Cisco MDS Introduction

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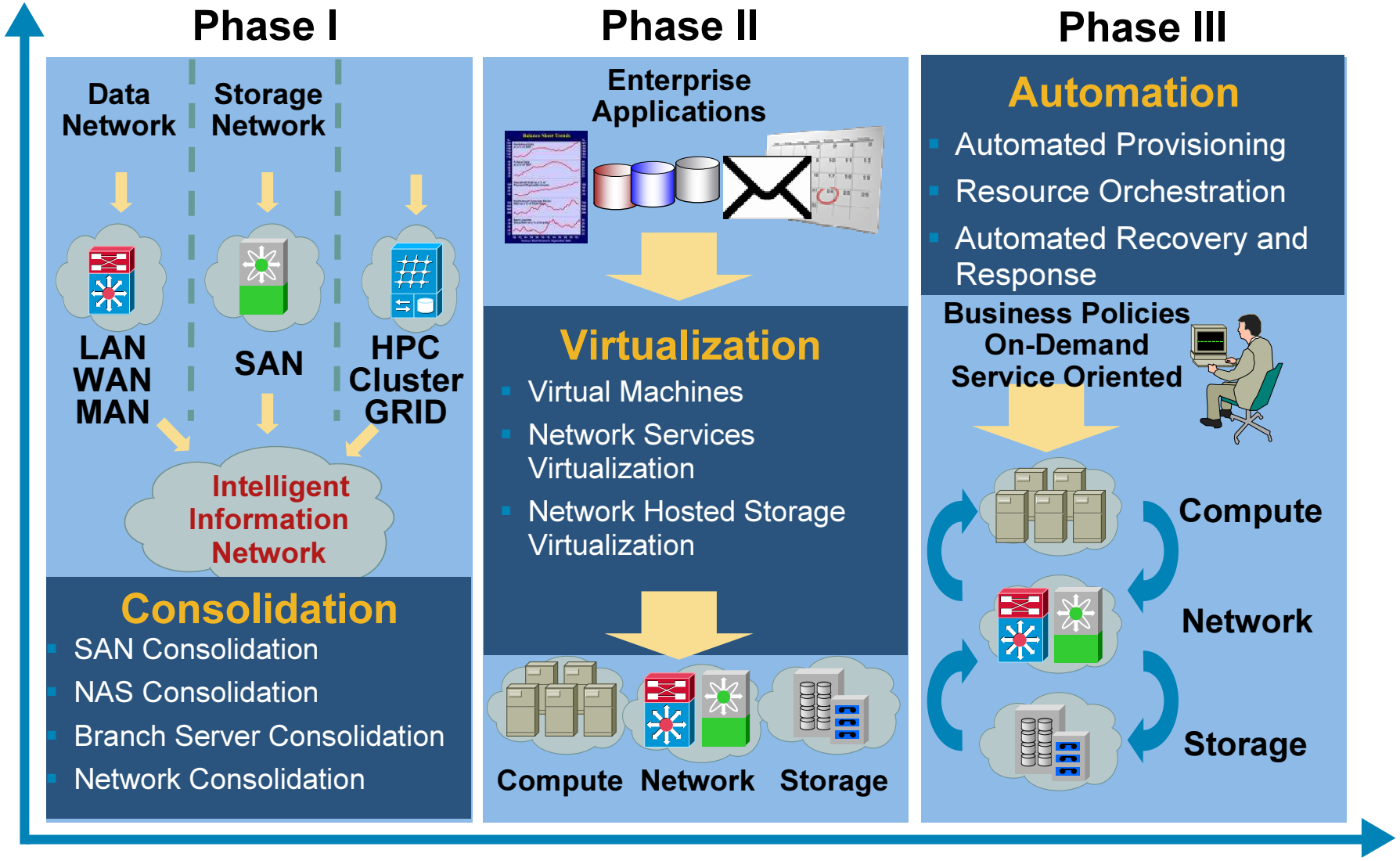
November 29, 2006

Agenda

- Cisco Data Center Vision
- Cisco Storage Vision
- Cisco MDS Product Overview
- Cisco Intelligent Fabric Applications:
  - Network-accelerated storage applications
  - Network-assisted storage applications
  - Network-hosted storage applications

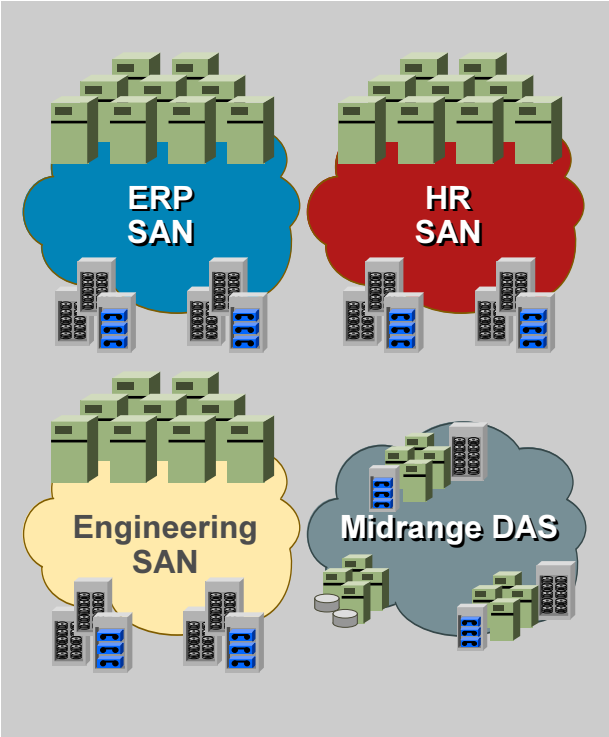
Cisco Data Center Vision

Cisco Data Center of the Future - Vision

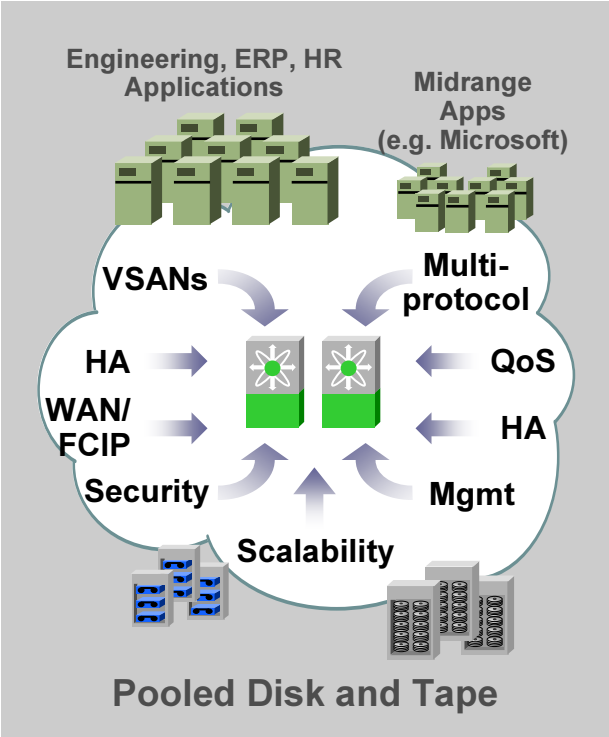


Evolution to Multilayer Storage Utility Model

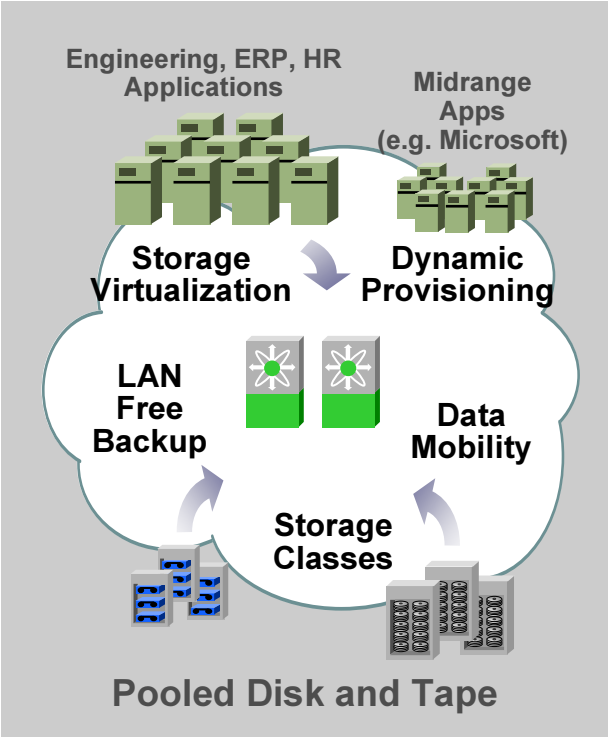
Homogenous "SAN Islands" → **Multilayer Storage Network** → **Multilayer Storage Utility**



