



Education

# Server and Storage Consolidation with iSCSI Arrays

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## Server & Storage Consolidation with iSCSI

This session will appeal to IT managers, administrators and architects interested in best practices and deployment considerations of storage consolidation solutions available with iSCSI-based systems today.

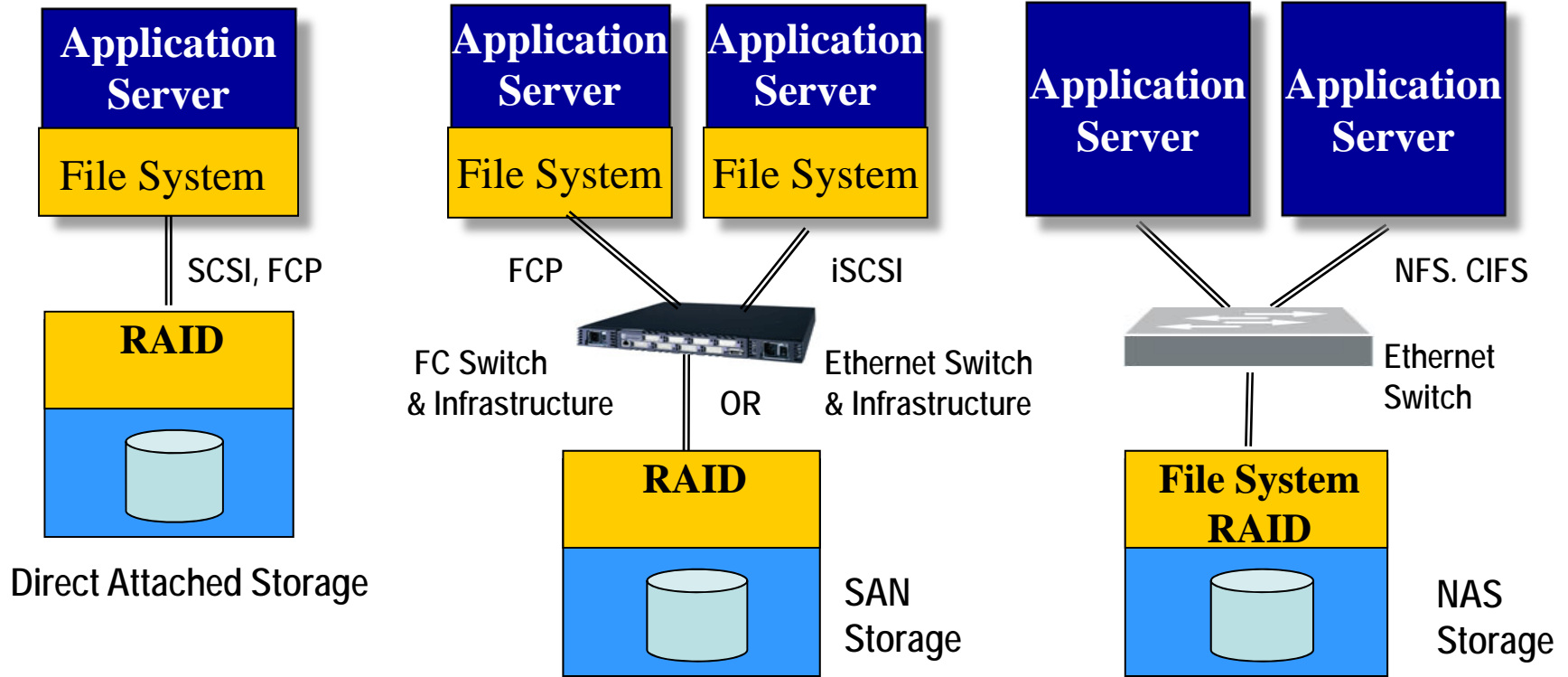
This presentation, an update to a very popular SNIA Tutorial, outlines the benefits of networked storage, contrasting deployment models. . After a summary of iSCSI-based SAN benefits, the presentation provides a detailed description of iSCSI SAN configurations, capabilities, options and best practices. As iSCSI has a natural affinity to virtualization, it also covers virtual server environments. Finally, the presentation describes typical deployment scenarios, and emerging developments, including higher speed Ethernet and FCoE.

- **Storage Consolidation with iSCSI SANs**
  - ◆ Advantages of networked storage
  - ◆ iSCSI SAN benefits
- **iSCSI –based Storage Area Networks**
  - ◆ Host connectivity and security
  - ◆ Boot from SAN
  - ◆ High availability
  - ◆ Quality of service
  - ◆ iSCSI performance
- **Deployments and Futures**
  - ◆ Typical array capabilities
  - ◆ Server virtualization with iSCSI
  - ◆ Typical deployment scenarios
  - ◆ Emerging new capabilities
- **Summary**

# Why Move to Networked Storage

- Value of Storage Networking
  - ◆ Improved reliability and reduced cost of backup
  - ◆ Improved scalability of storage capacity and performance
  - ◆ Simplified storage provisioning
  - ◆ Improved data availability
  
- Top reasons for deploying a SAN
  - ◆ Back-up
  - ◆ Storage consolidation
  - ◆ Satisfy on-going demands for additional capacity
  - ◆ Performance
  - ◆ Disaster recovery
  - ◆ New project or application deployment

# Storage Technologies Compared

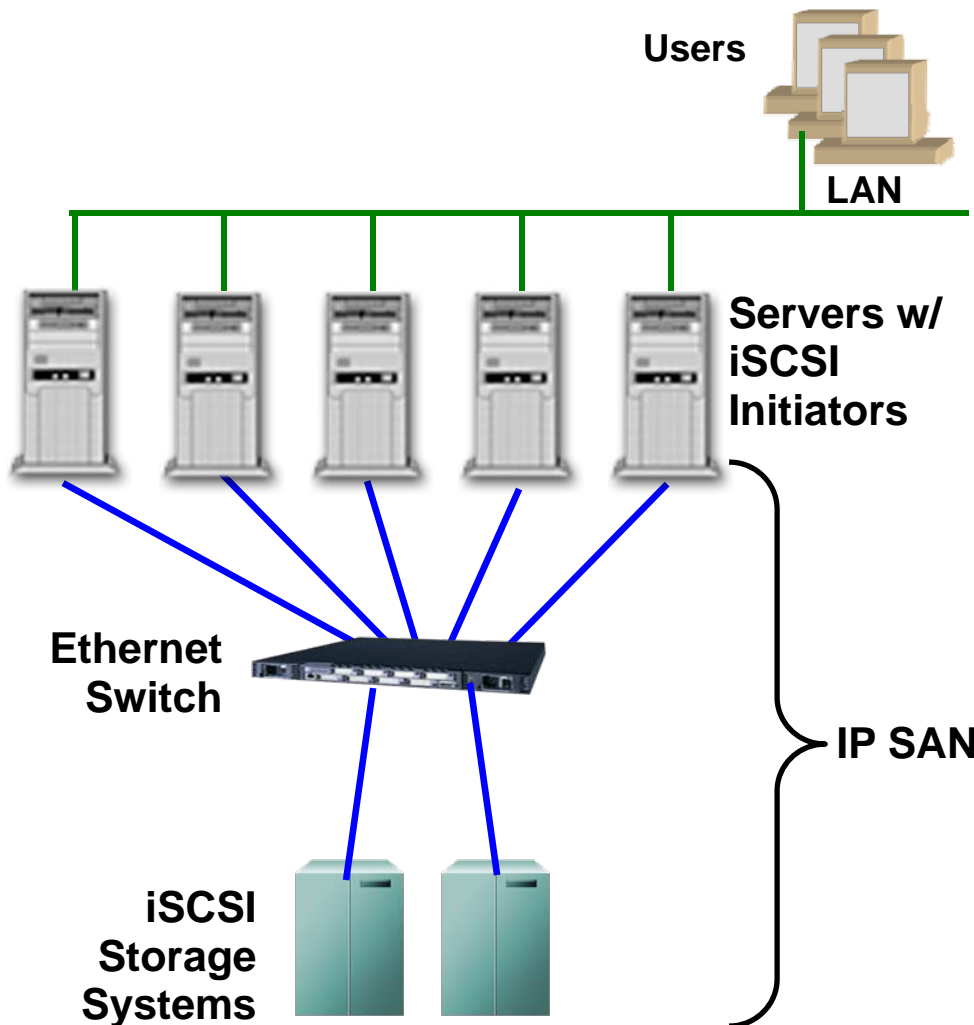


- Server-based data management
- No resource sharing
- No data sharing
- Works with all apps

