
Key Management
FIPS Level 3

High Availability

Redundant BW/Slot
VSAN
Port Channels



SAN Consolidation

VSAN & IVR
Multiprotocol Integration

Secure Access

VSAN-based RBAC
RADIUS
TACACS+

Disaster Recovery

Integrated FCIP support
FCIP Acceleration Services
HW Compression/Encryption
FC SAN Extension

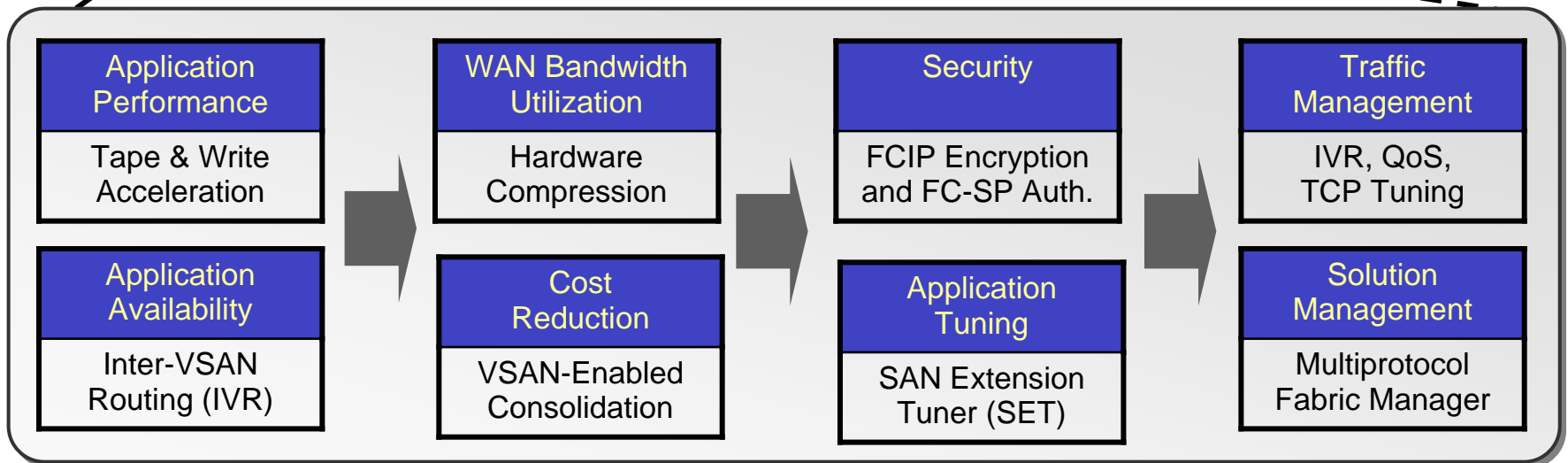
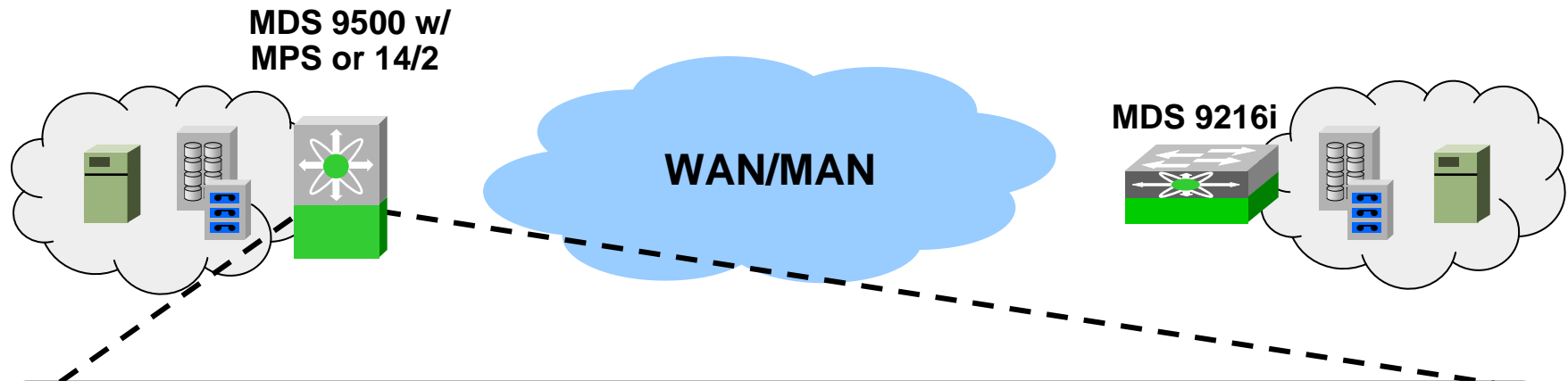
Mainframe Connectivity

FICON support

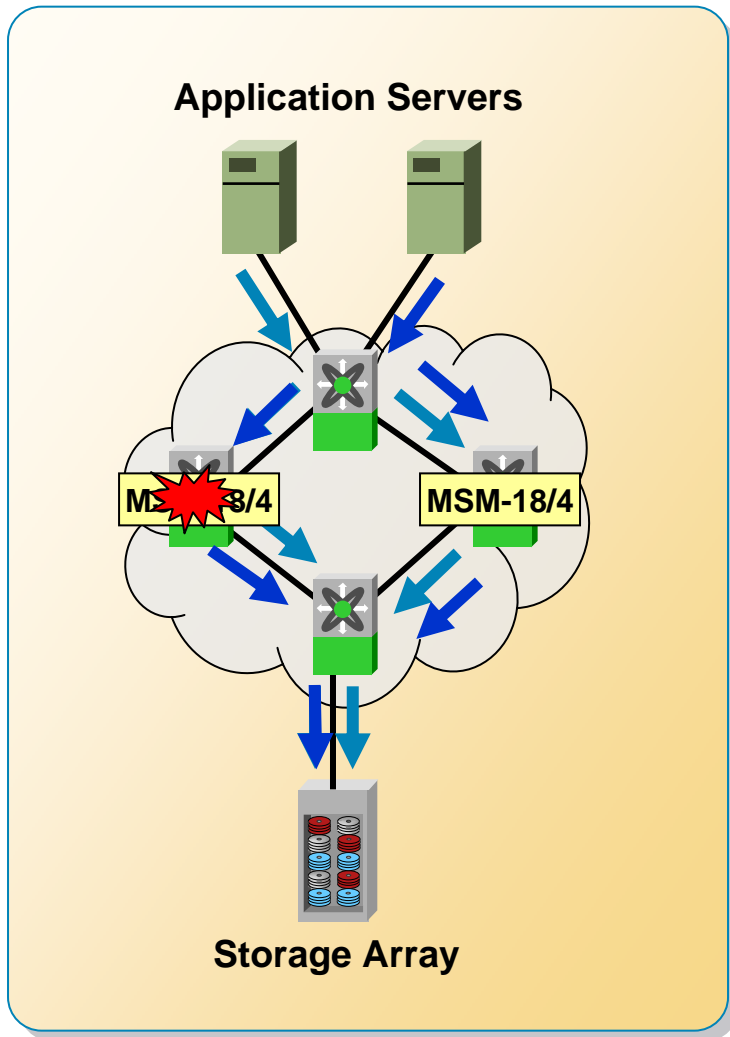
FCIP-based Business Continuity: Comprehensive SAN Extension Solution

