



Education

STORAGE CONSOLIDATION WITH IP STORAGE

David Dale, NetApp

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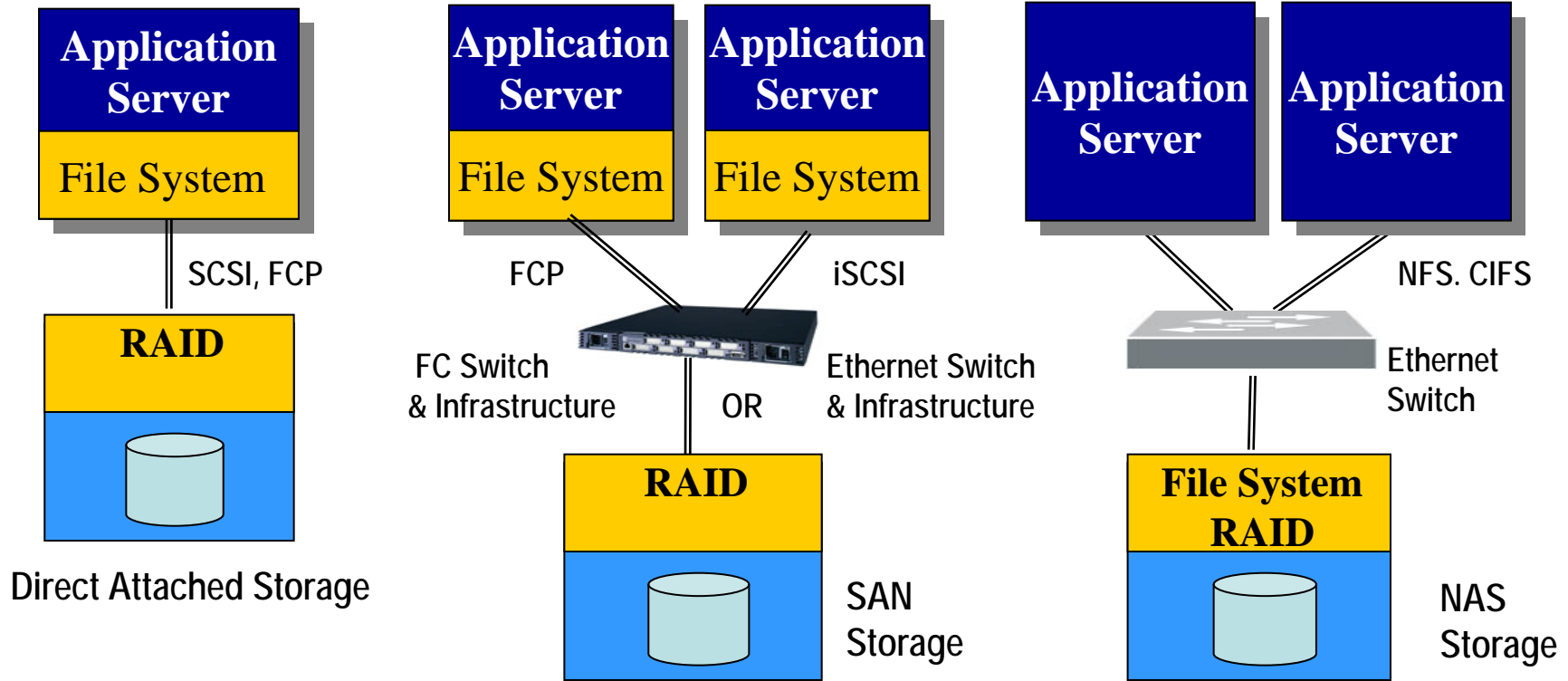
Storage Consolidation with IP Storage

This session will appeal to IT managers, administrators and architects interested in best practices and deployment considerations of storage consolidation solutions available with IP Storage technologies today.

This presentation, an update to a very popular SNIA Tutorial, outlines the benefits of networked storage, contrasting the different options. It then goes into detail on iSCSI-based SAN configurations, capabilities, options and best practices, including contemporary iSCSI storage features. It then explains via customer case studies how these capabilities deliver benefits to IT organizations. Finally, emerging and future technologies and capabilities are considered, including 10GbE and FCoE.