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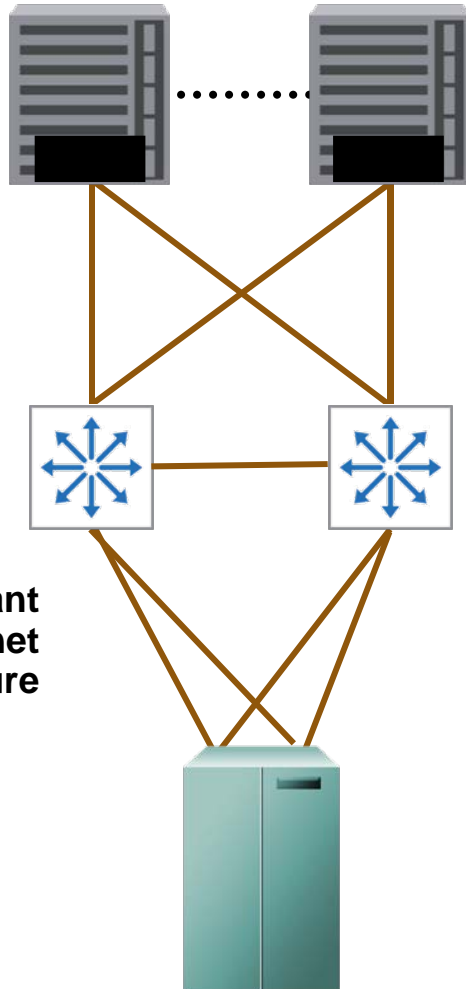
- Storage-based data management
- Resource sharing
- Data sharing
- Works with qualified apps

# iSCSI SAN Benefits



- **Standard SAN storage**
  - ◆ Block storage access
  - ◆ Supports all apps
  - ◆ Transparent migration from direct attached storage
- **Lower TCO than FC**
  - ◆ Zero host connection cost
  - ◆ Less costly infrastructure
  - ◆ Easier to manage
- **Leverages IP Expertise**
  - ◆ Expertise in existing staff
  - ◆ Robust well-understood management software
  - ◆ Easily enables remote integration of data assets

## Host Systems



## Connectivity:








- ▶ 1 Gb or 10Gb Ethernet
- ▶ Jumbo frames (recommended)
- ▶ Link aggregation or MPIO or Multi-Connection Sessions (bandwidth and/or availability)

## Security:

- ▶ Host authentication (CHAP)
- ▶ Private network
  - ▶ Physical
  - ▶ VLAN (zoning)
- ▶ Array LUN masking
- ▶ Optional IPsec
- ▶ Optional key management



# iSCSI Host Support

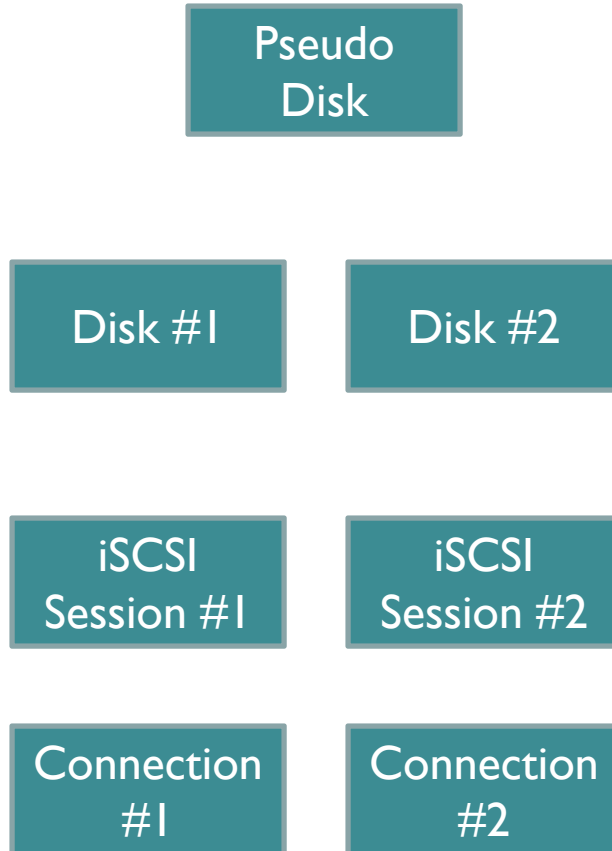
OS	Initiator	Certified	Multi-pathing	Cluster
	Hardware, Software	<input checked="" type="checkbox"/>	MPIO, MCS	Yes
	Hardware, Software	<input checked="" type="checkbox"/>	Trunking, MPxIO	Yes
	Software	<input checked="" type="checkbox"/>	PV Links	TBD
	Software	<input checked="" type="checkbox"/>	Trunking	TBD
	Hardware, Software	<input checked="" type="checkbox"/>	Trunking; MPIO	Yes
	Hardware, Software	<input checked="" type="checkbox"/>	Trunking, MPIO	Yes
Novell. NetWare.	Software	<input checked="" type="checkbox"/>	Trunking	Yes
	Software	<input checked="" type="checkbox"/>	Trunking	Yes

- ✓ **Simplify Server Hardware Upgrades/Repurposing**
- ✓ **Easy to configure temporary or test servers**
- ✓ **Simplify Server OS Imaging**
- ✓ **Simplify disk drive replacement**
- ✓ **Centralize storage monitoring and management**
- ✓ **Boot from iSCSI HBA or from native OS initiator**
- ✓ **Industry standard implementation of iBFT**
- ✓ **Removes spinning media from server**
  - **Important for power saving strategies and reduced maintenance**