Primary Data Center

Backup Data Center

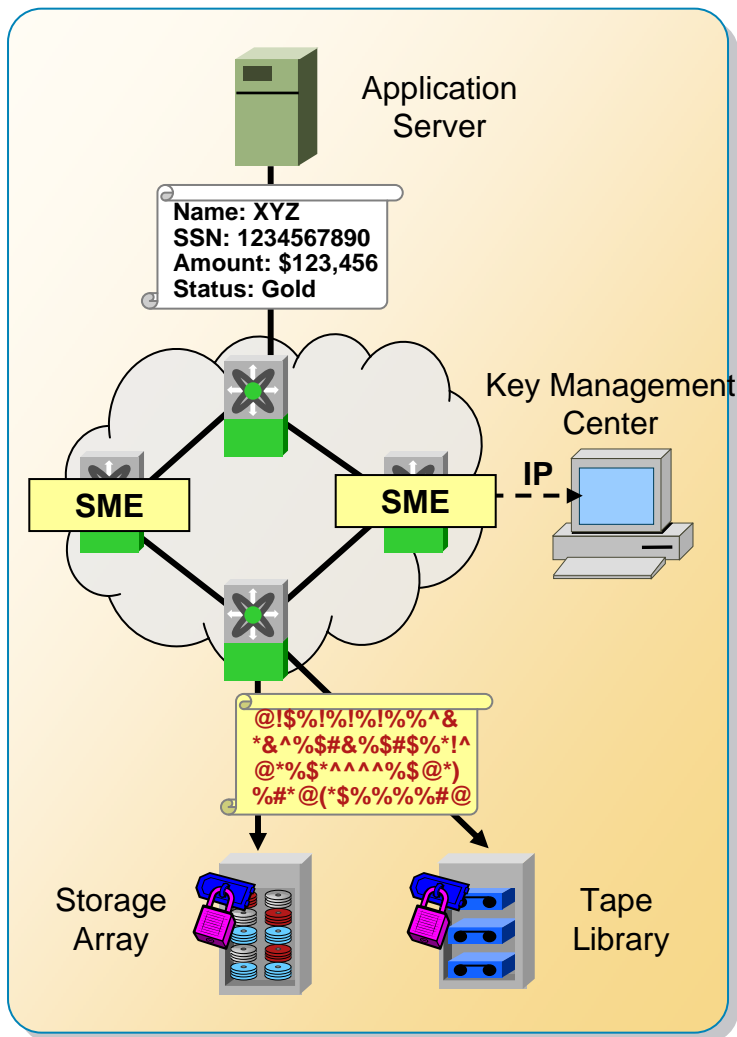


Intelligent Storage Applications: Delivered as a Transparent Fabric Service



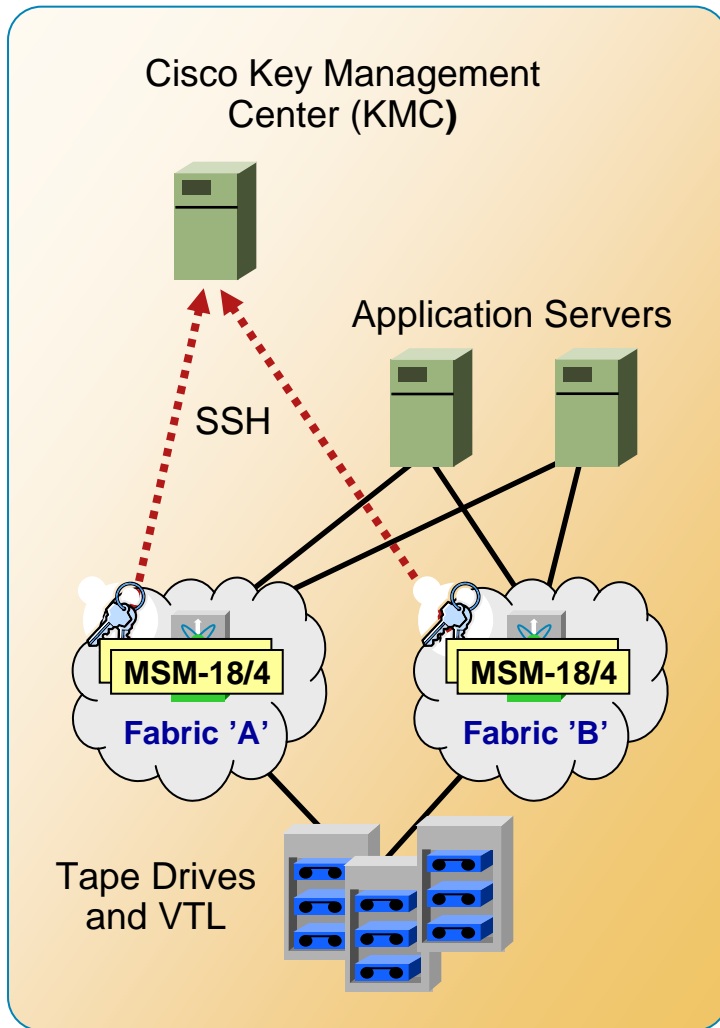
- Extend storage services to any device in the SAN
- Transparent to applications
- Non-disruptive deployment
 - No SAN re-configuration
 - No re-wiring to insert appliances
- Highly scalable performance
- Automatic load balance
- Reliable, highly available service
- Wizard-based provisioning

Cisco Storage Media Encryption (SME)



- Encrypts storage media (data at rest)
 - IEEE compliant AES-256 encryption
 - Integrated as transparent fabric service
- Transparent Fabric Service
- Supports heterogeneous storage arrays, tape devices, and VTLs
- Compresses tape data
- Offers secure, comprehensive key management
- Allows offline media recovery
- Built upon FIPS level-3 system architecture

Cisco Key Management Center



- Integrates key management with Cisco Fabric Manager
 - No additional software to install
 - Intuitive provisioning and management through web browser interface
- Provides complete, essential key management functions for Cisco SME
 - Archives, recovers, distributes, and shreds media keys
 - Accommodates single and multiple site environments
- Configures, stores, and transports keys securely

Cisco SME Hardware Platforms

HIGH-PERFORMANCE INTEGRATED SOLUTION WITH MULTI-GIGABIT THROUGHPUT



Runs SME

Encrypts traffic from any port in fabric – Requires no rewiring

18/4-Port Multiservices Modules (MSM-18/4, MSFM-18/4)