Phase I: Isolated SANs and Mid-range DAS



Phase II: Consolidation MultiProtocol Transport and Full Service Virtual Fabrics



Phase III: Fabric Embedded Storage Services and Storage Virtualization

Infrastructure Needs

- ***High Density Architecture*** to support consolidation and increase utilization
- ***Ease of Provisioning*** to support organizations' changing needs
- ***Ease of Provisioning*** to support customers' changing needs
- ***Heterogeneous Storage Support*** for customers' diverse environments
- ***Investment Protection*** for both the service provider and customers
- ***Virtualization*** to enable scalable design, growth, and consolidation of storage, server and network resources – fault and management isolation and sharing resources
- ***Integrated distance extension*** technologies for cost effective business continuity
- ***Integrated Compression and Encryption*** reduces leased line charges and cost of separate encryption devices
- ***Diagnostic and Troubleshooting Tools*** reduce downtime and improve performance, for management at device and network / fabric level

Cisco Multilayer Intelligent Storage Solutions

- Product Overview

MDS 9000 Fabric Switch Positioning

Cisco positioned to extend reach all market segments

Industry-Leading Investment Protection Across a Comprehensive Product Line

Enterprise & Service Provider

Small/Medium Business

MDS 9000 Family Systems

MDS 9020/9124*

MDS 9216 and 9216i

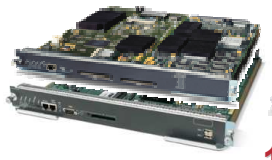
MDS 9120/9140

MDS 9506

MDS 9509

MDS 9513

MDS 9000 Modules

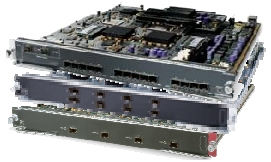


Supervisor 1 and 2

14-Port, 16-Port, 32-Port 1 & 2 Gb FC

12-Port, 24-Port, 48-Port 1, 2 & 4Gb FC

4-Port 10Gb FC



IP Storage Services – iSCSI and FCIP

SSM (Virtualization; Intelligent fabric Applications)

Mgmt.

Cisco Fabric Manager

OS

Cisco MDS 9000 Family SAN-OS

MDS 9000 Director Roadmap: 3.0-3.1
High Port Count 4Gbps & 10Gbps FC Solutions

MDS 9513

12-port FC

24-port FC

48-port FC

Supervisor 2

4-port 10Gbps FC

4G SFPs
10G X2

MDS 9513, 4Gbps, 10Gbps

MDS 9513, Supervisor 2

12 x 1/2/4 Gbps FC

24 x 1/2/4 Gbps FC

48 x 1/2/4 Gbps FC

4 x 10 Gbps FC

4 Gbps SFPs (SW, LW)

10 Gbps X2 (SW, LW)

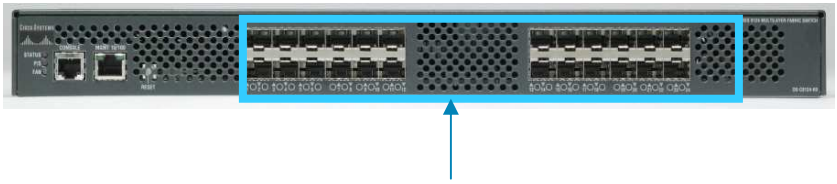
Up to 528 Ports per Chassis

SW Support in SAN-OS 3.0

CQ2 2006
SAN-OS 3.0

Introducing Cisco 9124 Fabric Switch

MDS 9124 – Front View



24 x 4G FC ports with line rate performance
(8-port base with 8-port License)

MDS 9124 – Rear View

Redundant Power Supply

Fans

MDS 9124 Platform

- Based on Cisco's System-on-a-Chip (SOC) technology
- 24 x 4G FC ports in 1 RU form-factor
  - Line rate performance on each port
- On-demand ports
  - 8-port base with 8-port license for growth
- Redundant, hot-swappable power supplies

Powered by SAN-OS Software

- Affordability without compromising functionality
- Dramatically simple and ease-to-use
- Cisco's market leading Enterprise-class functionality now available on entry-level fabric switches
  - Security, Availability, and Flexibility

Common Architecture –

Ease-of-Migration and Investment Protection

Supervisor 1

MDS 9506/09

MPS-14/2

IPS-4

IPS-8

FC-32

FC-16

SSM

All Modules Forward/Backward Compatible*

Supervisor 2

MDS 9513

12-port FC Module

24-port FC Module

48-port FC Module

4-port 10Gbps FC

Current Generation

- Architectural support for up to 256 ports
- Max planned system density of 252 ports
- 1/2Gbps FC interfaces

New Generation

- Architectural support for up to 1,024 ports
- Max planned system density of 528 ports
- 1/2/4G, 10G FC interfaces

* *Some feature limitations in mixed configurations*

MDS 9000 Modular Platform Scalability

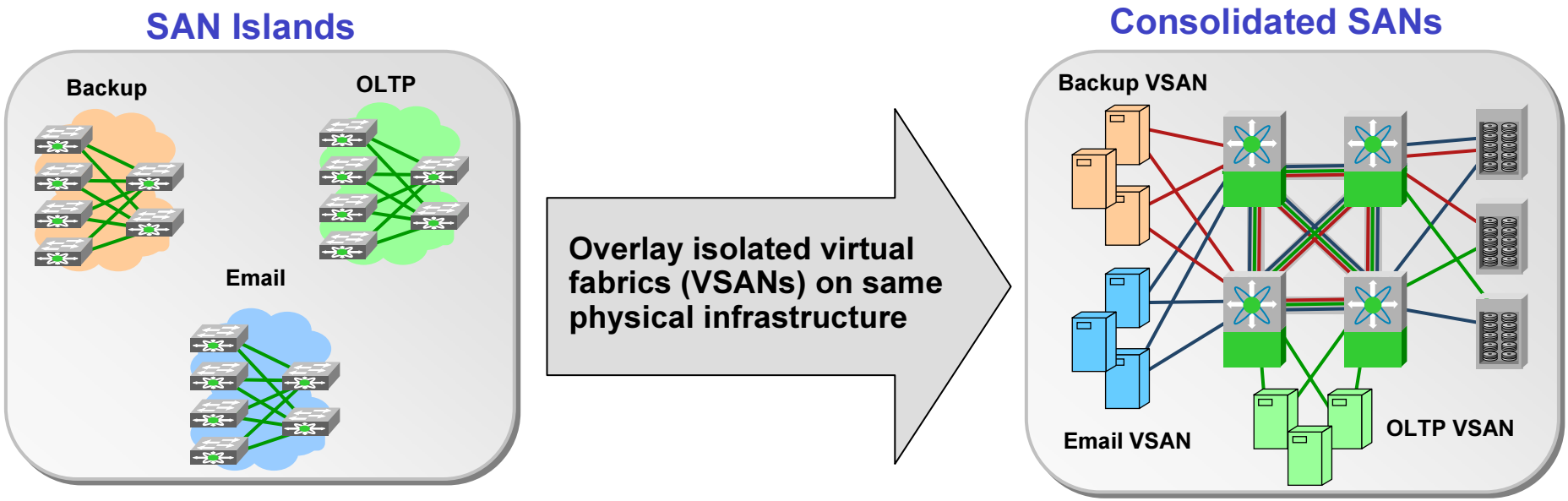
MDS 9216i	MDS 9500 Series	MDS 9506	MDS 9509	MDS 9513
				
Up to 16 fixed 2-Gbps ports plus 48 x 4-Gbps or 4 x 10-Gbps	*Mixed Curr/New Gen Configuration*	192 x 1/2/4Gbps 16 x 10Gbps	252 x 1/2/4Gbps 28 x 10Gbps	252 x 1/2/4Gbps 40 x 10Gbps*
	New Gen-only Configuration	192 x 1/2/4Gbps 16 x 10Gbps	336 x 1/2/4Gbps 28 x 10Gbps	528 x 1/2/4Gbps 44 x 10Gbps