- Storage Consolidation: Advantages of SANs
- Storage Area Networking with IP Storage
 - ◆ Topologies
 - ◆ Benefits
- iSCSI-based SANs
 - ◆ Connectivity and security
 - ◆ Host support
 - ◆ Performance
 - ◆ Typical array capabilities
- Typical iSCSI Deployment Deployments
 - ◆ Where IP Storage Fits
 - ◆ Typical Reasons for Deployment
 - ◆ Deployment Case Studies
- What's Next
- Summary

Storage Technologies



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

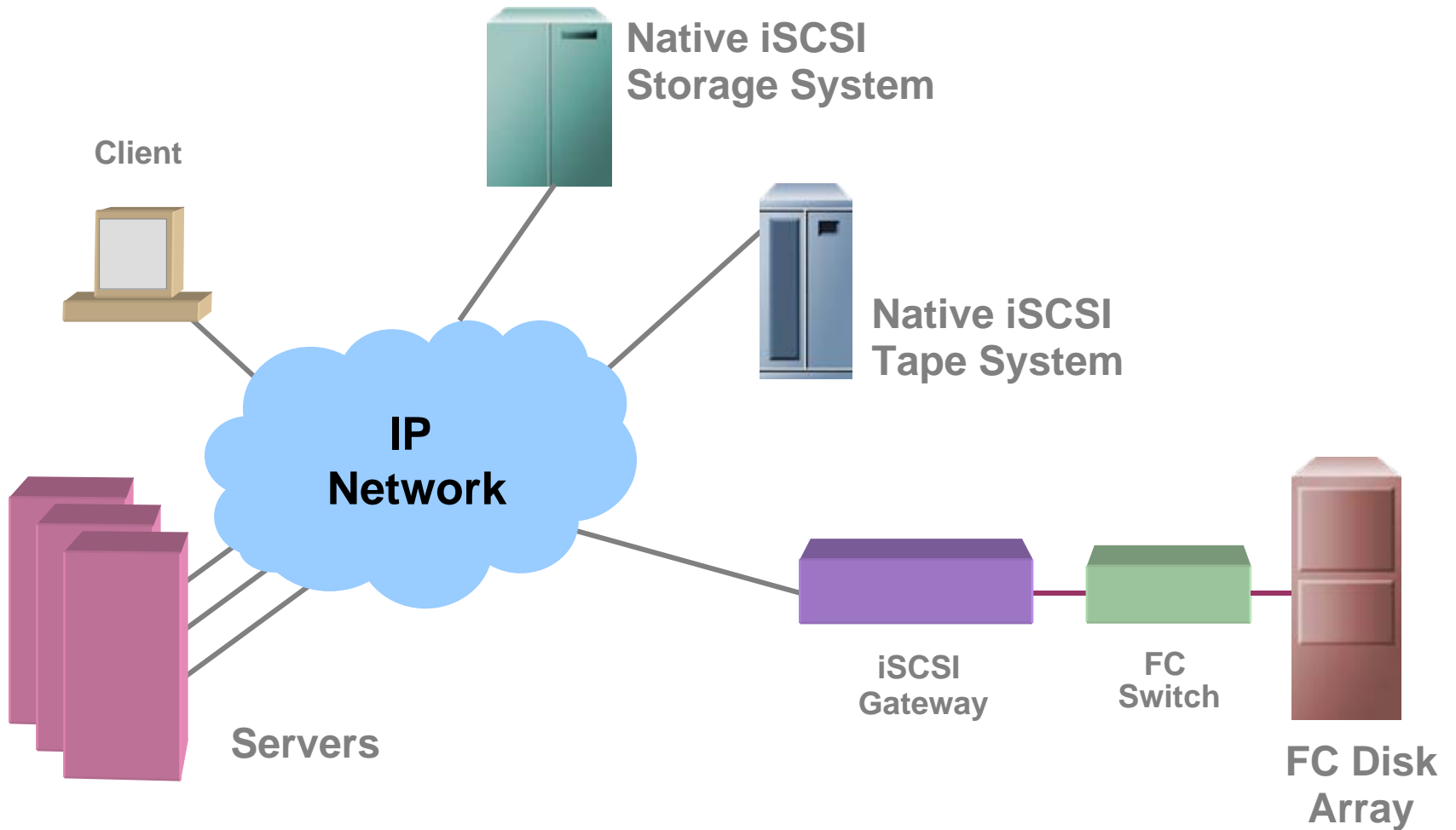
- Server-based data management
- Resource sharing
- No data sharing
- Works with all apps