MDS 9000
Family
Systems

MDS 9000
Modules

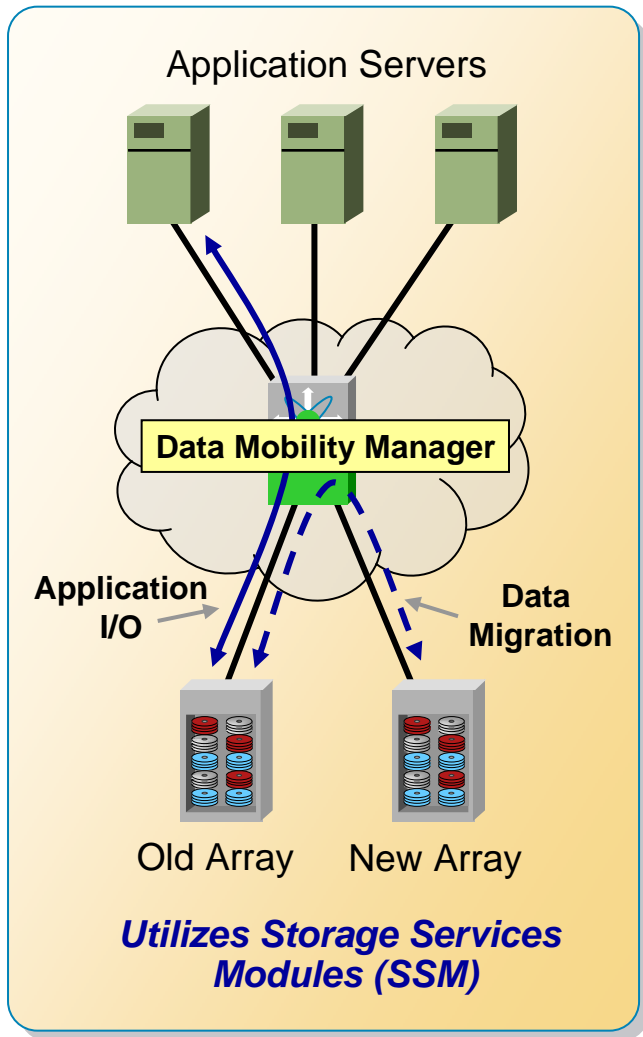
Mgmt

Cisco Fabric Manager w/Key Management Center

OS

Cisco MDS 9000 Family SAN-OS

Cisco Data Mobility Manager (DMM)



- Migrates data between storage arrays for
 - Technology refreshes
 - Workload balancing
 - Storage consolidation
- DMM offers
 - Online migration of heterogeneous arrays
 - Simultaneous migration of multiple LUNs
 - Unequal size LUN Migration
 - Rate adjusted migration
 - Verification of migrated data
 - Secure erase
 - Dual fabric support
 - CLI and wizard-based management with Cisco Fabric Manager
- Requires no SAN re-configuration or rewiring

Features

- Online Sync Data Migration
- Heterogeneous Array Migration
- Unequal LUN Migration
- Rate Adjusted Migration
- Verification of migrated data
- Delayed Cut-Over
- Configuration using Wizard based GUI & CLI
- Dual Fabric/Multipath Support

Cisco DMM Enabled Platforms

**HIGH-PERFORMANCE INTEGRATED SOLUTION WITH
MULTI-GIGABIT THROUGHPUT**



MDS 9222i



**MDS 9216A
MDS 9216i**



MDS 9506



MDS 9509



MDS 9513



Runs DMM

Storage Services Module (SSM)

**MDS 9000
Family
Systems**

**MDS 9000
Modules**

Mgmt.

OS

Cisco Fabric Manager w/ DMM Wizard

Cisco MDS 9000 Family SAN-OS

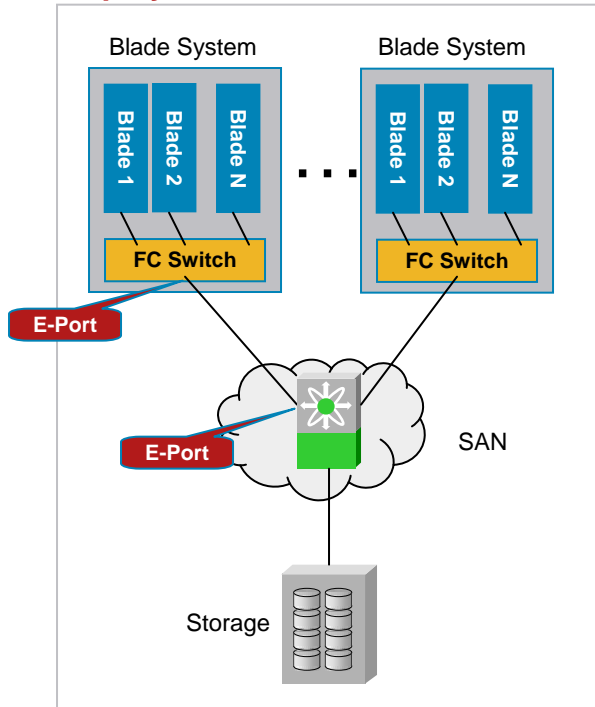
SAN-OS v3.2.1 License Packages

Storage Media Encryption	Data Mobility Manager
<ul style="list-style-type: none">▪ Strong AES-256 encryption of data at rest▪ Heterogeneous device support▪ Tape and VTL support▪ Non-disruptive installation and provisioning▪ Key manager▪ Secure management and vaulting of media keys▪ Key catalog import and export▪ Smart Card support▪ API for enterprise-wide key management systems	<ul style="list-style-type: none">▪ Online migration of heterogeneous arrays▪ Simultaneous migration of multiple LUNs▪ Unequal size LUN migration▪ Rate adjusted migration▪ Verification of migrated data▪ Secure erasure of migrated data▪ Dual fabric support

N-Port Virtualizer (NPV)

Enabling Large-Scale Blade Server Deployments

Deployment Model - FC Switch Mode

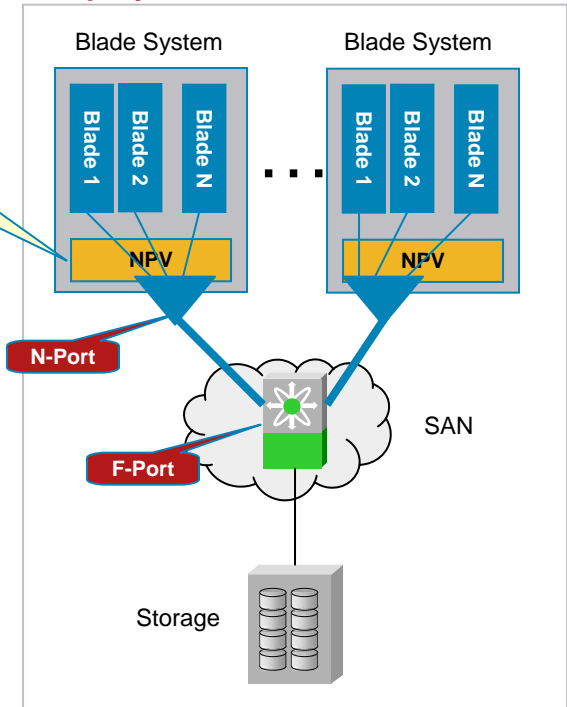


Blade Switch configured as NPV (i.e. HBA mode)