***Assumes at least one current generation module**

Cisco Multilayer Intelligent Storage Solutions

- Key Features for Outsourced Data Centers

The Case for SAN Consolidation

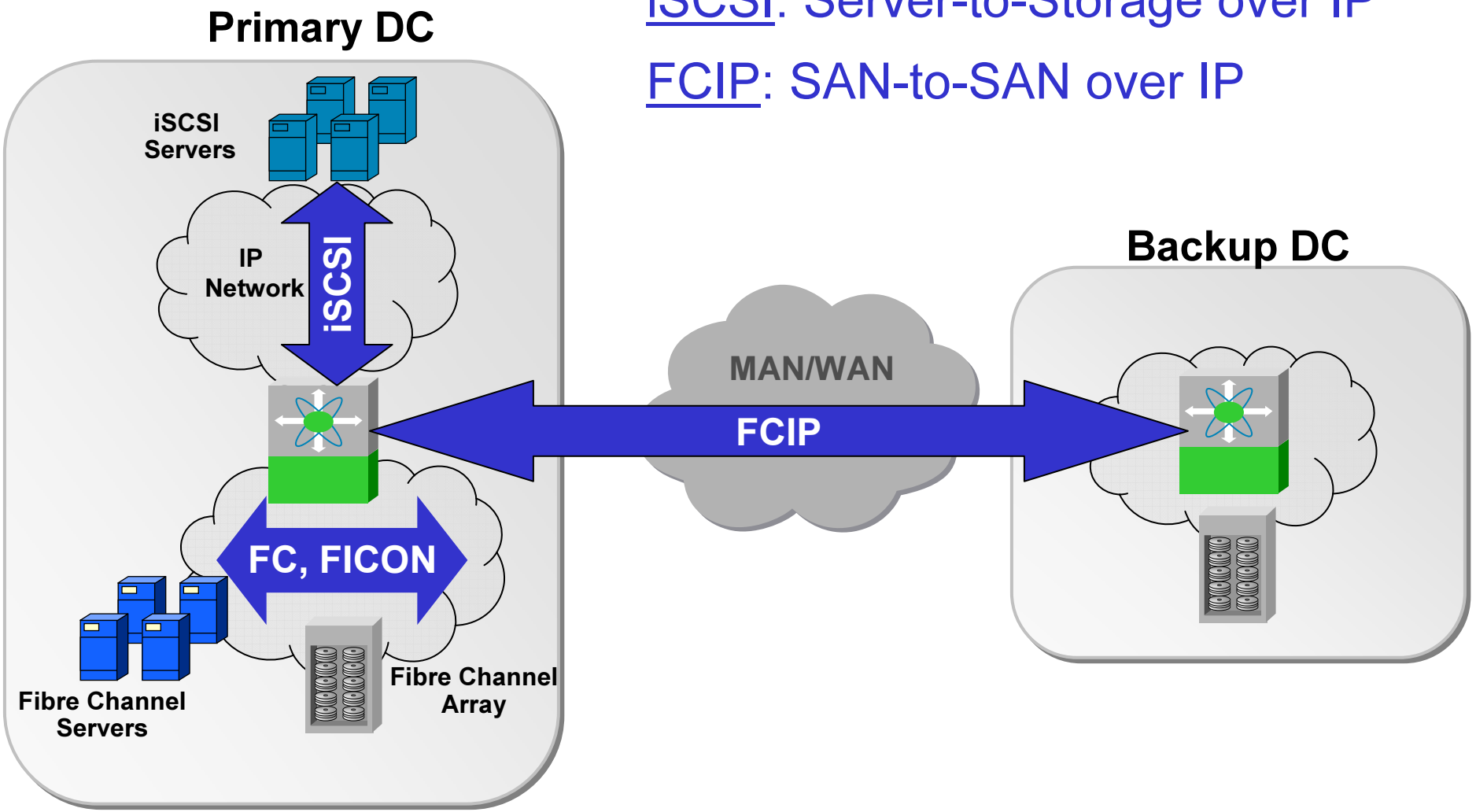


	Attribute	
More	Number of SAN Switches	Fewer
No	Share Disk/Tape	Yes
No	Share DR Facilities	Yes
Complex	SAN Management	Simple
High	Overall TCO	Low

Integrated Multi-Protocol Connectivity:
Connectivity Options for Cost Effective SANs

iSCSI: Server-to-Storage over IP

FCIP: SAN-to-SAN over IP

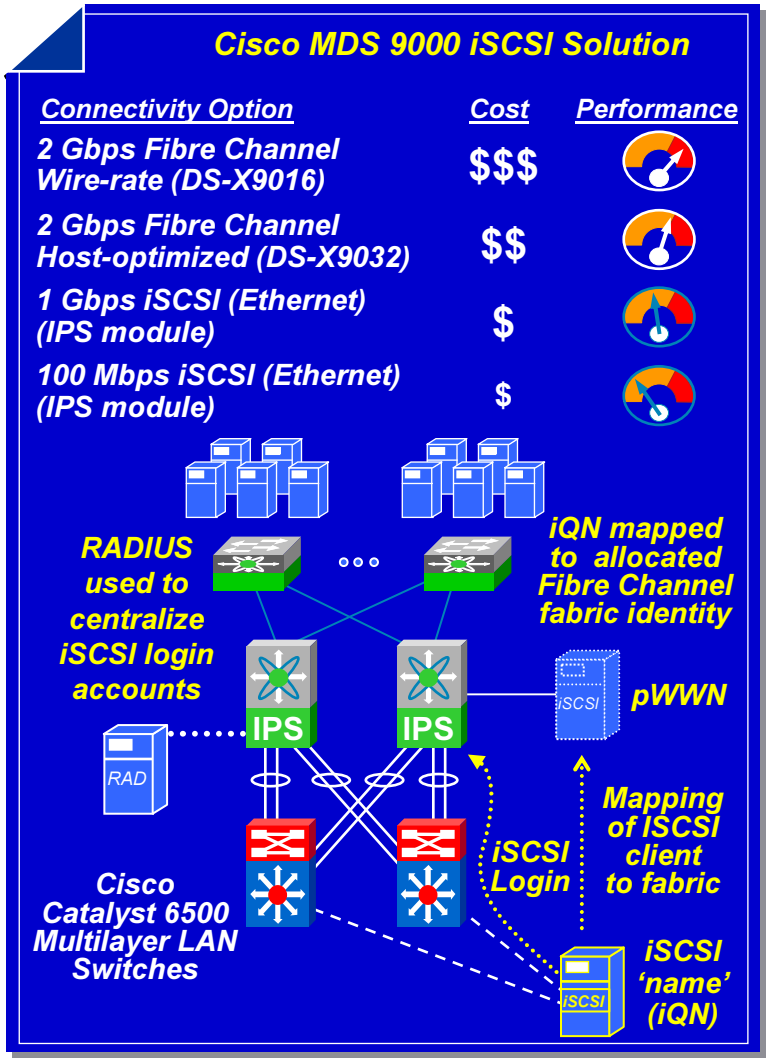


Multiprotocol support: iSCSI

Industry First!

- The Cisco MDS 9000 Family delivers industry' first embedded multiprotocol solution
  - 8-port IP Services module
  - 4-port IP Services module
  - Multiprotocol Services Module (2-port IP)
  - High density iSCSI gateway solution

    Provides 4 different connectivity options each varying in cost and performance
- Transparent mapping of iSCSI hosts to Fibre Channel fabrics
  - Leverage Fibre Channel SAN management tools and skills
  - Common management tools
    - Cisco Fabric Manager – multiprotocol



Mission-Critical Availability:
Hardware and Software Resiliency

Cisco MDS 9500 Multilayer Directors

Reducing Down-time Through Hardware and Software Resiliency

Integrated Call-Home

Non-Disruptive Online Software Upgrades

Stateful Software
Fail-Over and Re-startable Software Modules

Logical Redundancy
VSANs, VRRP, Port Channels, Load Balancing

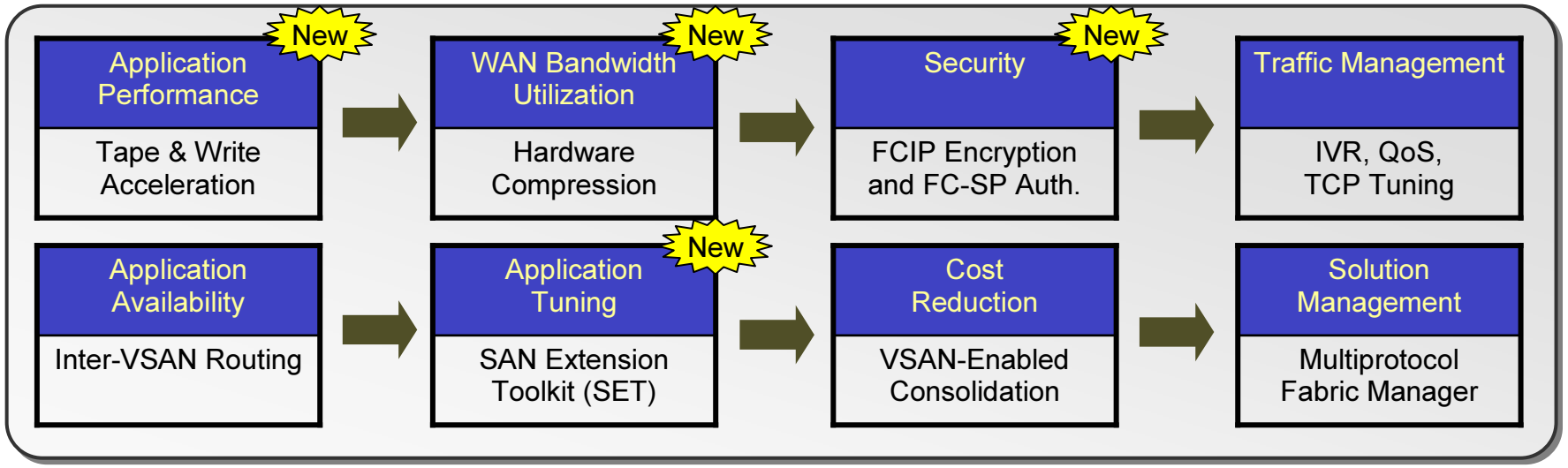
Physical Redundancy
Supervisors, Power Supplies, Fabrics