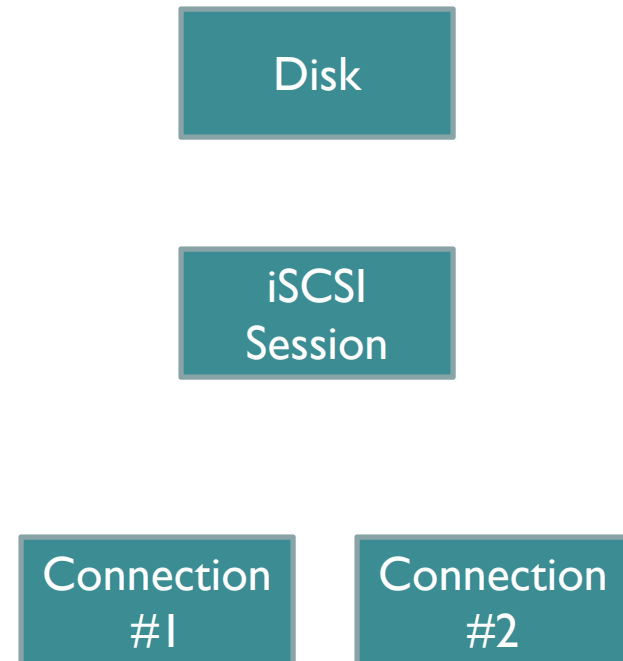


# iSCSI : High Availability Options

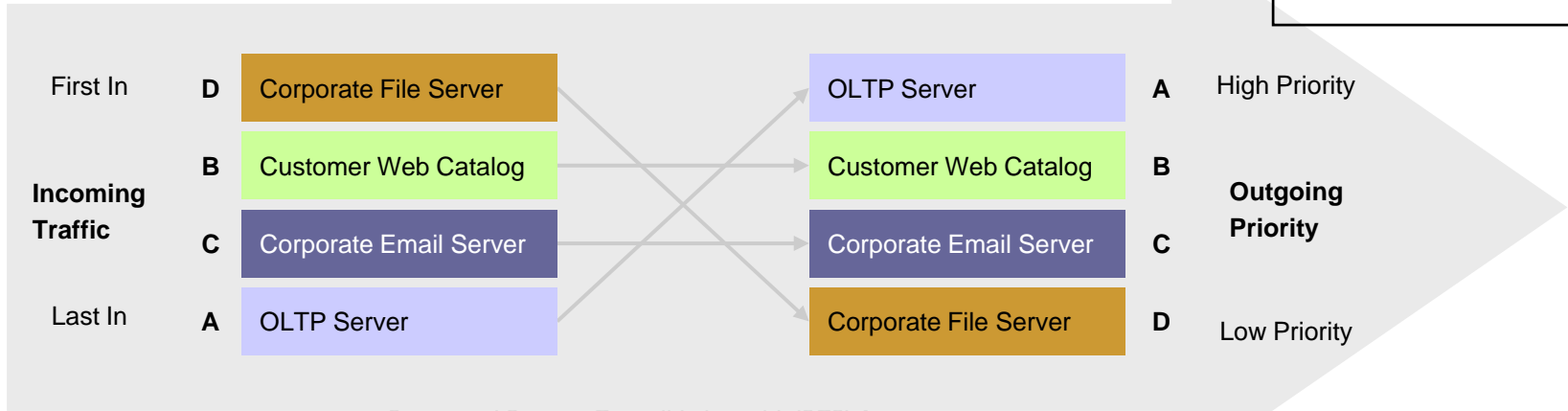
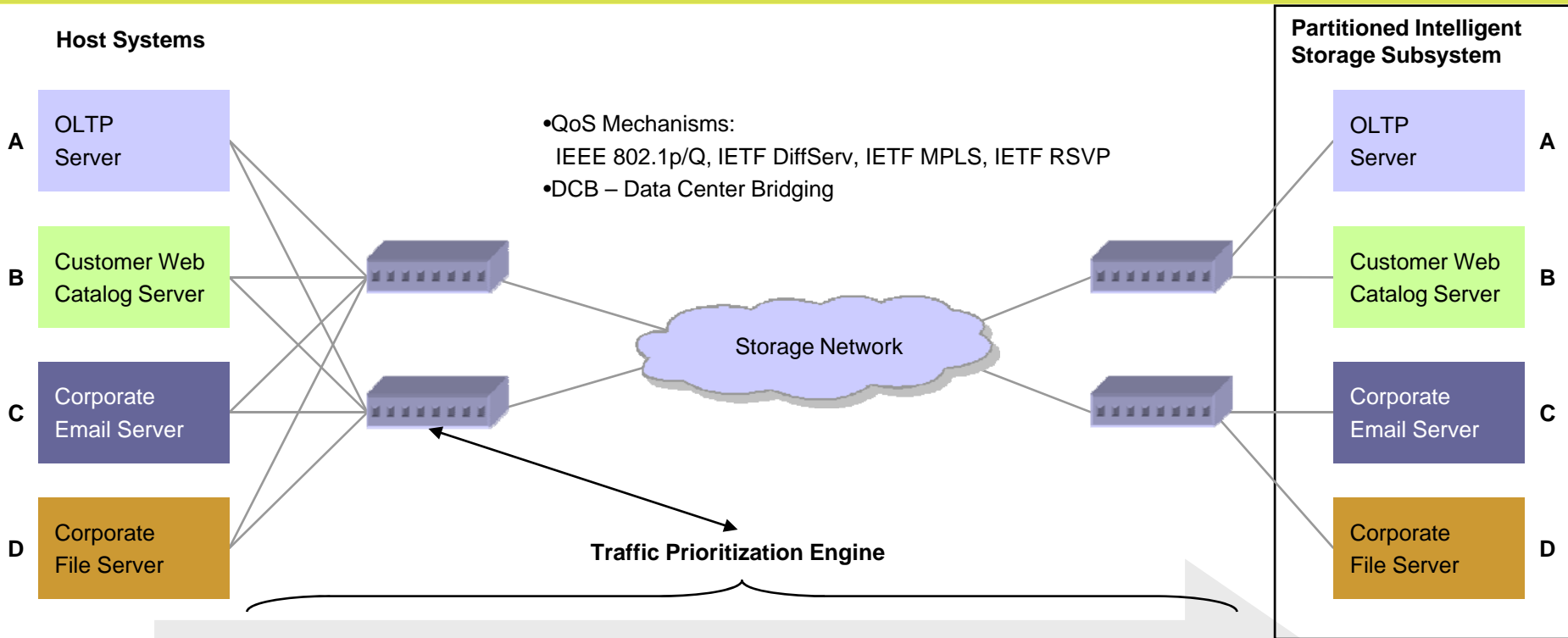
## MPIO