NPV enables large scale Blade Server deployments by:

- Reducing Domain ID usage
- Addressing switch interop issues
- Simplifying management

Deployment Model - HBA Mode



	Blade Switch Attribute	
FC Switch Mode (E-Port)	Deployment Model	HBA Mode (N-Port)
One per FC Blade Switch	# of Domain IDs Used	None (uses Domain ID of core switch)
Yes	Interoperability issues with multi-vendor Core SAN switch	No
Medium	Level of management coordination between Server and SAN Administrators	Low

Fabric Switches



Cisco MDS 9124 Multilayer Fabric Switch Features:



**Optional
Power Supply**

MDS 9124 Fabric Switch

- **24 line rate 4-Gbps Fibre Channel ports**
64 buffer-to-buffer credits per group of 4 ports
- **1/2/4 Gbps shortwave Fibre Channel SFPs**
- **8-port base configuration**
8-port incremental licensing
- **Comprehensive Security Framework**
- **Management through 10/100 Base-T Ethernet and RS232 Console Port**
- **2 hot-swappable power supplies with integrated fans**
3 Fans + 1 Fan per Power Supply
- **Complete SAN-OS 3.x feature set, with few exceptions**
- **Non-disruptive software upgrade**
- **Support for 16 VSANs**
- **1 SPAN session**
- **Full MIB and SMI-S support**

<http://www.enterprisestrategygroup.com/ESGPublications/download.asp?ReportAttachment=Attachment1&ReportID=722>

IBM and HP FC Switch Modules



IBM FC Blade Module

- Total 20 ports
- Port Licensing offered for
 - 7 servers + 3 uplinks
 - 14 servers + 6 uplinks
- SAN-OS firmware



HP FC Switch Module

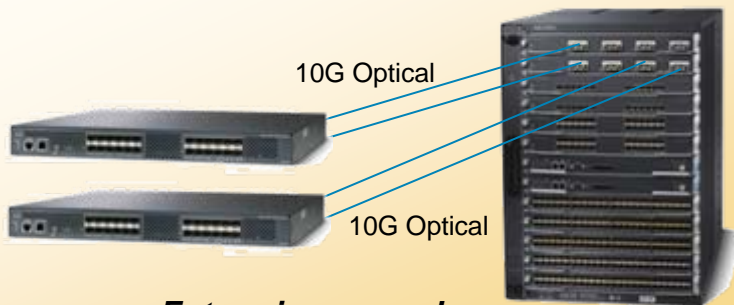
- Total 24 ports
- Port Licensing offered for
 - 8 servers + 4 uplinks
 - 16 servers + 8 uplinks
- SAN-OS firmware



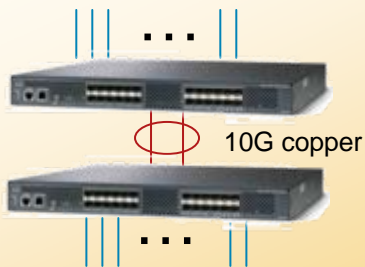
MDS 9134 Multilayer Fabric Switch Extending the Fabric Switch Portfolio



Standalone



Enterprise core-edge



High density stackable

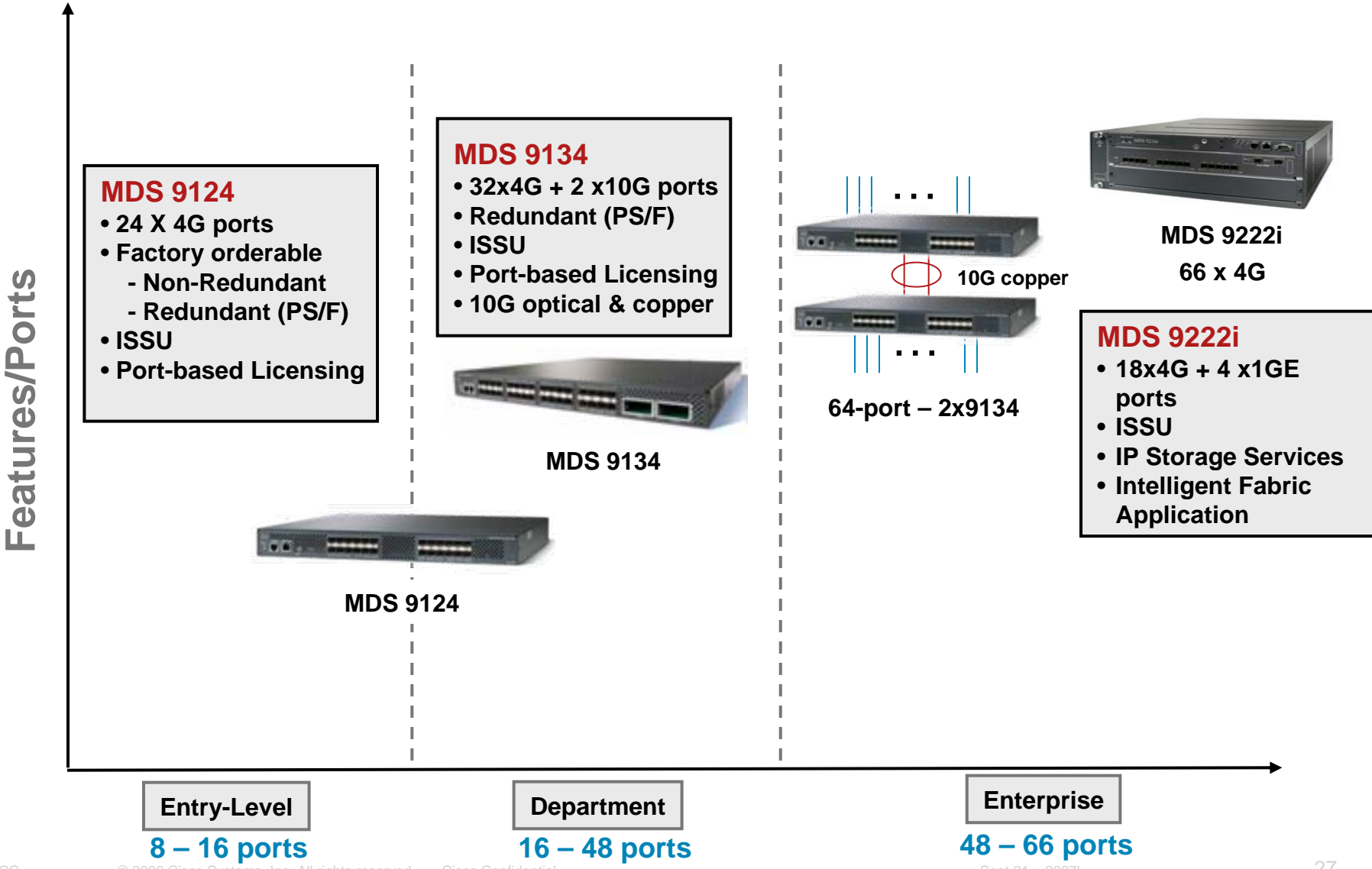
MDS 9134 Platform

- 32 x 4G + 2 x 10G FC ports in 1 RU form-factor
Line rate performance on each port
- Multiple deployment options
Standalone – Up to 32 x 4G ports
Enterprise core-edge – Up to 32 x 4G + 2 x 10G
High density stackable – Up to 64 x 4G ports
- On-demand ports
24-port base with 8-port license for growth
10G port license for additional connectivity
- Redundant, hot-swappable power supplies