Fabric Virtualization and Fabric Routing

Three Key Concepts

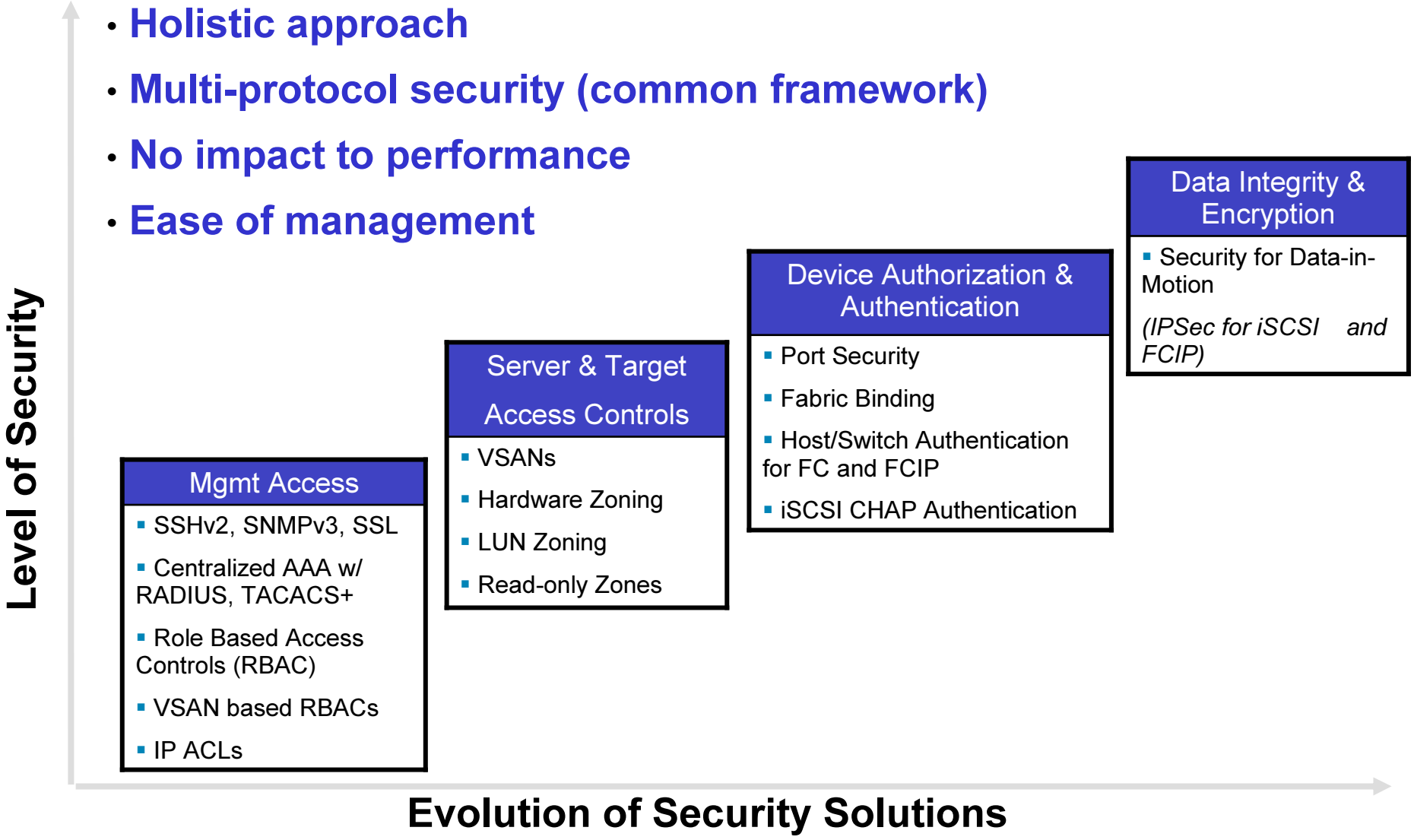
- **Fabric Virtualization**
  Provide independent ('virtual') fabric services on a single physical switch
- **Fabric Routing**
  Ability to provide selected connectivity between virtual fabrics without merging them
- **Virtual Fabric Trunking**
  Ability to transport multiple virtual fabrics over a single ISL or common group of ISLs

Comprehensive SAN Extension Solution



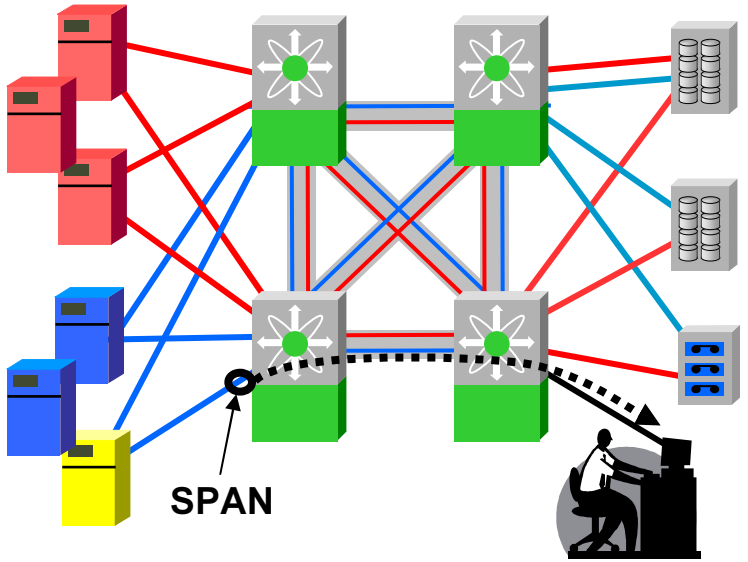
Summary of MDS Security Solutions

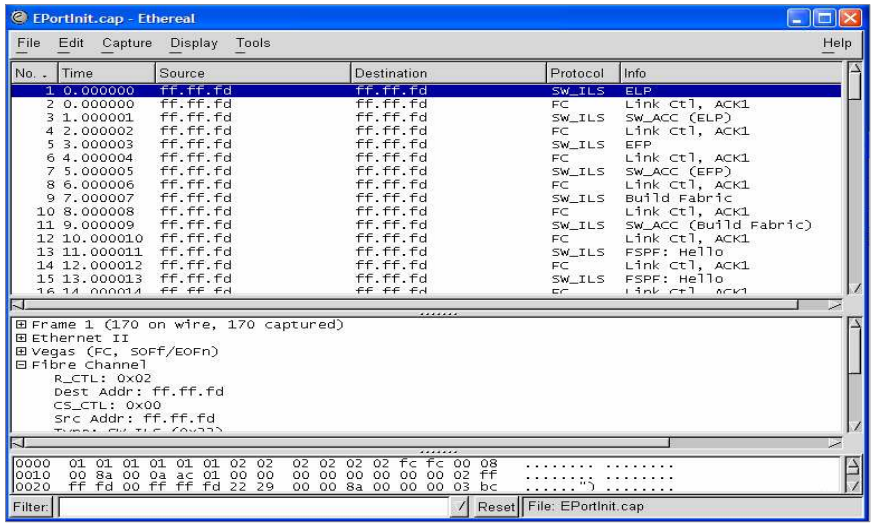
- **Holistic approach**
- **Multi-protocol security (common framework)**
- **No impact to performance**
- **Ease of management**



Diagnostic & Troubleshooting Tools:
Minimize Downtime and Improve Performance

- Cisco Fabric Analyzer
  - –Decode and analyze Fibre Channel and SCSI protocols and send to workstation over IP
- (R)SPAN
  - –Provides the ability to intelligently capture traffic
- FC Traceroute
  - –Check reachability & logs timestamps of each hop
- FC Ping
- Full IOS-like debugging
- Switch-integrated Call Home





Cisco Multilayer Intelligent Storage Solutions

- Intelligent
  Fabric
  Applications

Objectives

Cisco Intelligent Fabric Applications addressing customer pain points by enabling or enhancing

- Nondisruptive operations
- Business continuity
- Disaster Recovery

Intelligent Fabric Applications with Cisco MDS 9000

- Network-accelerated storage applications
- Network-assisted storage applications
- Network-hosted storage applications

Storage Services Module (SSM):
Open Platform for Intelligent Fabric Applications

MDS 9000 Storage Services Module

- ASIC-based innovation
- Open, standards-based platform
- Hosts multiple partner applications

MDS 9000 Storage Services Module

Network-Hosted	Network-Assisted	Network-Accelerated
FAIS-based API (T11)	SANTap Protocol	Standard FC protocols
Volume Mgmt, Data Migration, Copy Services	Async. Replication, CDP	Serverless Backup, FC Write Acceleration*