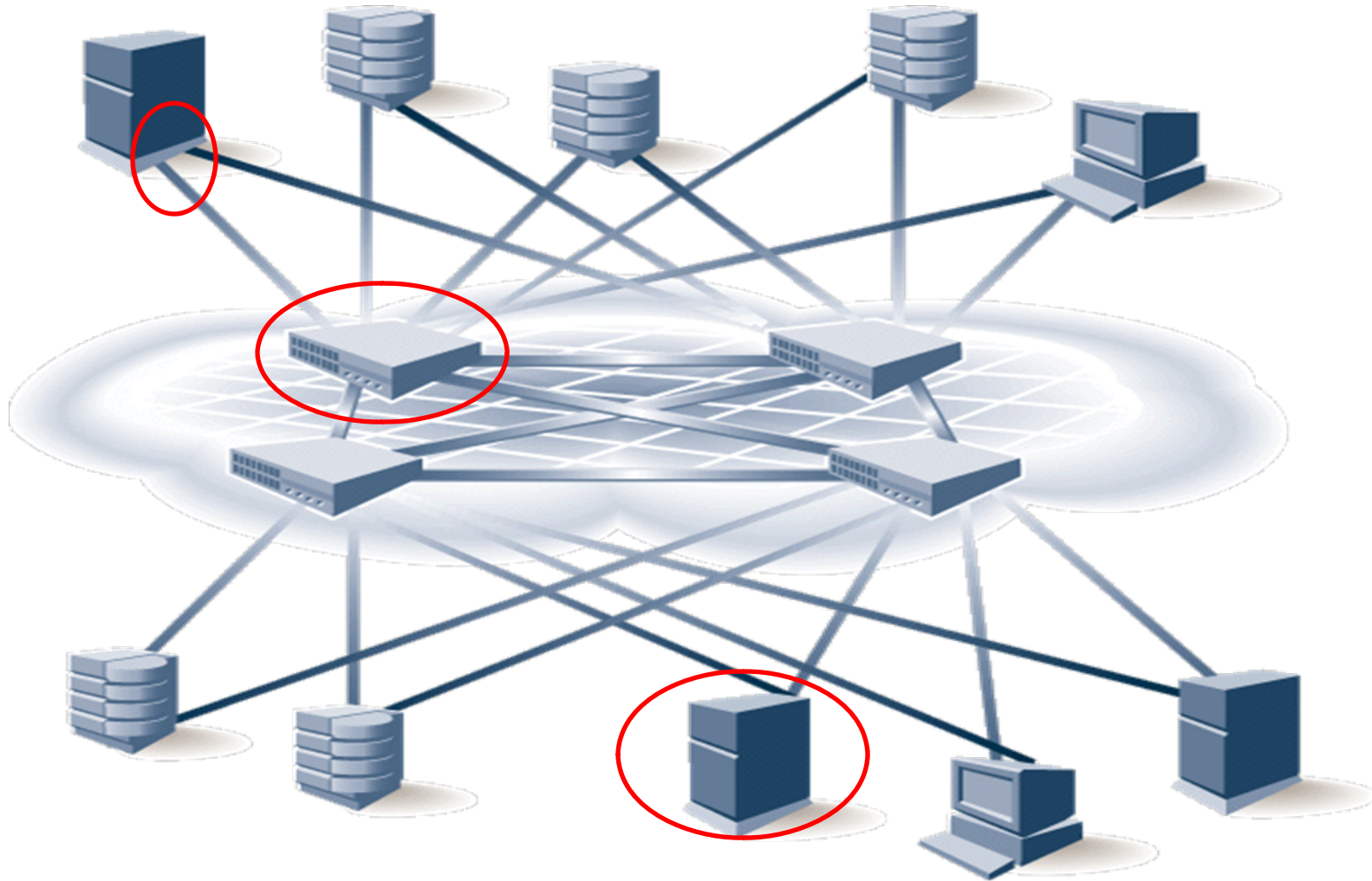
## MCS



# Quality of Service Policies

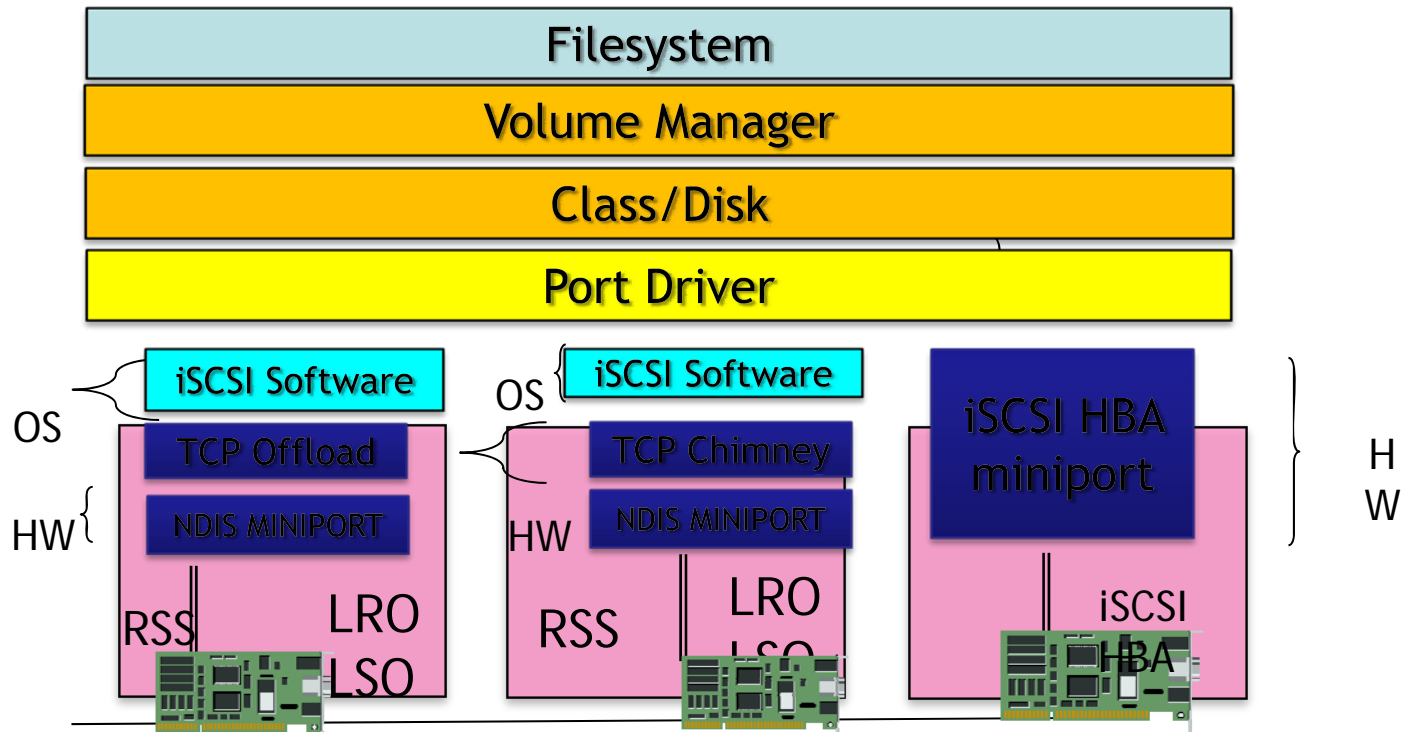


# iSCSI : High Availability



# Demystifying iSCSI Performance

- iSCSI Protocol is not limited in performance, only by underlying bus speed
  - iSCSI operates at 10Gig Wire Speed today with software initiators
  - HBAs may reduce CPU utilization for some workloads
  - Performance scales with Ethernet speeds 10 Gb, 40 Gb, and up



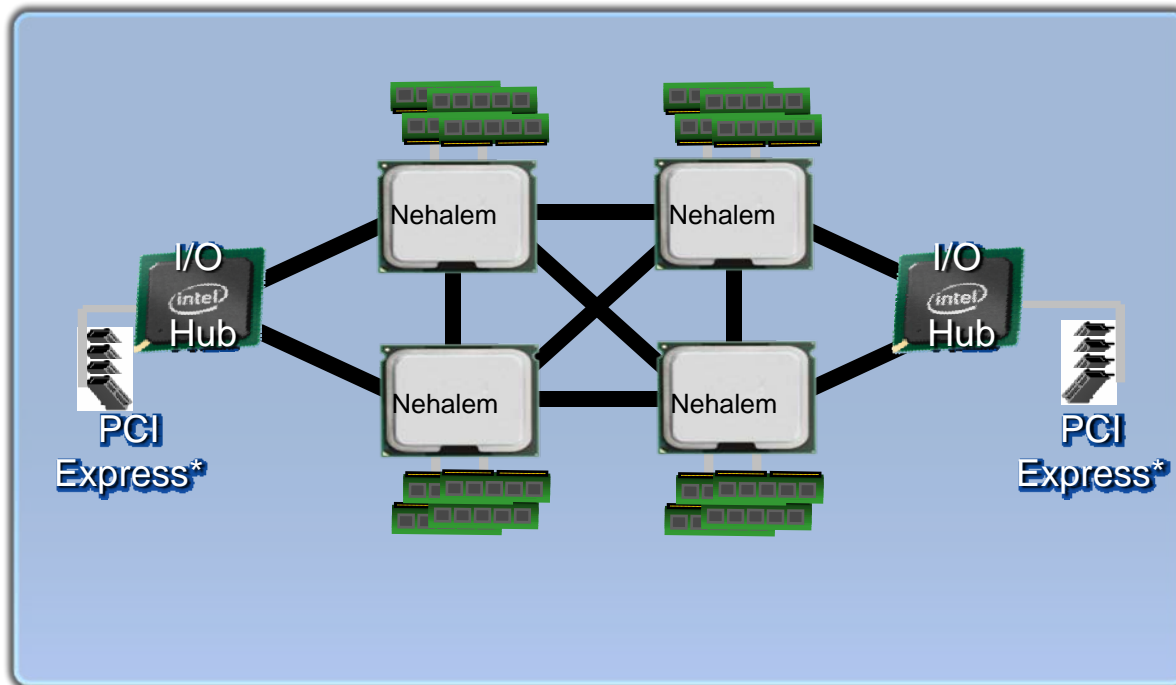
# 10 Gigabit Ethernet

- IEEE 802.3ae ratified 2002
- Broadly deployed in inter-switch links
- Host-side proliferation now happening
  - ◆ Affordable Price
  - ◆ Server I/O architecture support
  - ◆ Standard component on commodity servers
  - ◆ Offload built into on-board components, supported by operating systems
- Deployment/applications
  - ◆ Backbone and port aggregation for 1 Gb LANs
  - ◆ File and block storage over 10GbE