Powered by SAN-OS Software

- Dramatically simple and ease-to-use
- Cisco's market leading Enterprise-class functionality now available on entry-level fabric switches
Security, Availability, and Flexibility

4-Gbps Fabric Switch Portfolio



SAN-OS 3.x Roadmap

- SME Tape / VTL Support
- Port Security Wizard
- NPV Wizard
- FCIP Wizard for MSM-18/4 and 9222i
- MSM-18/4 and 9222i FICON qualification
- IPv6 for IPsec

Oct CY'07
SAN-OS 3.2(2)

DMM

- Async Migration

- Secure Erase

Fabric Manager

- JBOSS performance improvements

- FM Web services

SAN-OS

- WWW NAT

- NPV traffic management

- SPAN locking change

- BS support for new IBM chassis

- Gen1/Gen2 SAN extension interop

SMI-S

- Expanded support for indications

- FC security & Virtual Fabric Subprofiles

Feb CY'08
SAN-OS 3.3

Fibre Channel Optics for SAN Extension

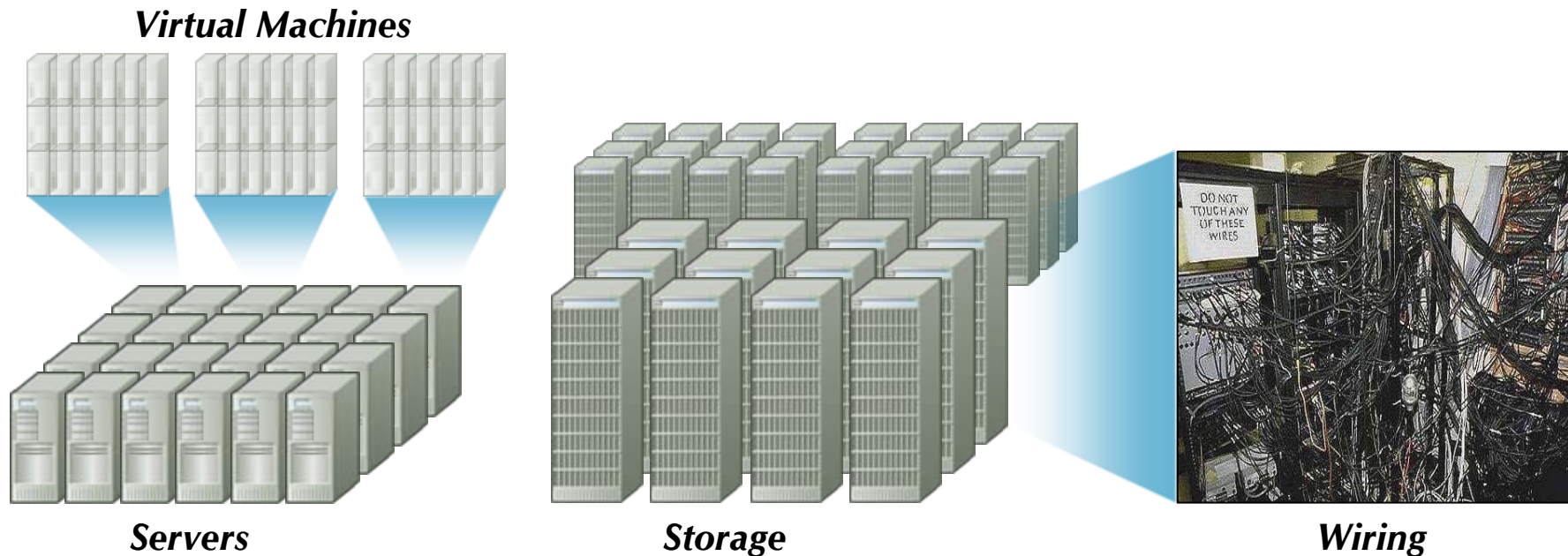
Optics	Application	Distance	Availability
10G FC ER	Cost effective high performance long distance ISL	40km	Available
10GE SR	Connectivity to existing 10GE optical transponder – cost saving vs. new 10G FC transponder	33m	Q3 CY07
10G FC CX4	Cost effective copper interconnect	15m	Q3 CY07
2G FC DWDM <i>32 wavelengths</i>	Long-haul networks, possibly combined with amplifiers	80km 200km (with amplifiers)	Q3 CY07
4G FC CWDM <i>8 wavelengths</i>	Less expensive, shorter distance multiplexed connectivity	25km as CWDM 40km point-to-point	Available
4G FC DWDM <i>32 wavelengths</i>	Long-haul networks, possibly combined with amplifiers	80km 200km (with amplifiers)	1H CY08 <i>(Tentative)</i>
10GE DWDM <i>32 wavelengths</i>	Long-haul networks to carry 10G FC, possibly combined with amplifiers	80km 200km (with amplifiers)	1H CY08

Fibre Channel over Ethernet (FCoE)



Challenges in the Data Center

Everything is Growing!



All of this growth is causing a significant problem with power, cabling and cooling