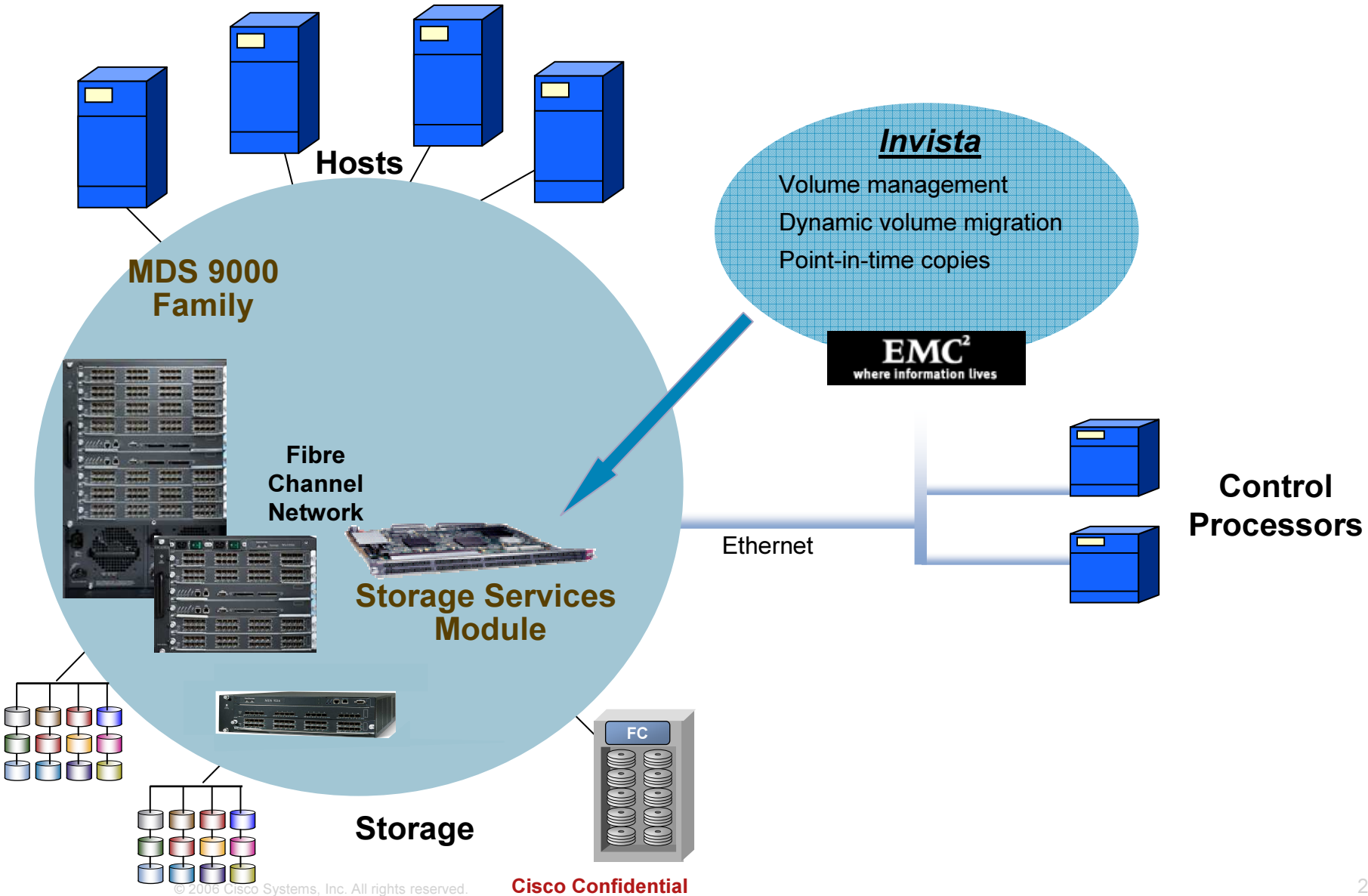
Enabled by SSE license

*** FCWA enabled by Enterprise License**

Intelligent Fabric Applications

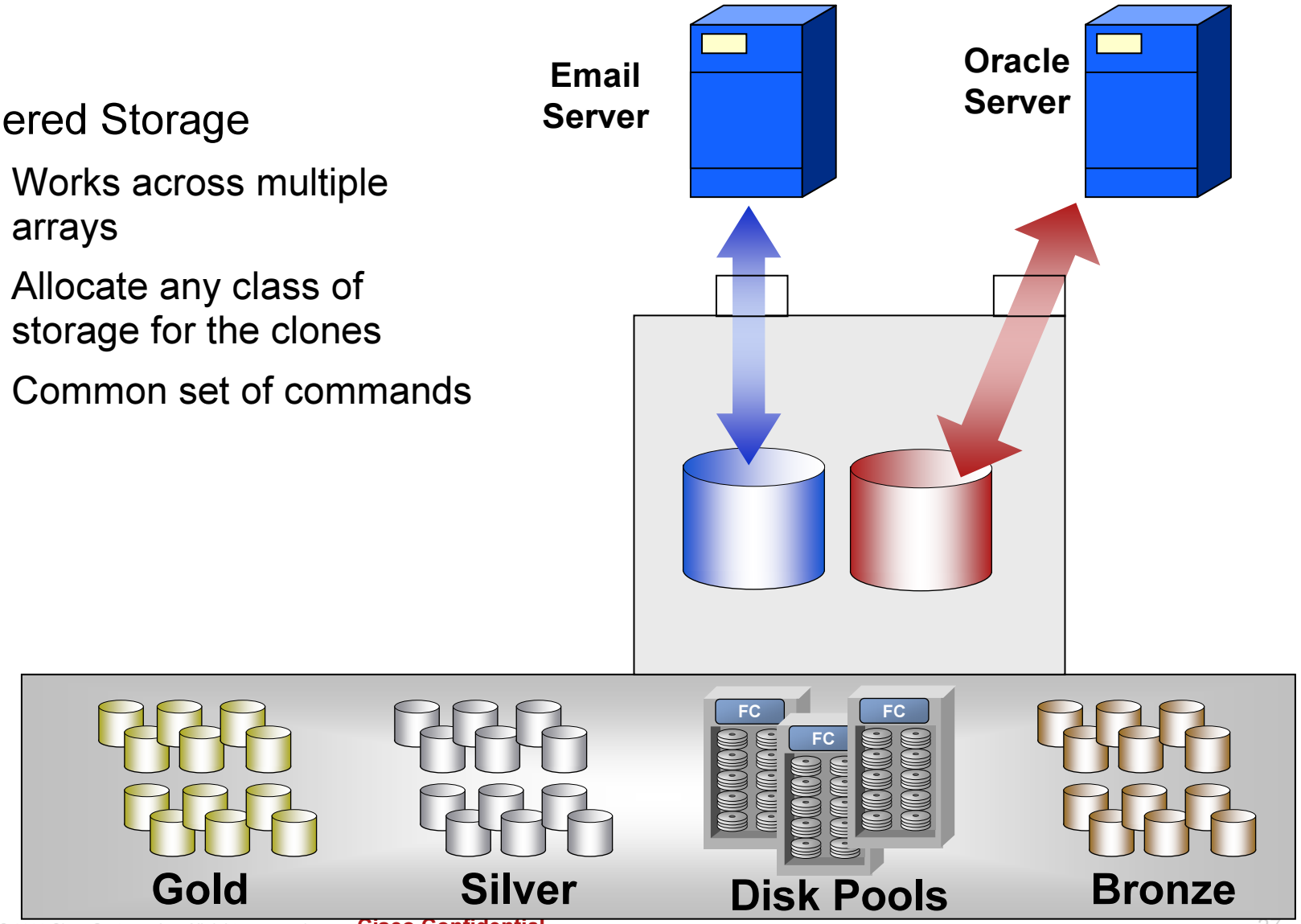
- Network Hosted Storage Applications

EMC *Invista* for Cisco MDS 9000:
The Solution



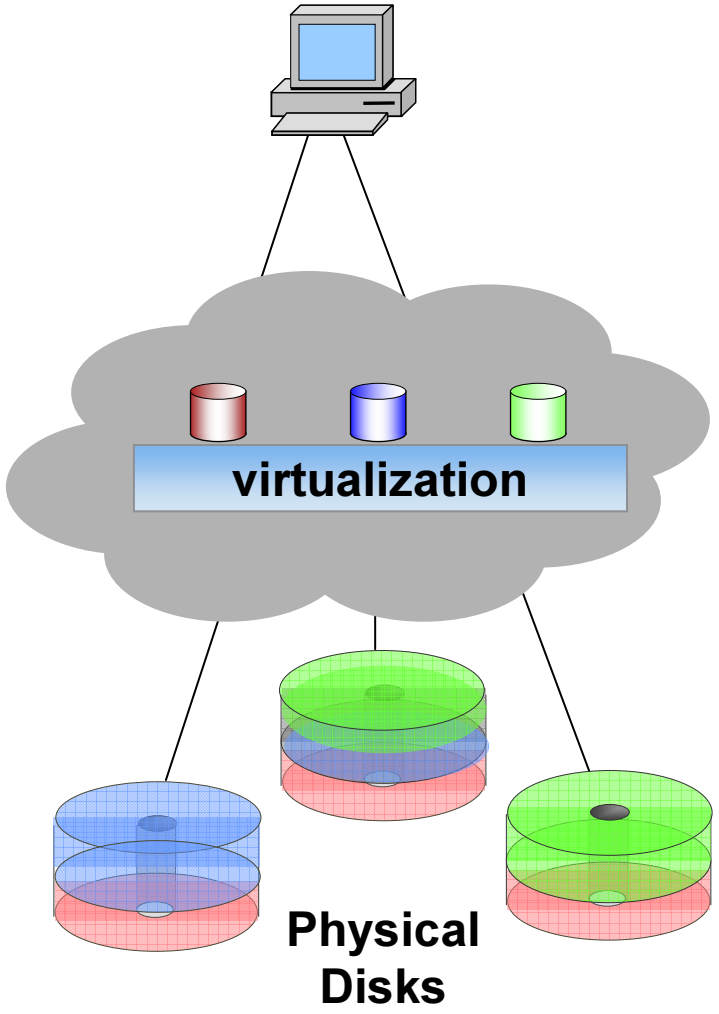
Storage Provisioning

- Tiered Storage
  - Works across multiple arrays
  - Allocate any class of storage for the clones
  - Common set of commands