# The Multi-Core factor

- Multi-Core changes the game
  - Multi-core Processors scale iSCSI software initiator performance
  - Performance is no longer limited by processing power of HBA engine
  - iSCSI Digest Offload directly to CPU hardware instruction set



# Typical iSCSI Array Capabilities

- **Basic storage considerations**
  - ◆ Redundant components
  - ◆ Dual active controllers with failover
  - ◆ RAID
  - ◆ SATA drives; FC drives; SAS drives
- **Storage features**
  - ◆ Point in time copies (Snapshot)
  - ◆ Network Boot
  - ◆ Multi-path I/O for High Availability
  - ◆ Thin provisioning (sparse allocation)
  - ◆ Remote data copy
  - ◆ Asynchronous mirroring for disaster recovery
- **Growth/scalability/configurability**
  - ◆ Capacity
  - ◆ Performance
  - ◆ Host integration

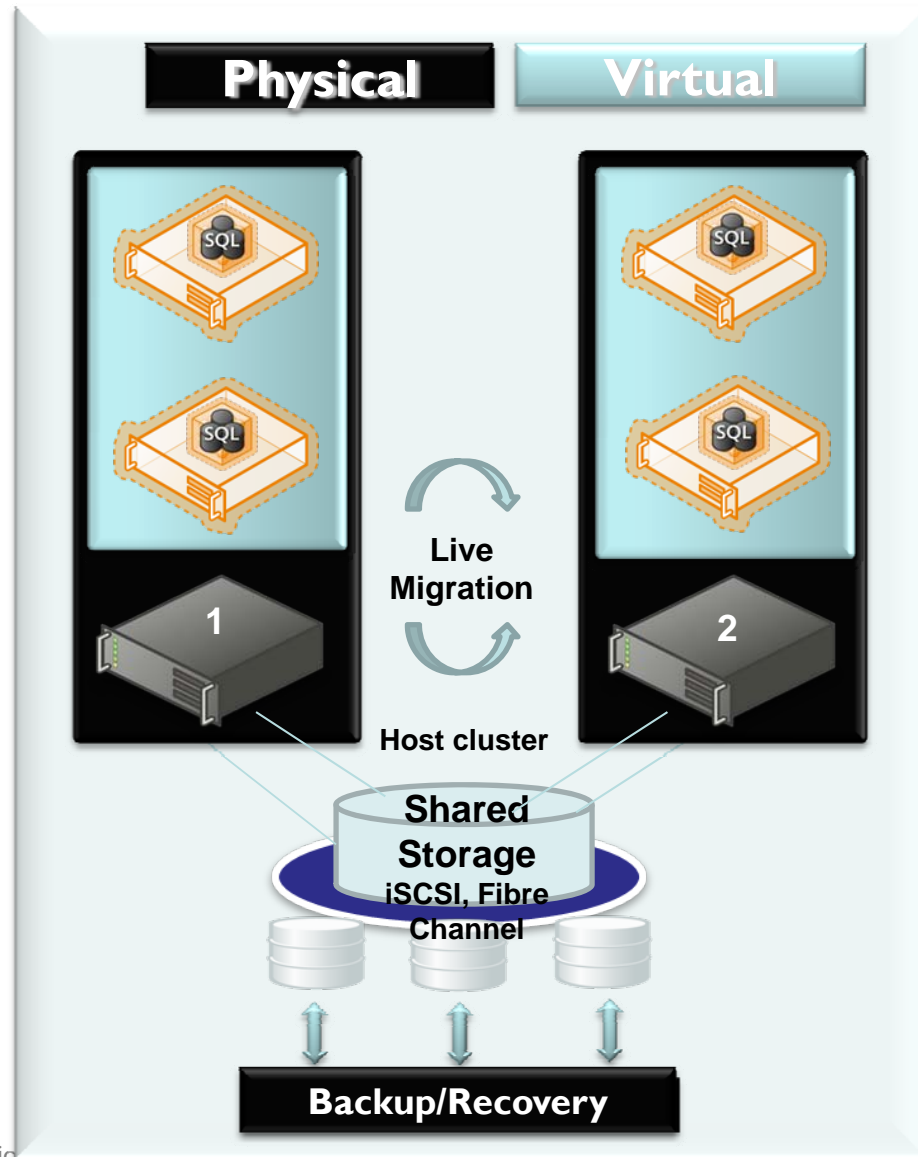
# Server and Storage Virtualization offer VM mobility

## Scenario Description:

- Manage high availability with multipathing and Live migration for planned downtime situations, such as hardware and software maintenance
- Failover individual virtual machines (VMs) to other hosts within a
- Use iSCSI software initiator within the guest connected to iSCSI storage to provide guest clustering
- Nodes in cluster can be active-active

## Virtualization Benefits:

- Less downtime and loss of service for failover with Live Migration.
- Server Virtualization combined with storage virtualization
- Improve availability with less complexity
- Better server utilization due to consolidation
- Seamless backup and recovery
- Management efficiency