ANSI T11 Project: FCoE

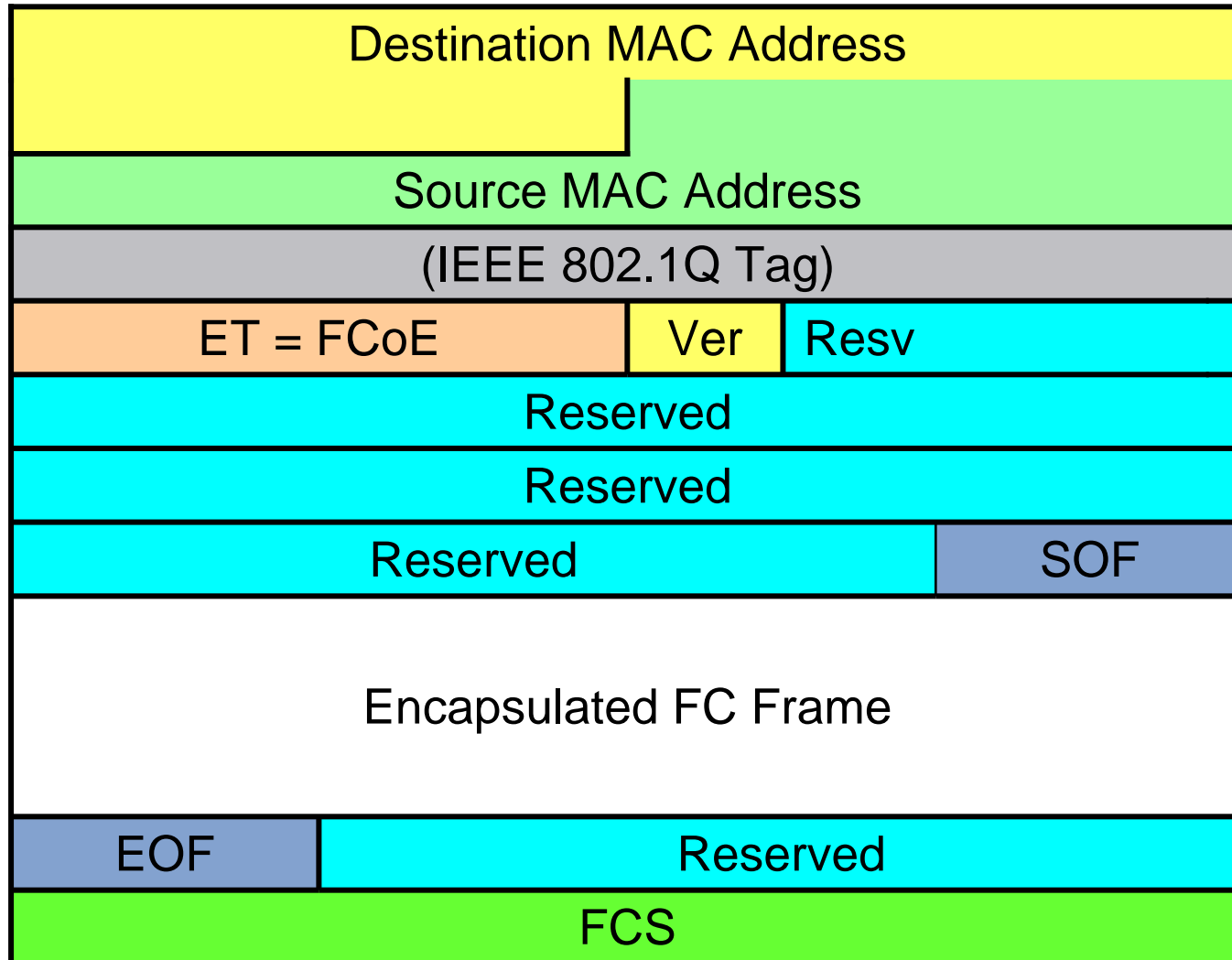
- **FC-BB-5 Project Proposal, T11/07-196v1, April 2007 Project Proposal For A New INCITS Standard Fibre Channel – Backbone – 5 (FC-BB-5) T11/07-196**
- **See http://www.t11.org/ftp/t11/admin/project_proposals/07-196v1.pdf**
- **Supporting companies:**
 - Brocade, Broadcom, EMC, Emulex, Qlogic, Cisco Systems, Nuova Systems, Sun Microsystems, IBM, Intel**
- **Will use features of IEEE 802.1au if available**
- **For further information: www.t11.org/fcoe**

What is FCoE?

The technology foundation for delivering a unified fabric

- A method for a direct mapping of Native FC frames over Ethernet
- Storage traffic (SCSI primarily) is transported in Ethernet networks over TCP (iSCSI)
 - Ethernet drops frames when congested, TCP provides reliable transport
 - But, TCP is not hardware friendly
- Fiber Channel switches use a Buffer to Buffer credit mechanism when congestion occurs to avoid frame drops
- Ethernet switches have some optional Ethernet extensions to allow no drop of frames when congested
 - The Pause mechanism defined in IEEE 802.3 Annex 31B
- If these extensions are implemented, Fiber Channel frames can be mapped directly on top of Ethernet avoiding TCP
 - FCoE: Fiber Channel over Ethernet

Converged Frame Format (i.e., no TimeStamp)