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

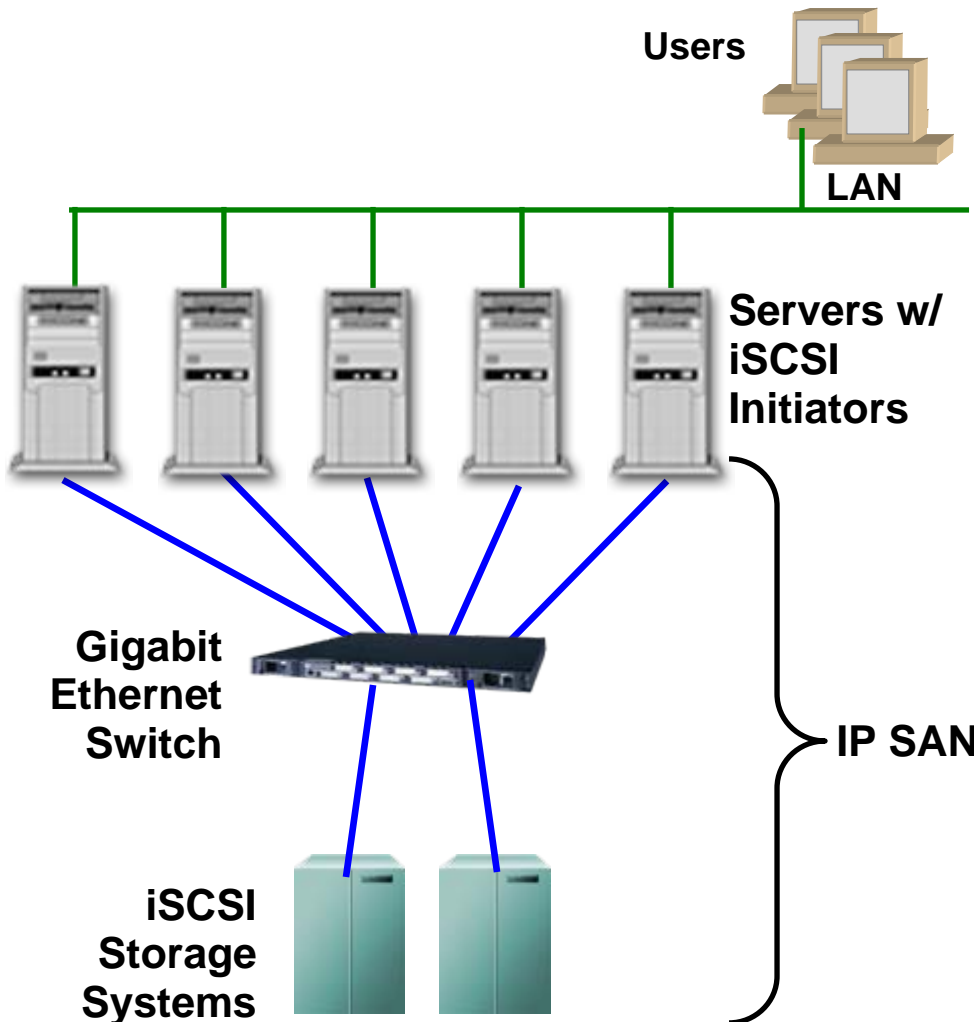
What SANs Deliver

- 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

iSCSI SAN Options

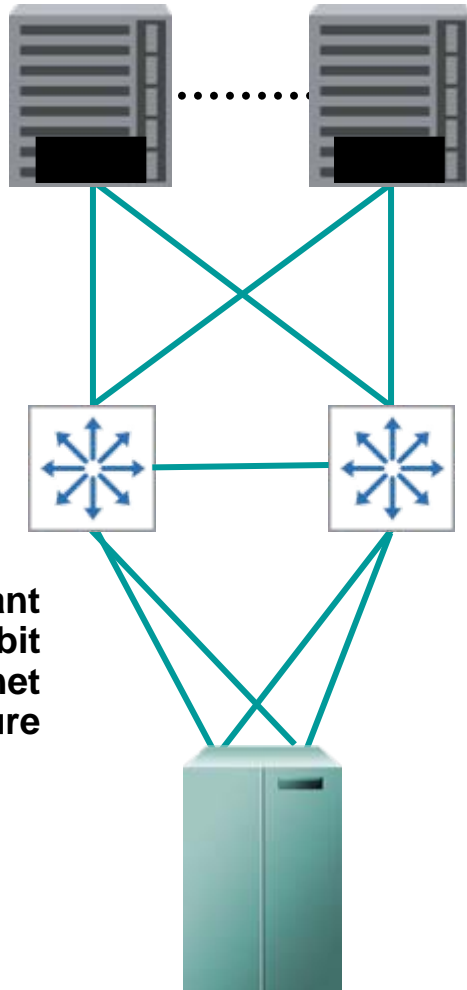


IP SAN Benefits