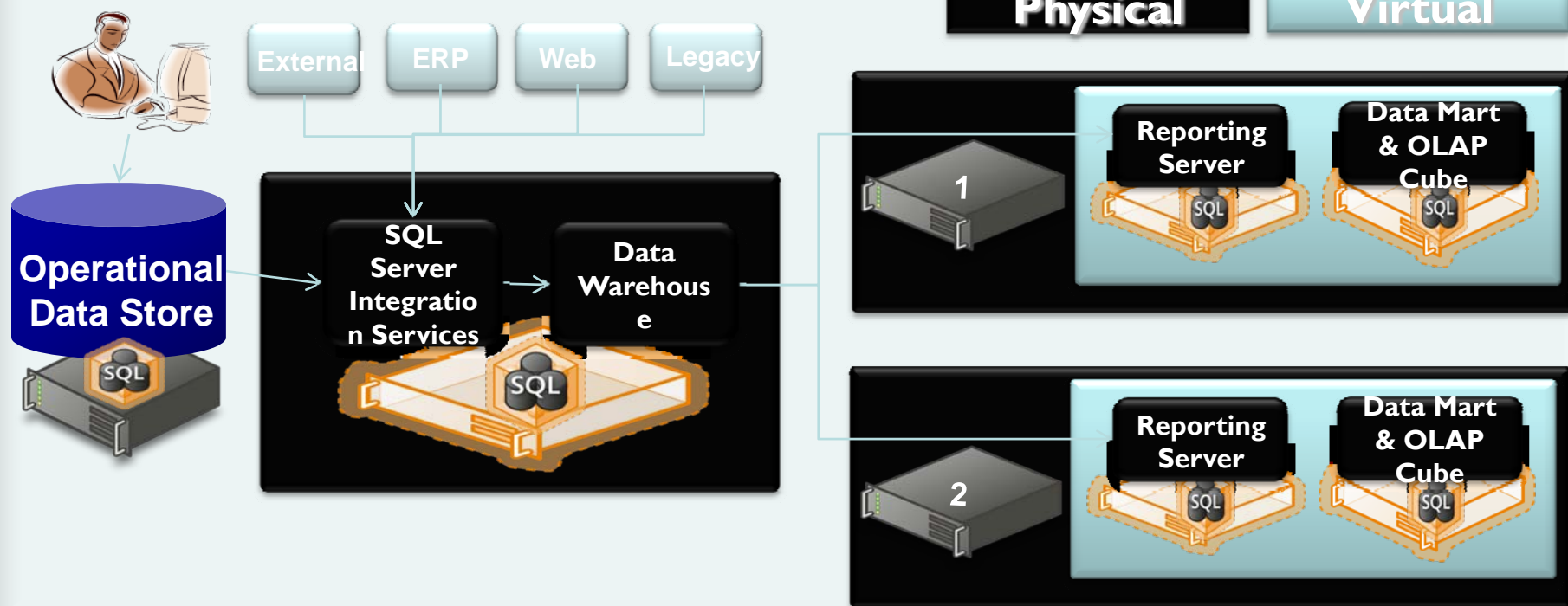
# Virtualization for BI Infrastructure

## Scenario Description:

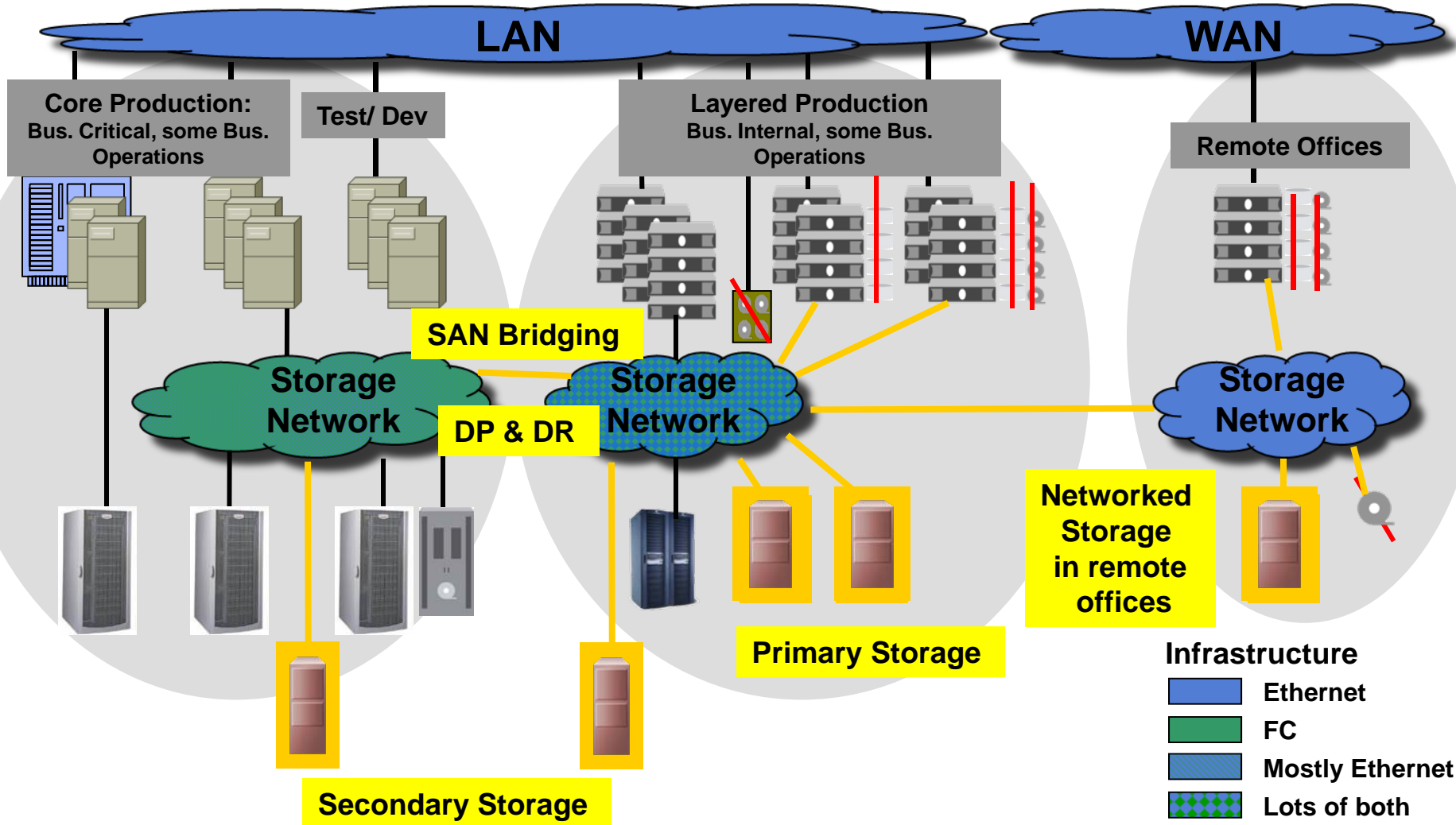
- Heavy transactional database remains physical
- SQL Server Integration Services & Data Warehouse could be physical or virtual. If virtual, keep them in same virtual machine.
- Virtualize Data Mart, OLAP cubes and Reporting Server

## Virtualization Benefits:

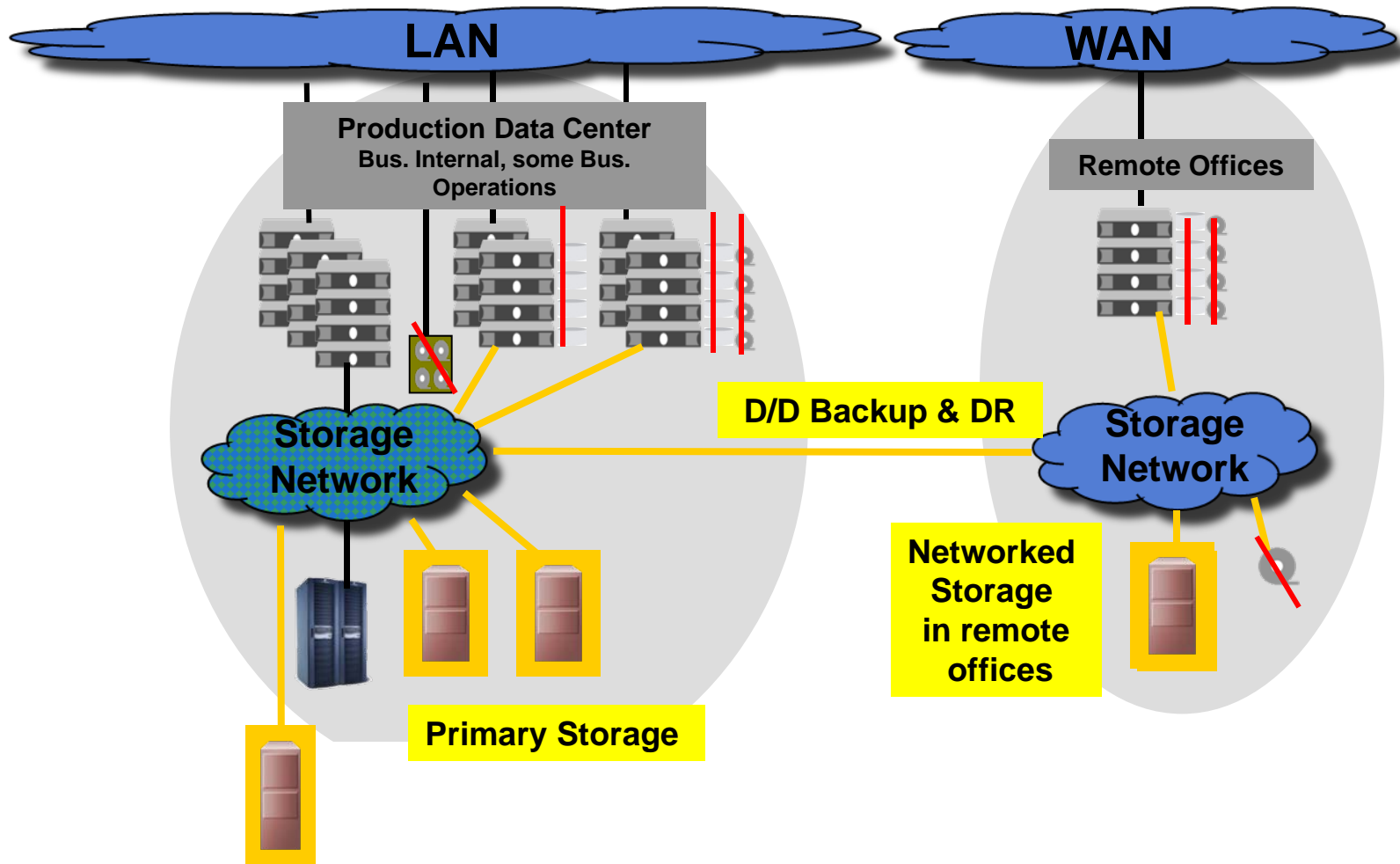
- Scale-out and rapidly provision BI components
- Reduce the number of physical servers
- Reduce hardware costs, save on power and space