FCoE Advantages

FCoE is Managed as Fibre Channel at the host and switch level

*Aligned with the
FC-BB-4 Model*

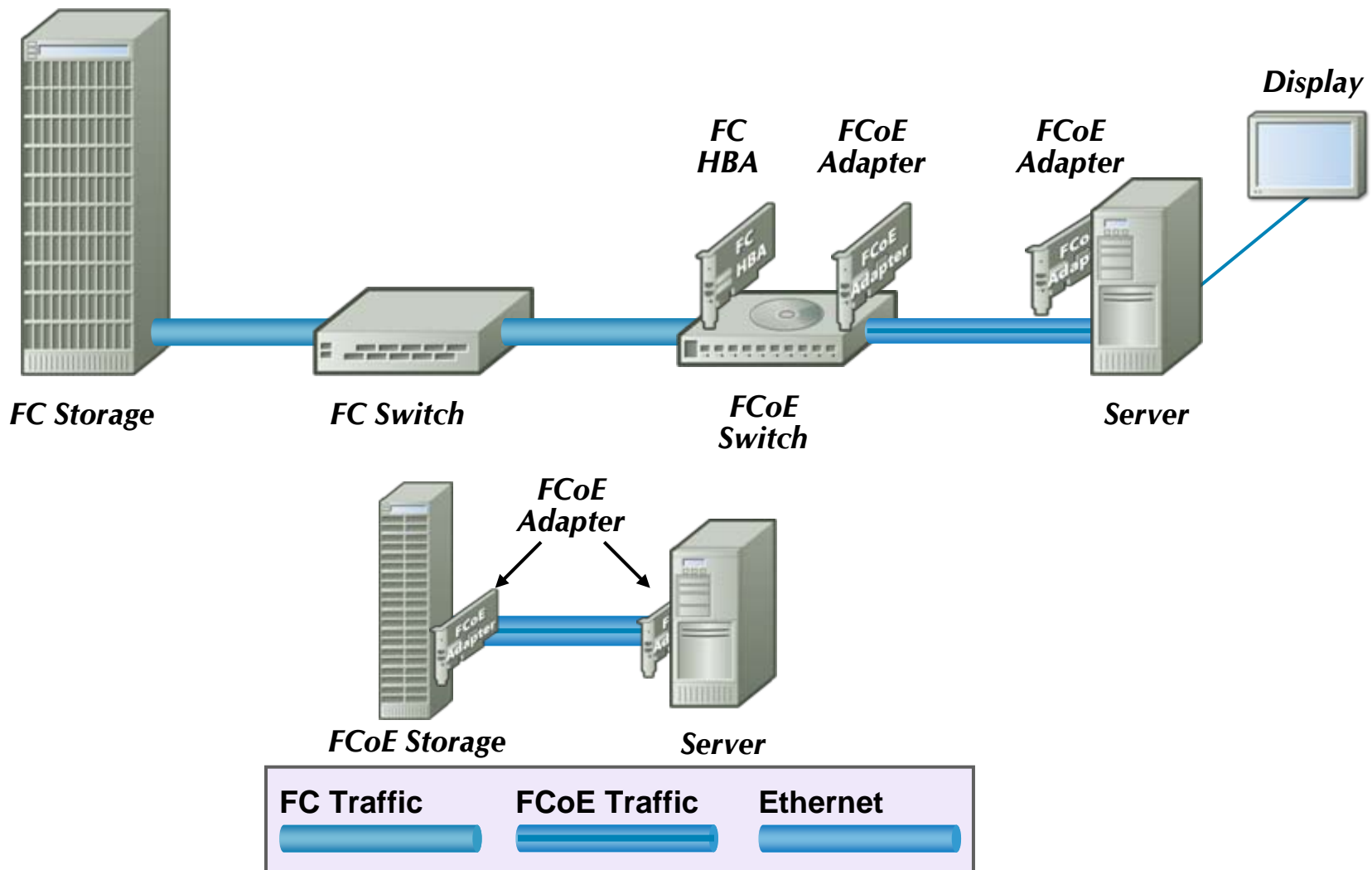
Completely based on the
FC model

Same host-to-switch and
switch-to-switch behavior of FC

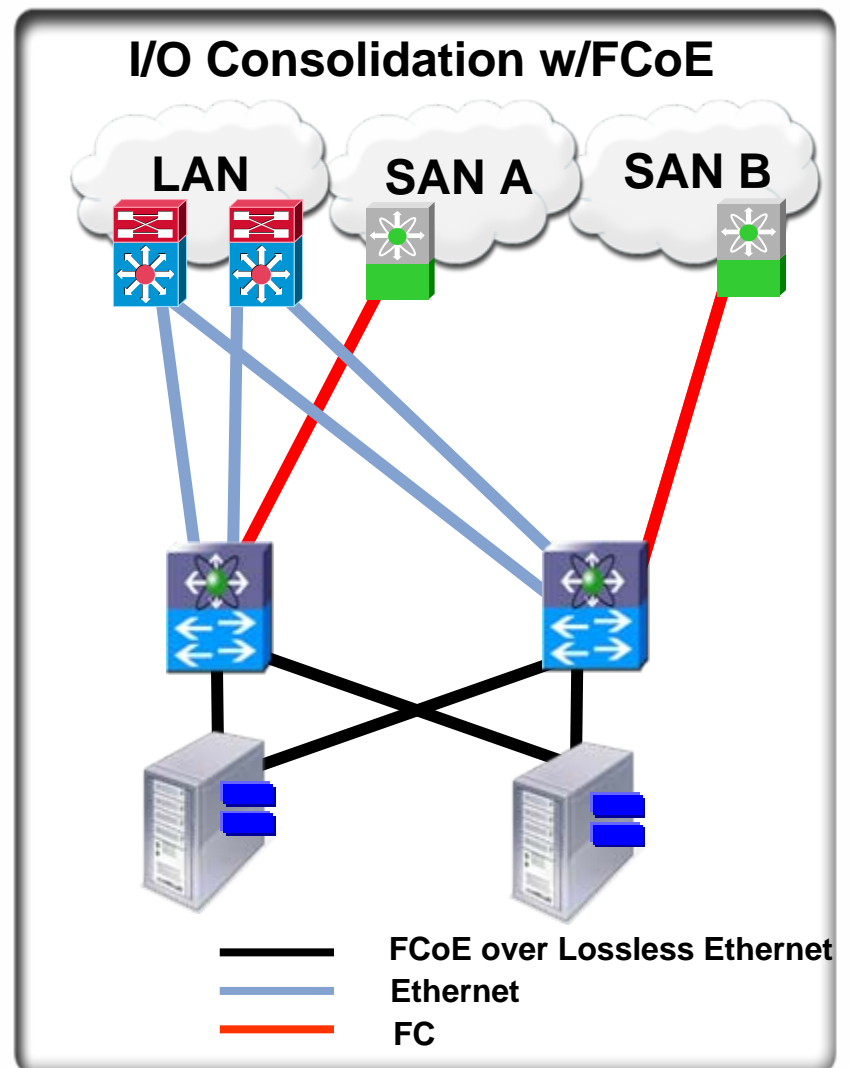
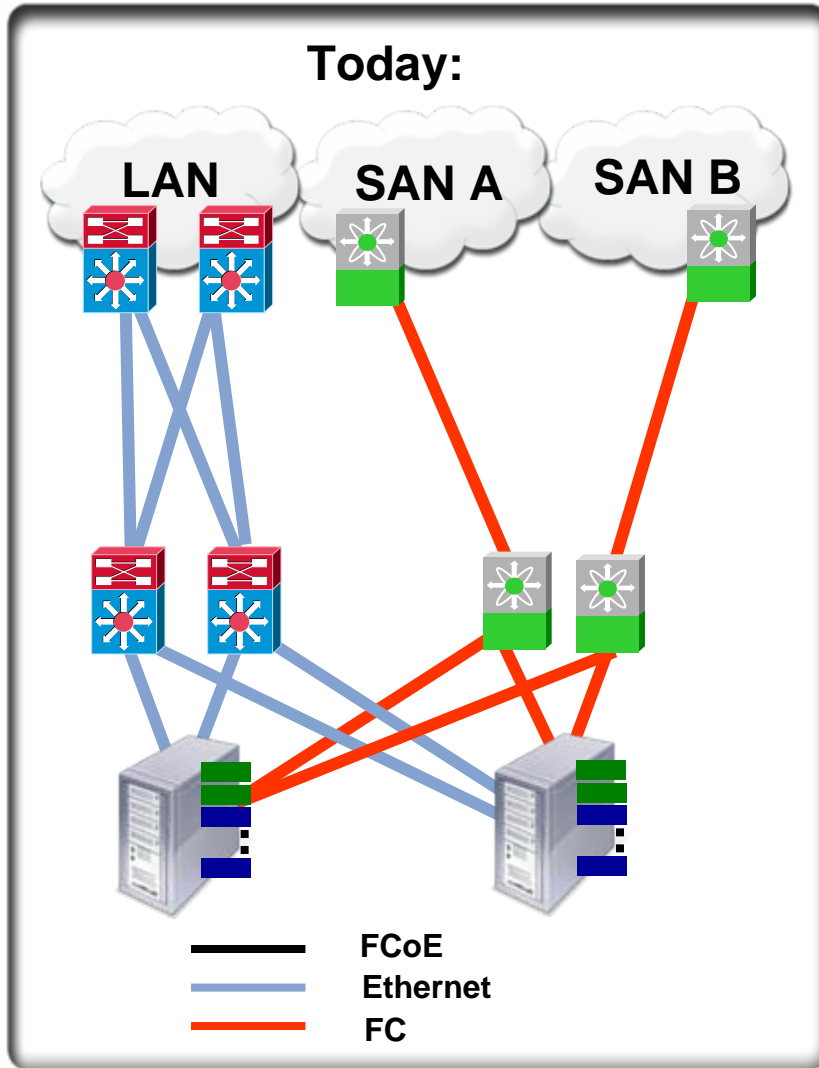
E.g., in order delivery or
FSPF load balancing