- **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



Redundant
Gigabit
Ethernet
Infrastructure

Connectivity:

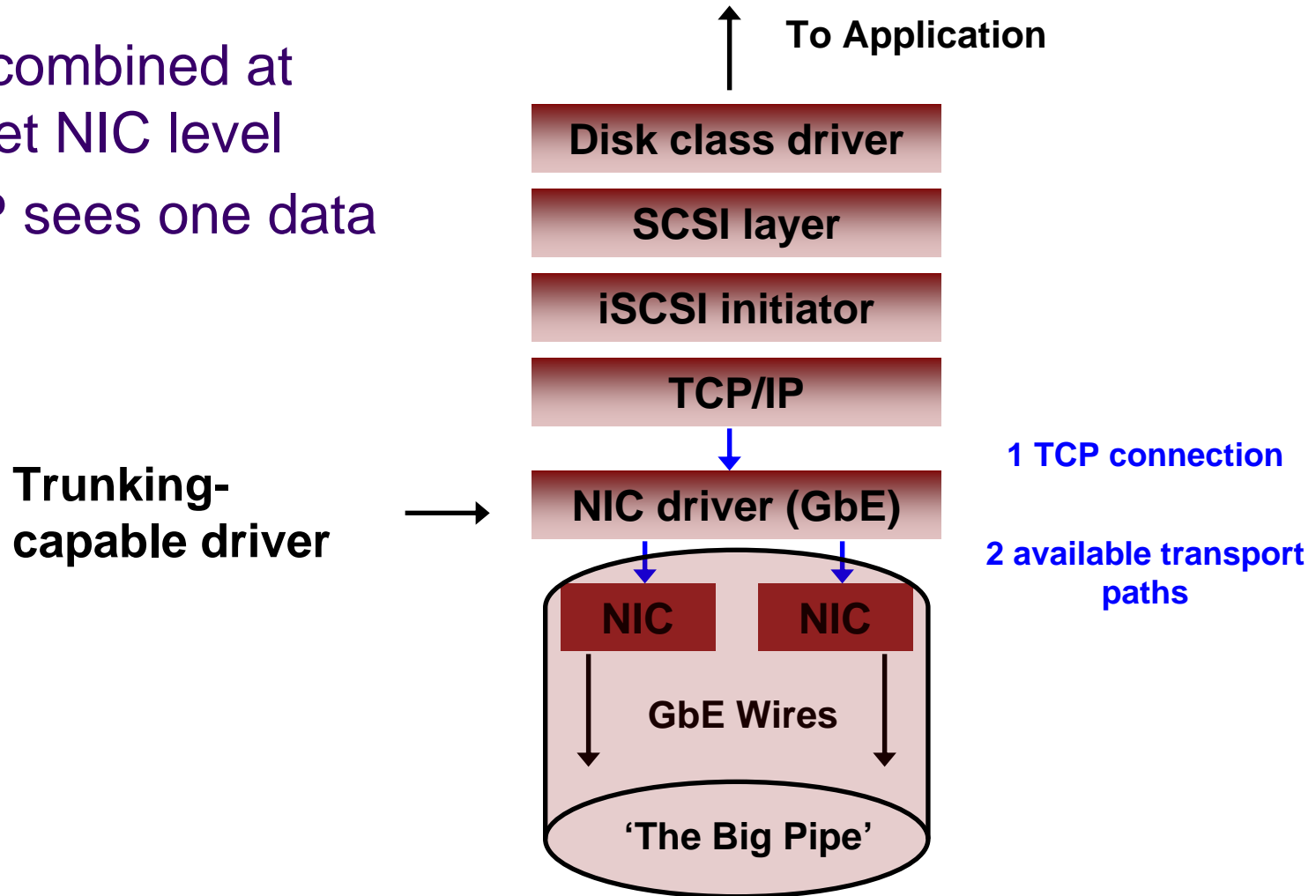
- ▶ Gigabit Ethernet (10Gb emerging)
- ▶ Jumbo frames (recommended)
- ▶ Link aggregation (bandwidth)