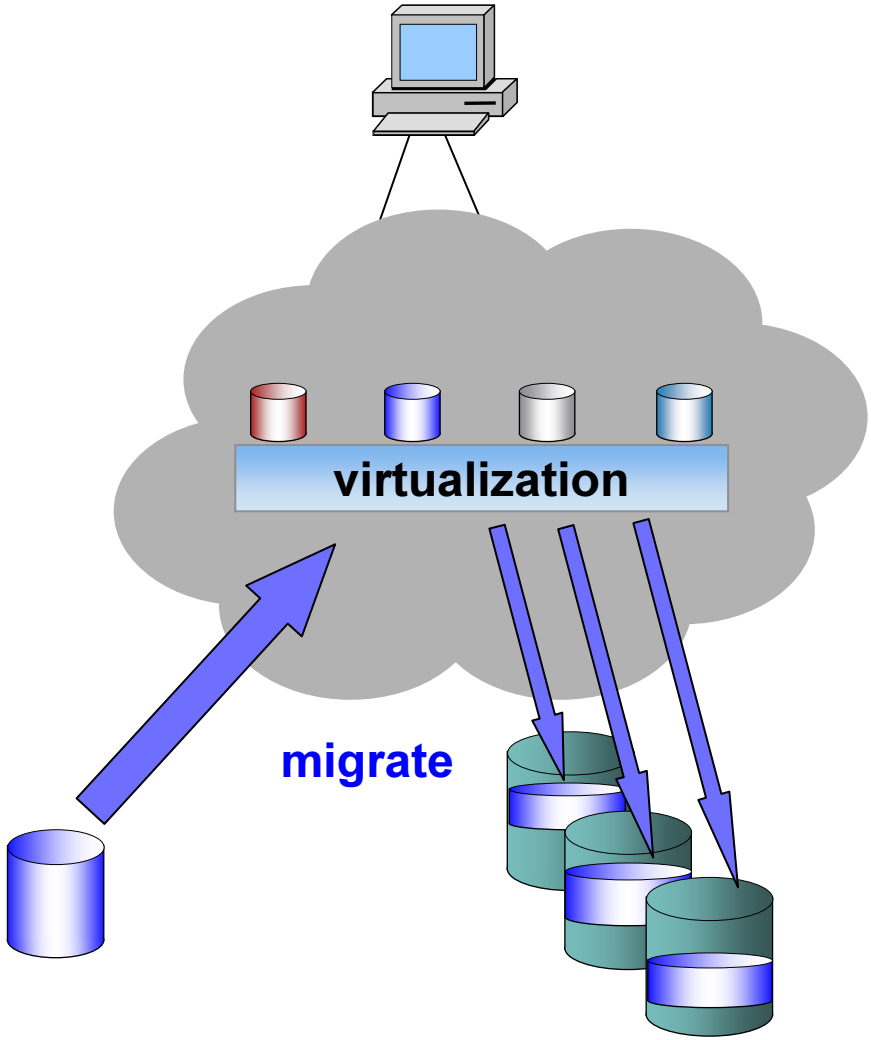
Volume Management

- Volume management
  - Simple Volume
  - Concatenation
  - Stripe
- Users can continue to access data while:
  - Redistributing data across disks
  - Changing RAID configuration and characteristics



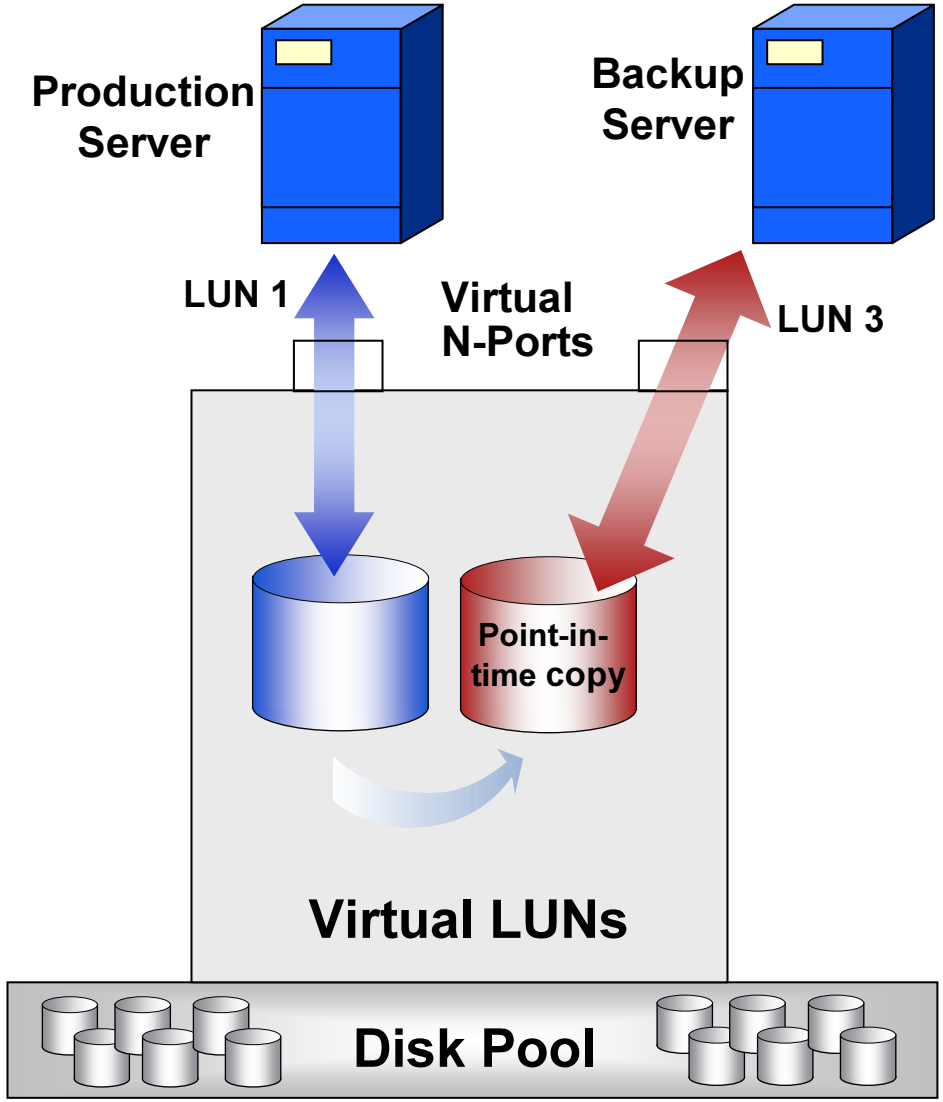
Dynamic Volume Migration

- Non-disruptive Movement of Production Data Across Storage
  - Lease Roll-over
  - Seamlessly upgrade storage
  - Reconfigure storage to meet SLA objectives
  - Data Center migration / additions