WWNs, FC-IDs, hard/soft
zoning, DNS, RSCN

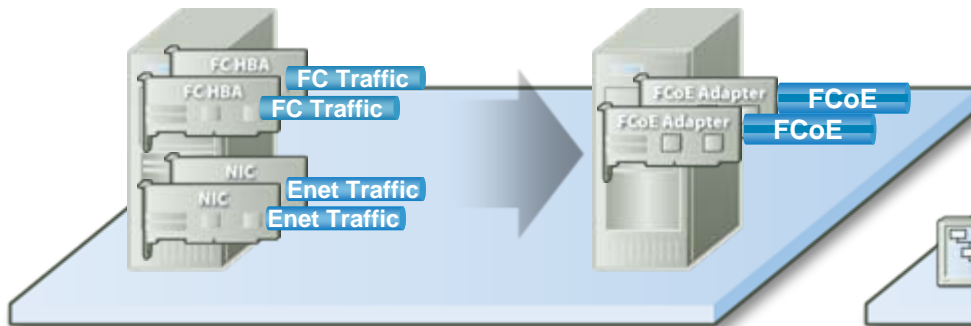
FCoE Technology Demonstration at SNW Dallas Texas, October 15-19, 2007



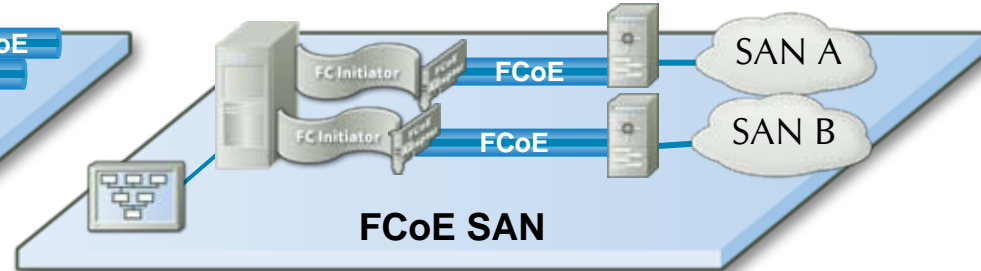
I/O Consolidation



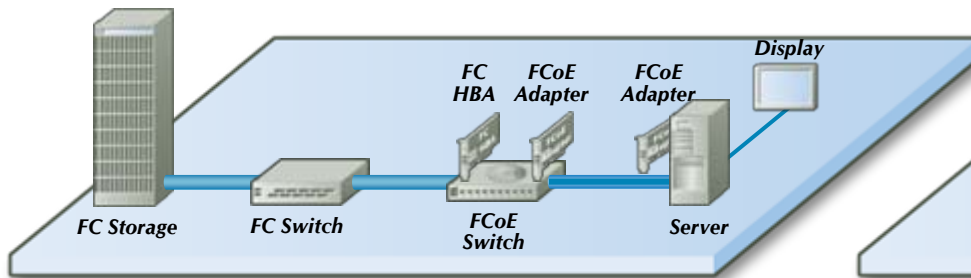
I/O Consolidation: Benefits to Customers



Fewer NICs and Cables



Same Management Model as Native FC

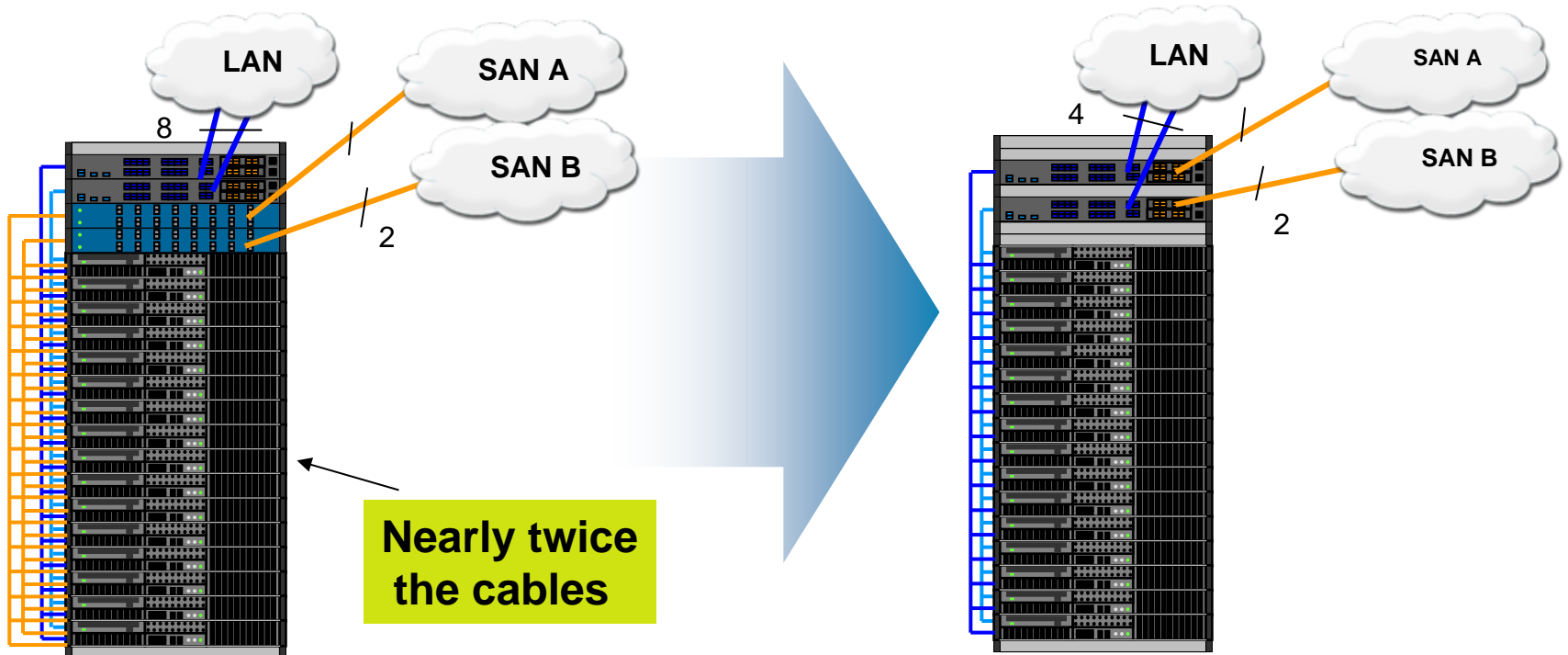


No Gateway



Less Power and Cooling

Phase 1: Top of Rack (ToR) Server Switch



16 Servers	Enet	FC	Total
Adapters	16	16	32
Switches	2	2	4
Cables	32	32	64
Mgmt Pts	2	2	4

16 Servers	Enet	FC	Total
Adapters	16	0	16
Switches	2	0	2
Cables	36	0	36
Mgmt Pts	2	0	2

Comparing Encapsulation Technologies

- To transport SCSI
- Other than native Fibre Channel