Security:

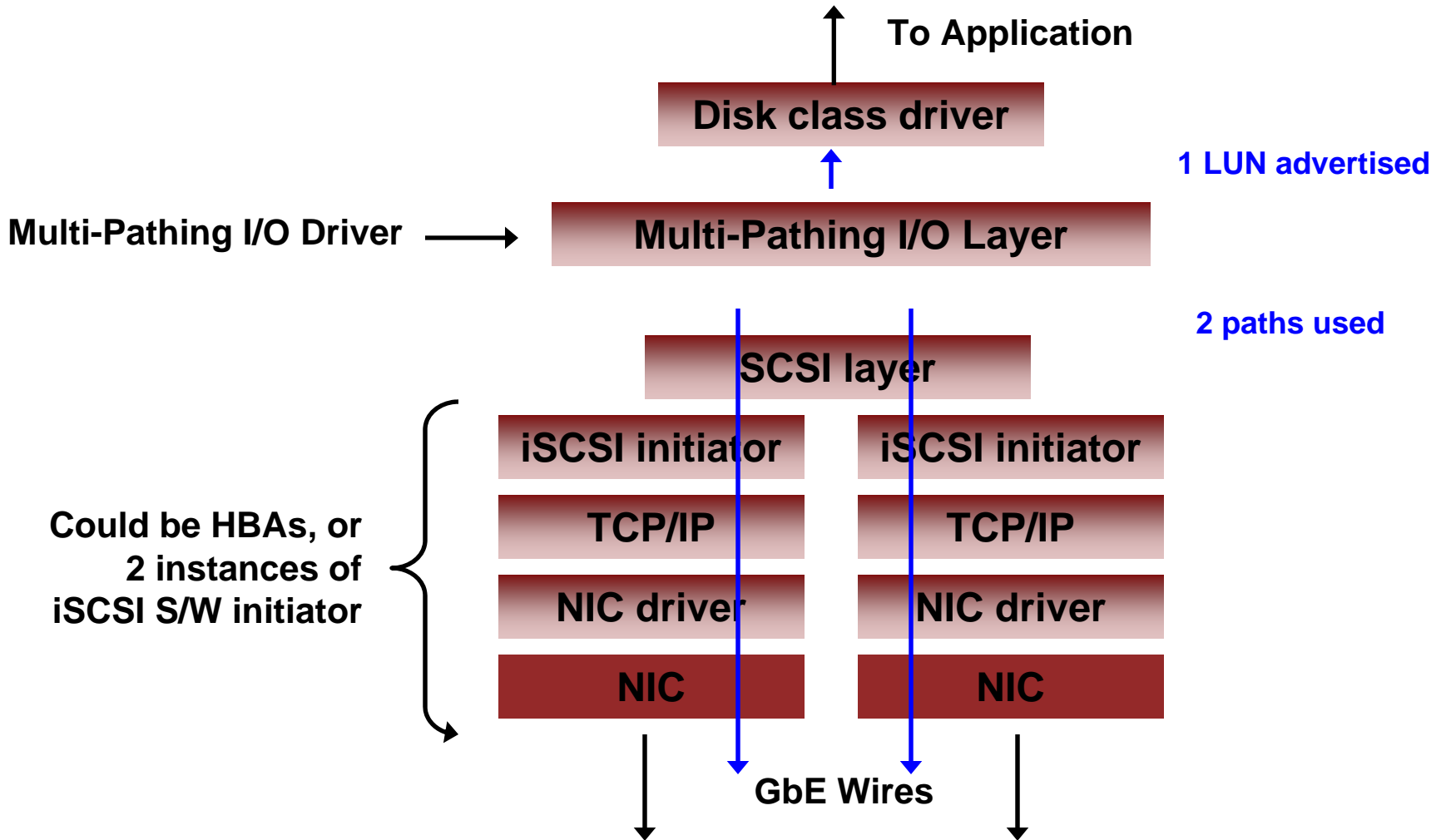
- ▶ Host authentication (CHAP)
- ▶ Private network
 - ▶ Physical
 - ▶ VLAN (zoning)
- ▶ Array LUN masking
- ▶ Optional firewall
- ▶ Optional IPSec appliance