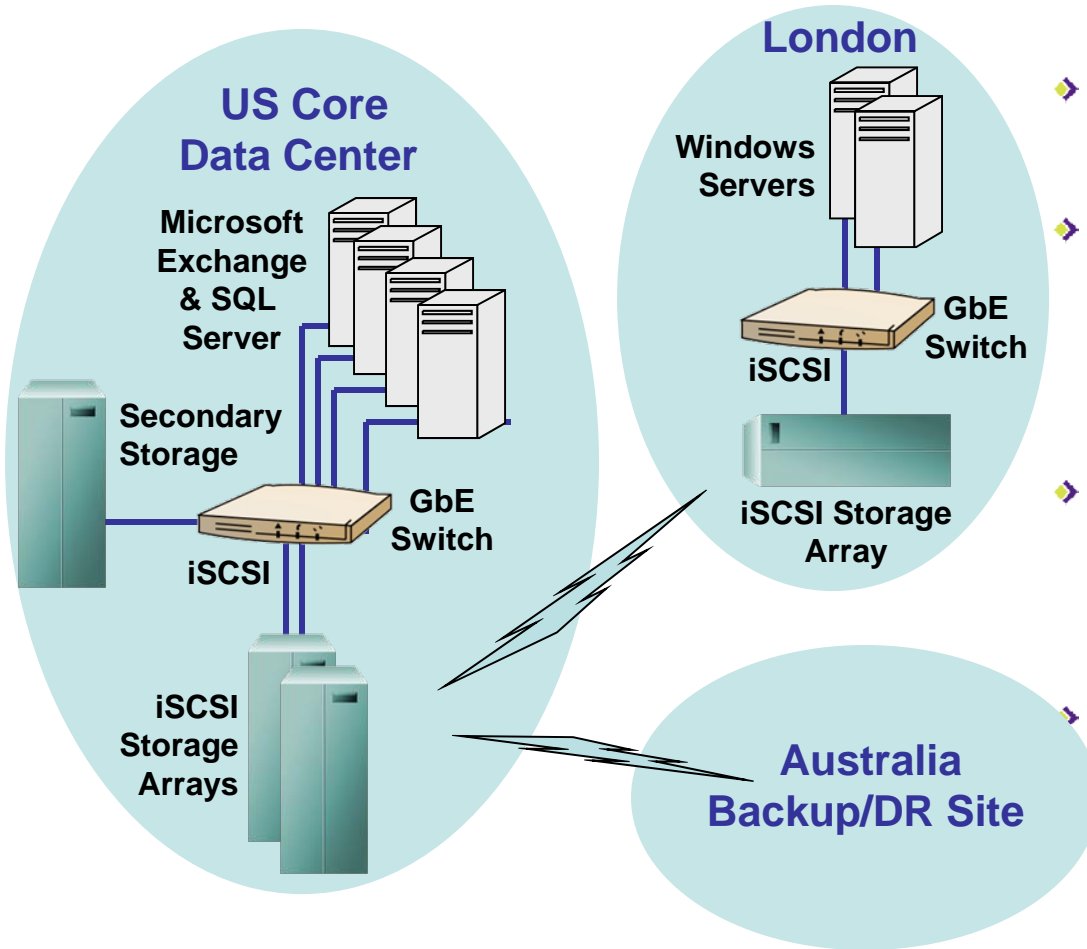


# Where iSCSI-based Storage Fits – Large Enterprise



# Where iSCSI-based Storage Fits – Medium/Small Enterprise





## Application

- SQL Server databases
- Microsoft Exchange

## Pain Points

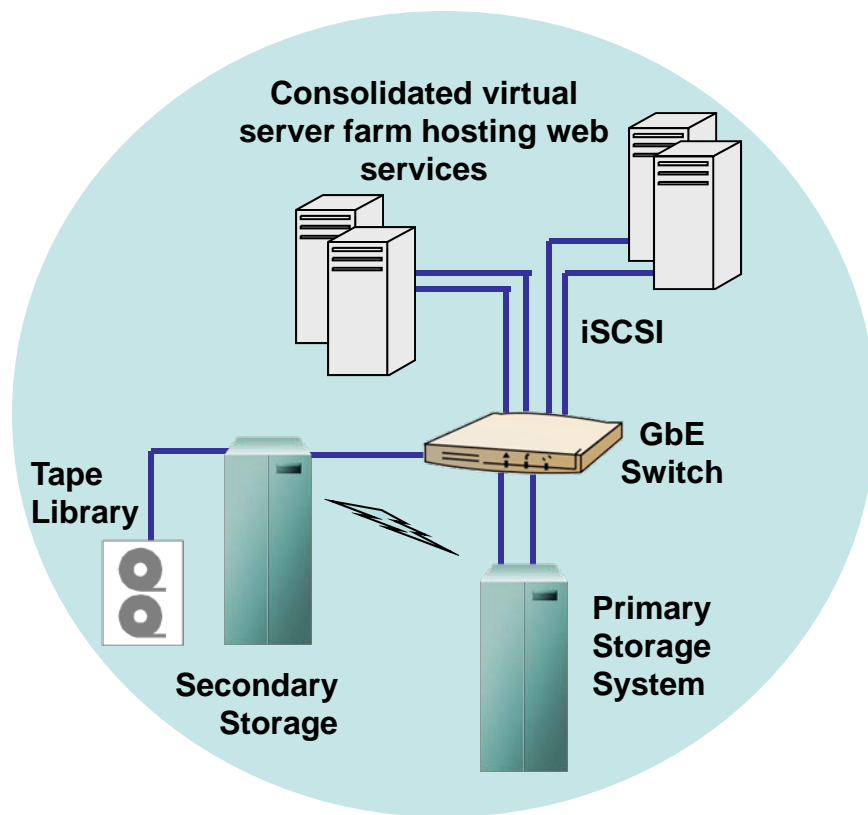
- Challenge to meet SLAs with direct attached storage environment
- Affordable SAN storage for SQL Server databases
- Affordable DR solution

## Solution

- IP SAN in each location
- Multiple snapshot backups per day to US core data center
- Async mirror to DR site

## Benefits

- High performance solution
- Simple, cost-effective storage network
- DR between existing data centers
- Enhanced ability to meet demanding airline customer SLAs



## ➤ Application

- ◆ Web hosting services

## ➤ Pain Points

- ◆ Rapid growth
- ◆ Outgrowing “green” data center
- ◆ Very poor server utilization
- ◆ Disruptive backup process