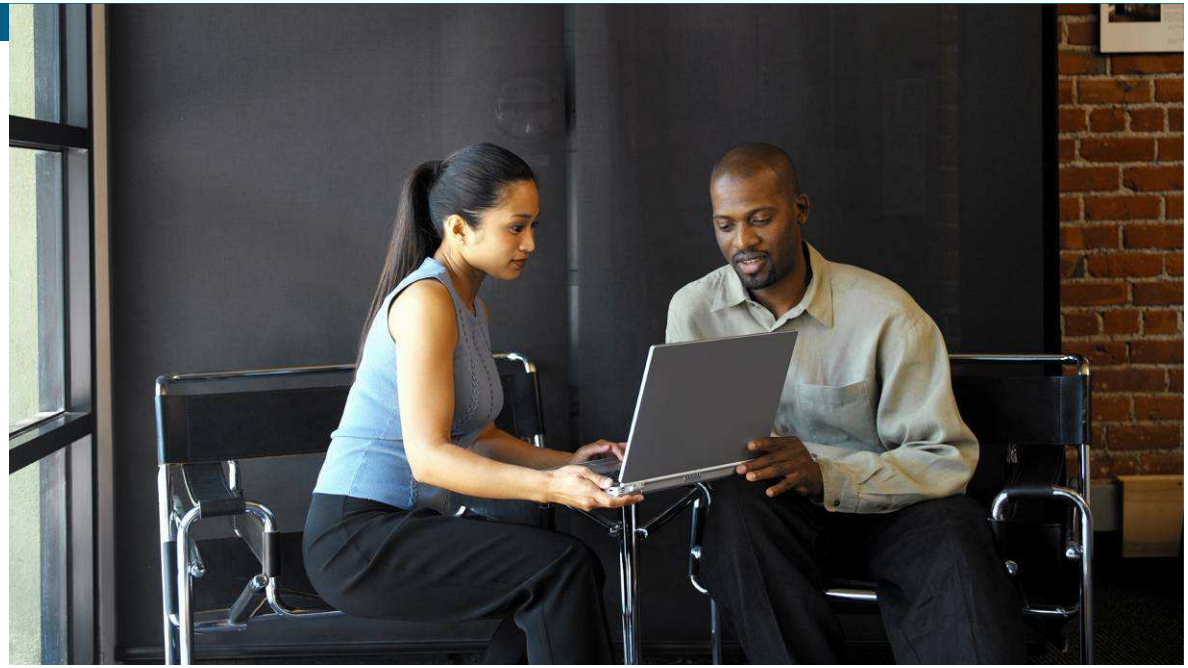
Point-in-Time Copies (Clones)

- Point-in-time copy for backup, development, testing, and reporting
  - Works across multiple arrays
  - Allocate any class of storage for the clones
  - Common set of commands



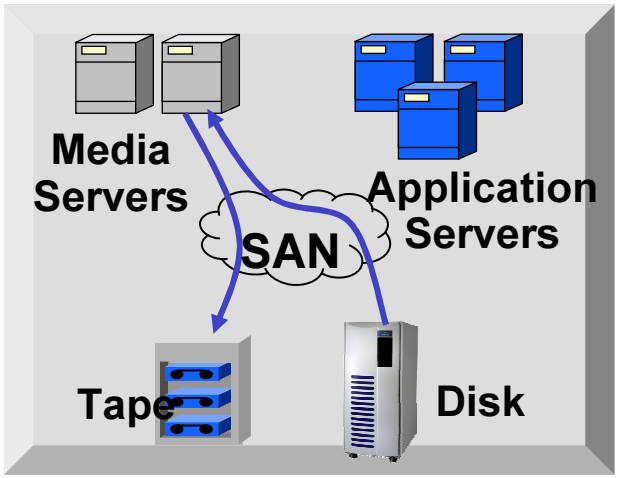
Intelligent Fabric Applications

- Network Accelerated Storage Applications

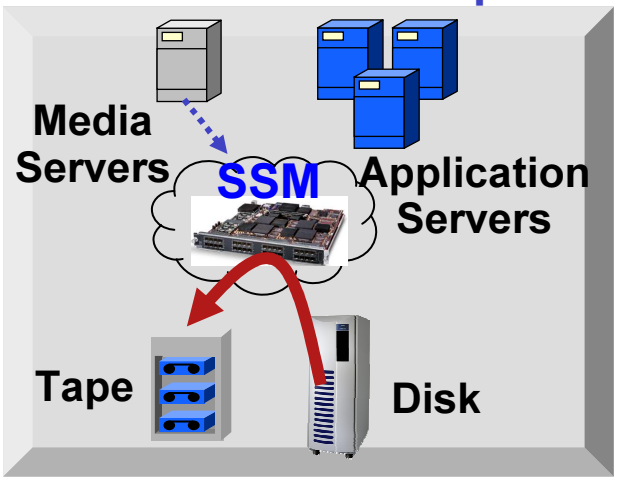


Network Accelerated Serverless Backup

Serverless Backup - Today

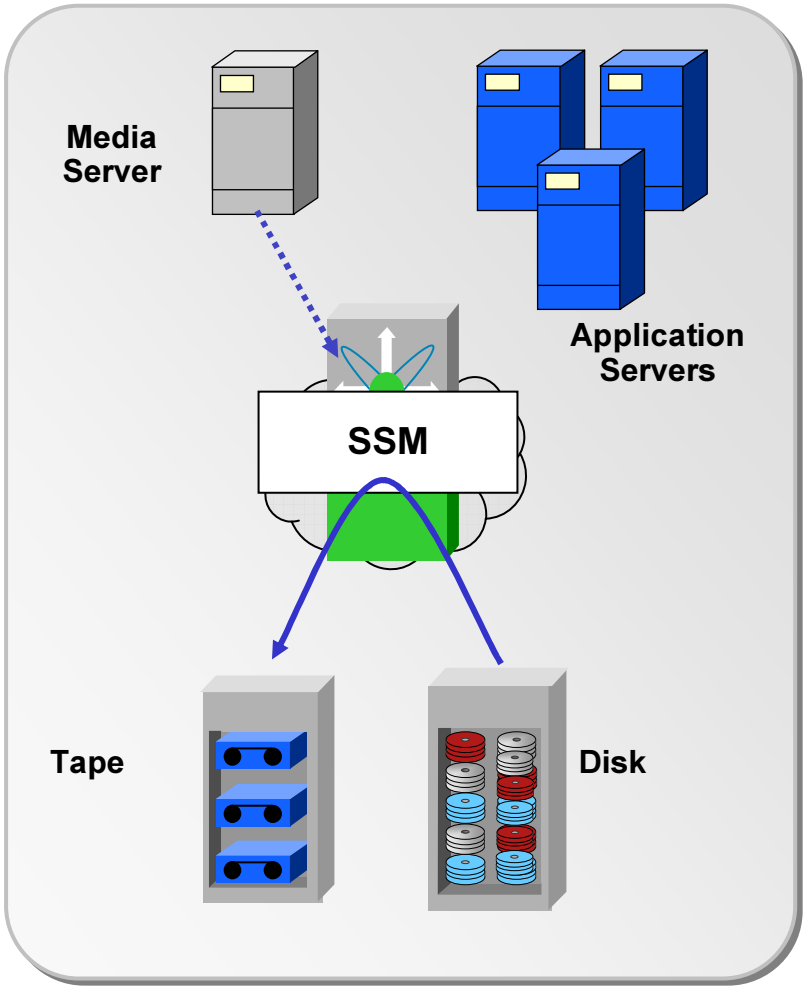


Network Accelerated Serverless Backup



Customer Benefit	Proof Points
Lower TCO	▪ Offload I/O & CPU work from Media Servers to SSM ▪ Reduce server administration & management tasks
Higher Performance & Reliability	▪ Each SSM delivers up to 16 Gbps throughput ▪ SSM integrated into a high availability MDS platform
Investment Protection	▪ No changes to existing backup environment ▪ SSM Data Movement can be enabled w/ software

Network Accelerated Serverless Backup



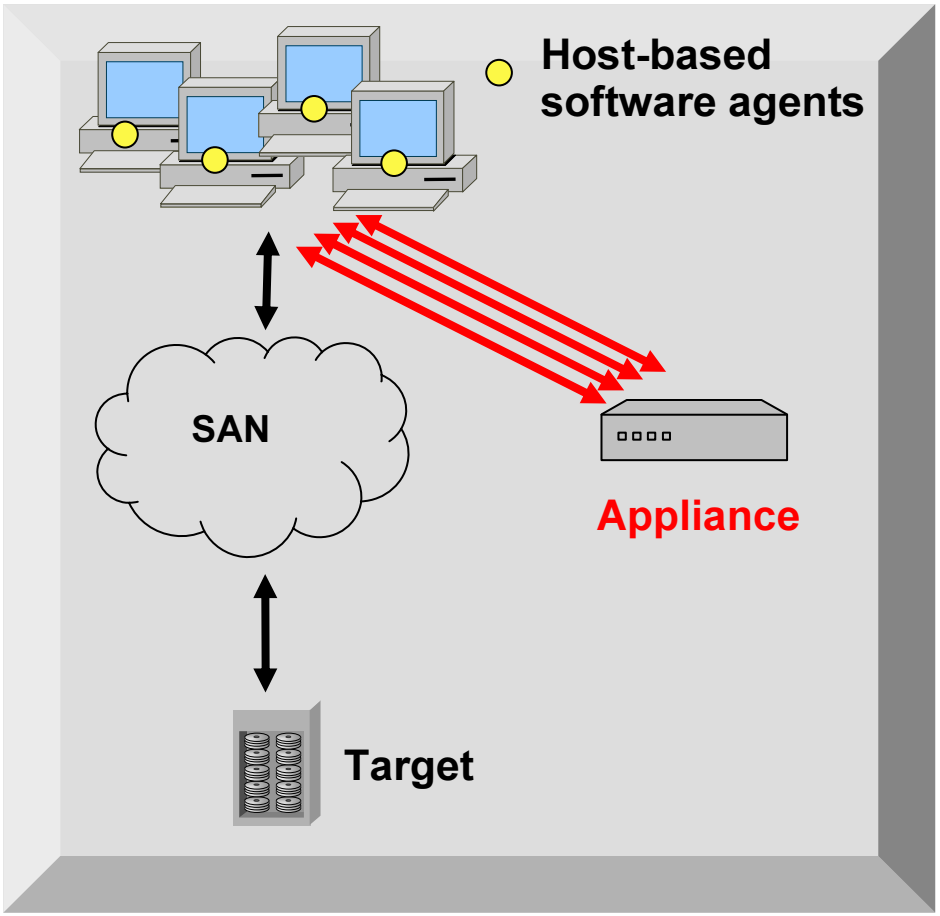
- SAN is very fast
- GE is no longer the bottleneck
- Impact on application server is minimized, due to XCOPY
  - Minimize CPU impact
  - Minimize backup traffic traversing application server and its HBAs
- Application Server is not involved
- Media server can be lightweight and is only used for cataloging
- SSM can stream 5TB/hr
- Works with any Backup Software that supports XCopy functionality – Veritas, CommVault, CA Brightstor, Legato.