HA Options: Link Aggregation

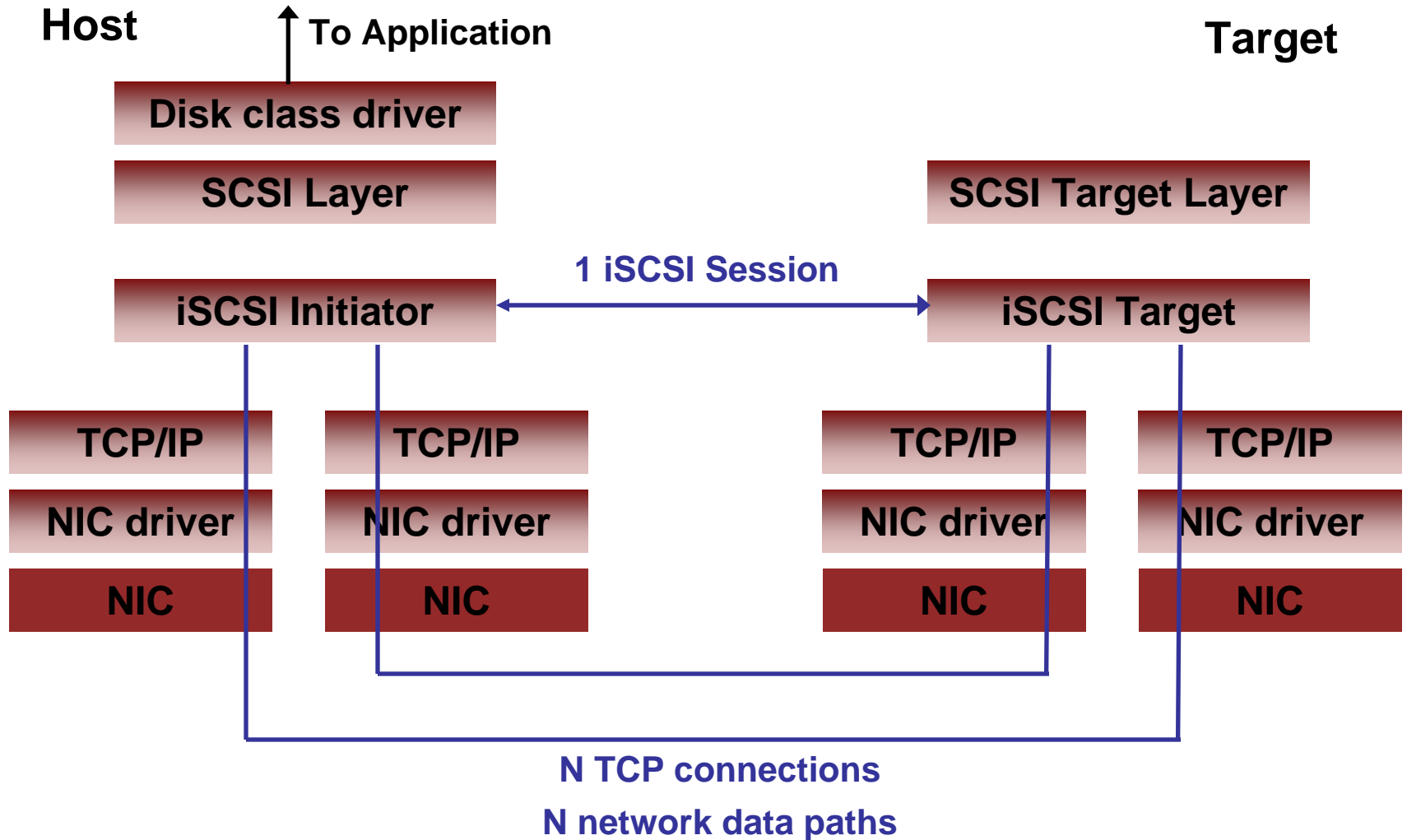
- ▶ Paths combined at Ethernet NIC level
- ▶ TCP/IP sees one data path