## ➤ Solution

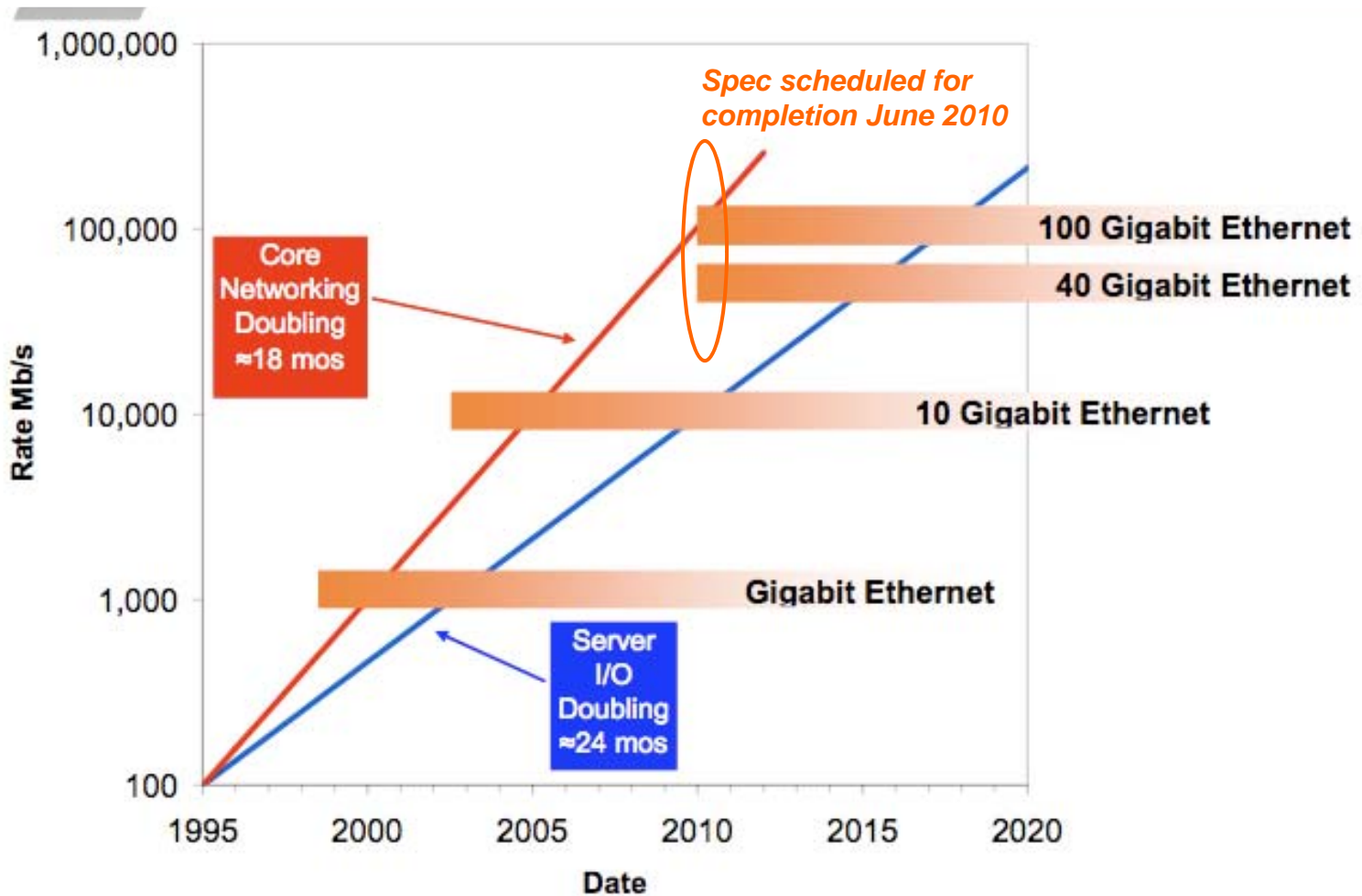
- ◆ Virtual servers w/ IP SAN
- ◆ Disk-to-disk backup for HA and DR

## ➤ Benefits

- ◆ Virtual server environment provides the flexibility to host additional clients and increase revenue potential.
- ◆ Server and storage consolidation reduced data center power consumption by 60 percent.
- ◆ Replacement of 120 white box servers with four SMP servers reduced cooling costs and data center footprint.
- ◆ Cost savings and cost avoidance enabled pursuit of additional environmental conservation solutions.

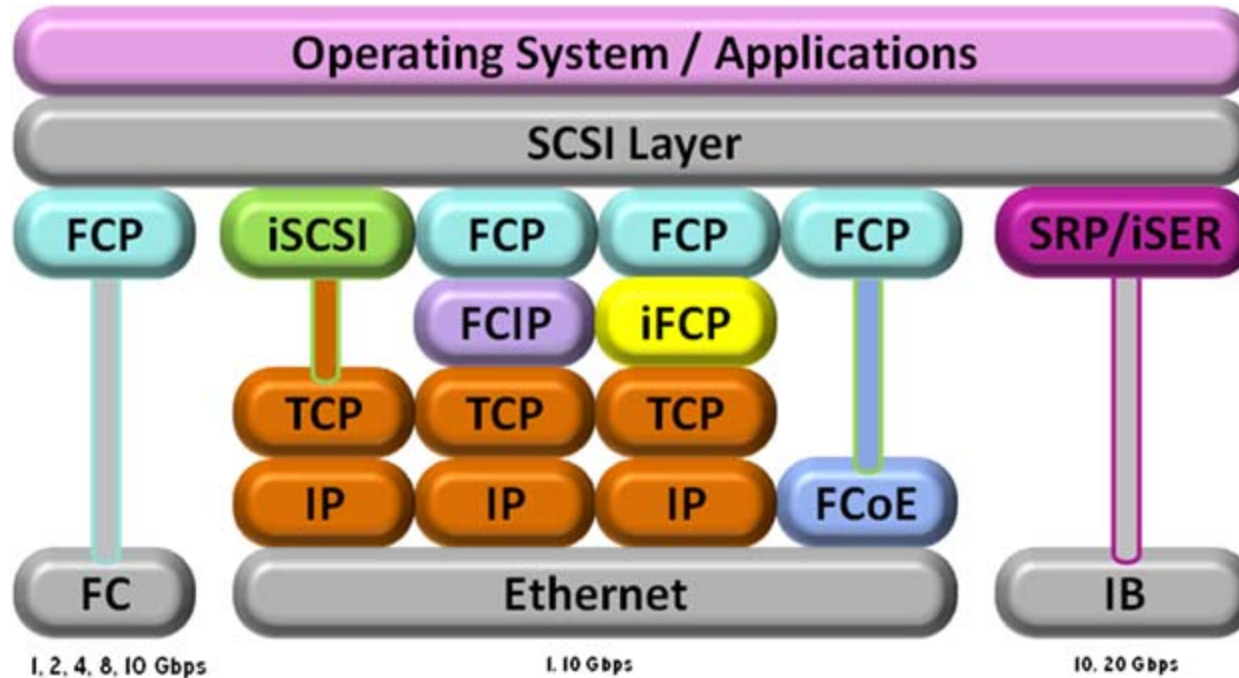


# Futures: Ethernet beyond 10Gb



**Source:** John D'Ambrosia, Force 10 Networks  
Chair, IEEE P802.3ba Task Force; Ethernet Alliance

# Fibre Channel over Ethernet



- An Extension of Fibre Channel onto a 10Gb Ethernet network
- FCoE is a direct mapping of Fibre Channel over Ethernet
- TCP/IP is not required and not present for FCoE
- Preserves ops, control and management environments for the FC layer

# IEEE 802.1 DCB Protocol Status

- FCoE requires “lossless” Ethernet
  - ◆ Possible with Ethernet plus some extensions
- Data Center Bridging benefits iSCSI and FCoE
  - ◆ Ensures Storage IO receives priority over lower priority traffic
- The IEEE 802.1 DCB WG is defining these extensions
  - ◆ Priority-based Flow Control (PFC): 802.1Qbb
  - ◆ Enhanced Transmission Selection (ETS): 802.1Qaz
    - › Including DCBX (DCB eXchange protocol)
  - ◆ Congestion Notification (CN): 802.1Qau
- Standards-compliant products shipping now
- FCoE I/O Consolidation requirements:
  - ◆ PFC is required,
  - ◆ ETS is highly recommended,
  - ◆ CN is optional (not required for initial FCoE deployments)
- DCB required for multiprotocol support (FCoE and TCP/IP)

# Summary - iSCSI Storage

- Sophisticated storage consolidation solutions for low-end and mid-range server environments
- Takes advantage of existing IT knowledge base
- Provides simpler, more affordable SAN infrastructure
- Improves data availability and performance
- Integrates distributed data and resources
- Solutions are deployed in many thousands of companies around the world
- Ultimately provides one technology for connecting clients, servers & storage devices

- ▶ Please send any questions or comments on this presentation to SNIA: [trackstoragemgmt@snia.org](mailto:trackstoragemgmt@snia.org)

**Many thanks to the following individuals  
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*SNIA Education Committee*

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