Intelligent Fabric Applications

- Network Assisted Storage Applications

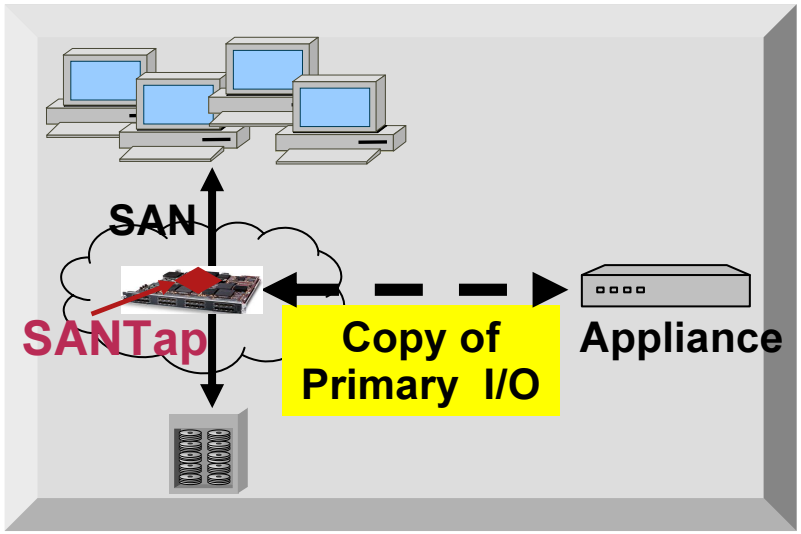
Appliance-based Storage Applications Today

- Disruptive insertion of appliance in data path
- Limited interoperability with other appliances or disk array features
- Appliance requires host-based software agents



SANTap: Network Assistance for Storage Applications

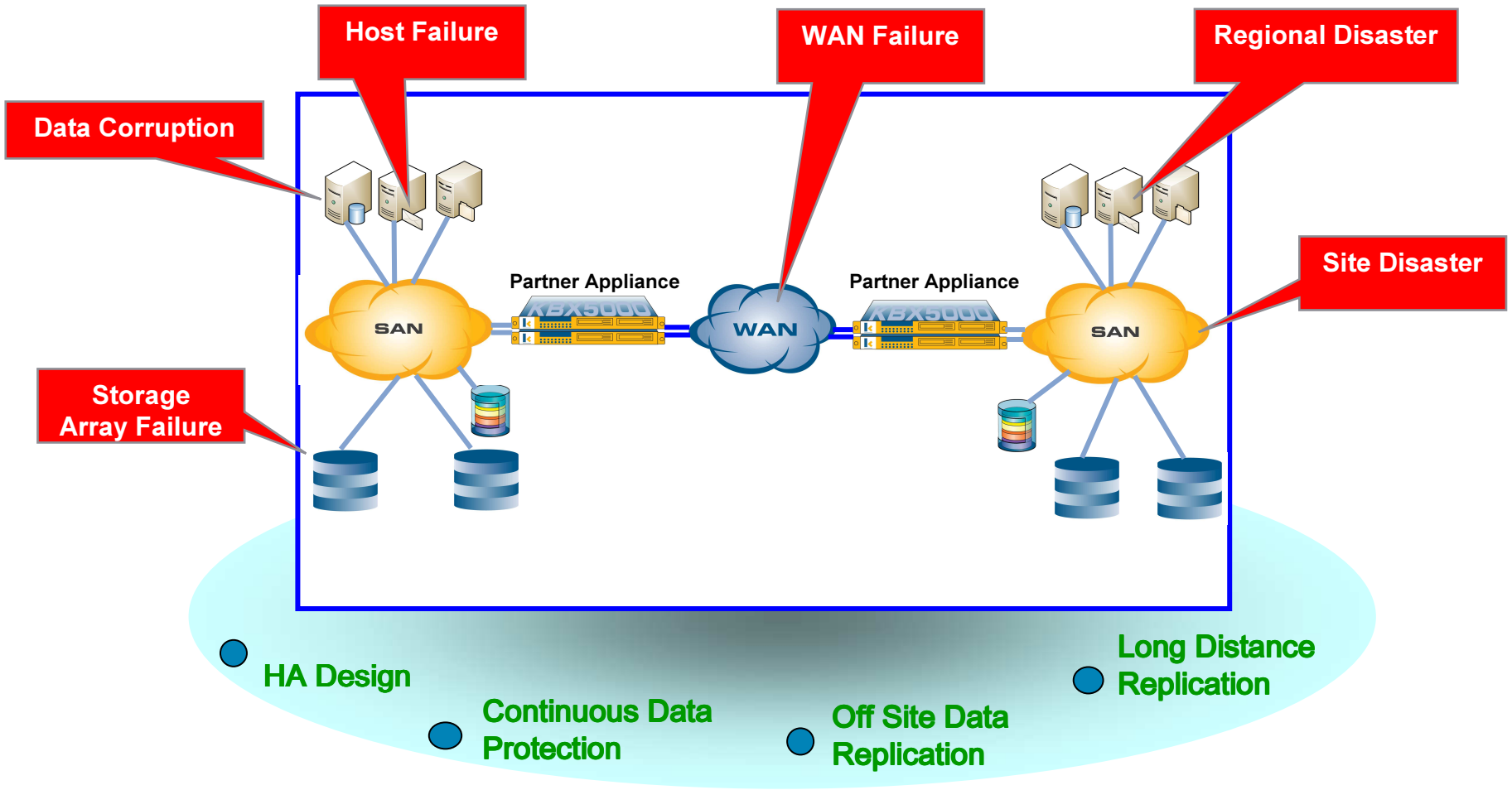
Network-assisted Applications



Customer Benefit	Proof Points
Increased Agility	▪ **Insert new appliance-based applications seamlessly** ▪ **Distributes workload to multiple appliances**
High Availability Solution	▪ **Preserves integrity, availability and performance of primary I/O** ▪ **Allows appliance to move out of data path**
Improved Business Continuance	▪ **Supports replication, point-in-time copy, and continuous data protection applications**

A Typical SANTap Deployment

Enterprise-Wide Data Protection



SANTap Partner Applications

Partner	Application
KASHYA	**(EMC) Heterogeneous async replication and CDP over extended distances with advanced data compression functionality**
Topio™	**(Network Appliance) Heterogeneous async replication over extended distances with data consistency**
FalconStor Software	**Heterogeneous asynchronous replication and CDP**
Cloverleaf Communications	**Heterogeneous asynchronous replication and CDP**
XIOtech	**Heterogeneous asynchronous replication (Kashya OEM)**

Review: Cisco MDS Differentiators

- ***High Density Architecture*** enables scaling up to 528 4Gbps ports and provide 10Gbps ISL connectivity for massive storage consolidation
- ***Integrated Multi-Protocol Support*** including Fibre Channel, iSCSI, and FICON for flexible, lowest-cost connectivity options within the datacenter
- ***Single Architecture*** runs the same software on all platforms except MDS 9020
- ***Investment Protection*** is achieved because linecards are interchangeable between chassis
- ***Virtual SAN (VSAN)*** to enable scalable SAN design, growth, and consolidation of storage and network resources – provides fault and management isolation
- ***Integrated InterVSAN Routing*** enables sharing of common resources across VSANs – routing is integrated in hardware, eliminating expense and mgt of separate routing devices
- ***Integrated SAN extension*** via FCIP and CWDM for cost effective business continuity
- ***Integrated Compression and Encryption*** reduces leased line charges and cost of separate encryption devices
- ***Fabric-based Services for Virtualization, Backup and Async Replication***
- ***Diagnostic and Troubleshooting Tools*** including FC Ping, Traceroute, SPAN, hot-spot & historical performance analysis – reduces downtime and improves performance
- ***Advanced Security Suite*** including role-based access control, AAA RADIUS and TACAS+, SSH, SFTP, SNVPv3, FC-SP, IP-sec

Q and A