HA Options: Multi-Pathing I/O



HA Options: Multi-Connection iSCSI Sessions



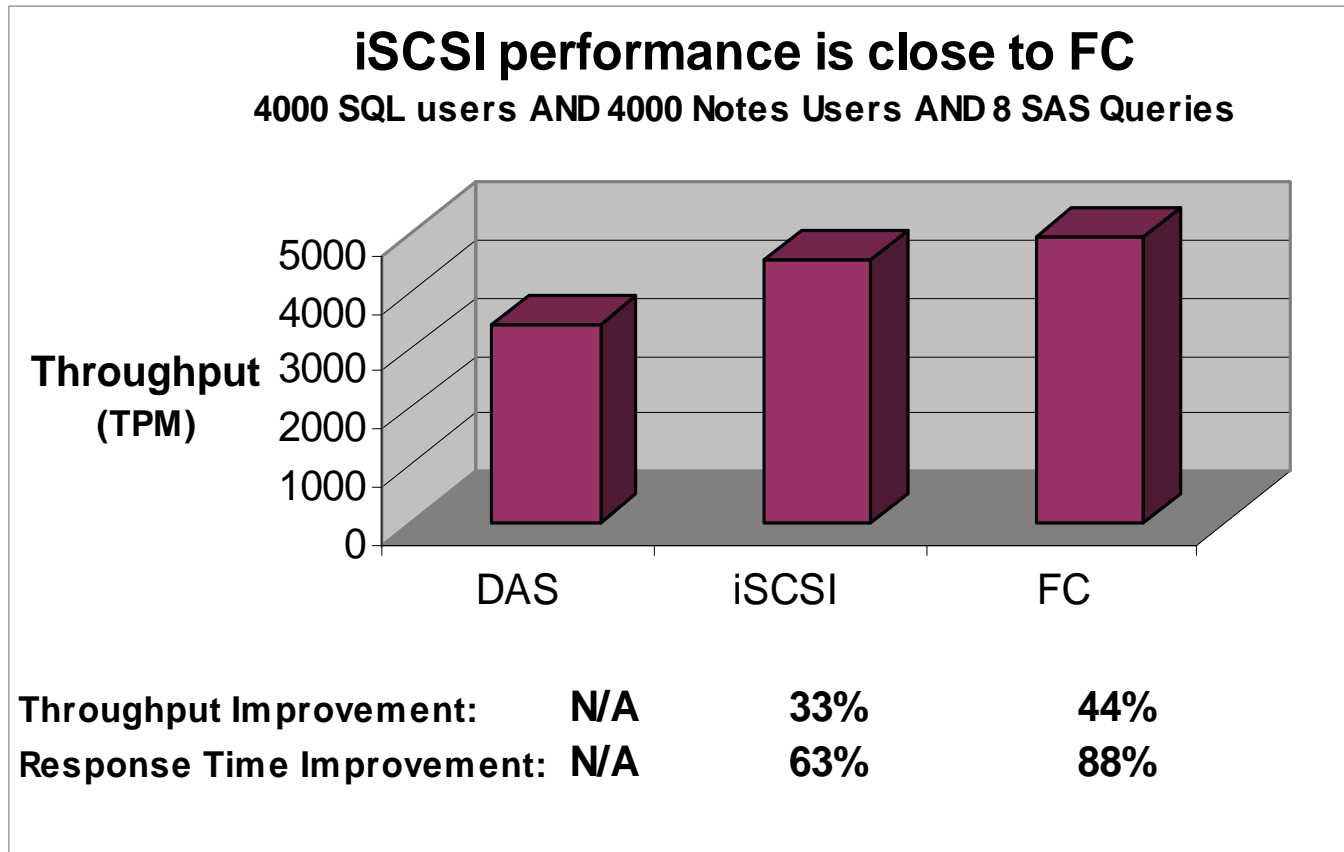
IP SAN Host Support

OS	Initiator	Certified	Multi-pathing	Cluster
	Hardware, Software	<input checked="" type="checkbox"/>	Trunking, 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

I/O Performance Considerations

- **Software iSCSI initiator + standard NIC**
 - ◆ Host CPU overhead (up to 500MHz)
 - ◆ Low cost (free download)
 - ◆ Adequate for most mid-range applications
 - ◆ Most popular solution today (85% deployments)
 - ◆ Now supports boot from SAN
- **TCP Offload (TOE) NIC**
 - ◆ Lower host CPU overhead
 - ◆ Uses OS-native iSCSI software initiator
- **iSCSI HBA**
 - ◆ Overhead similar to Fibre Channel HBA
 - ◆ Added services/options: boot from SAN, IPSec for security and Data Digest for higher data integrity

➤ Enterprise Strategy Group Validation study (4/04)

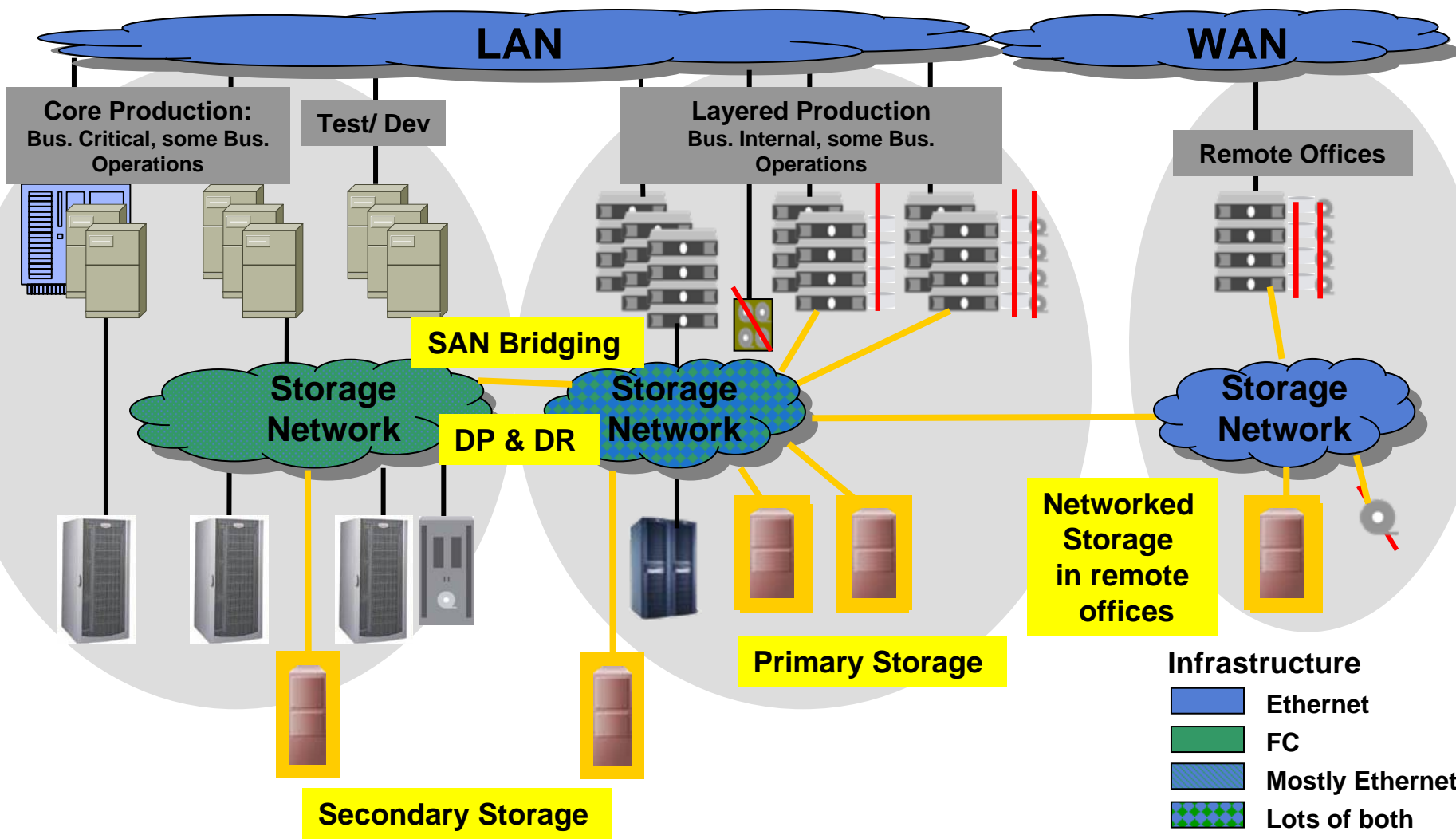


Typical iSCSI Array Capabilities

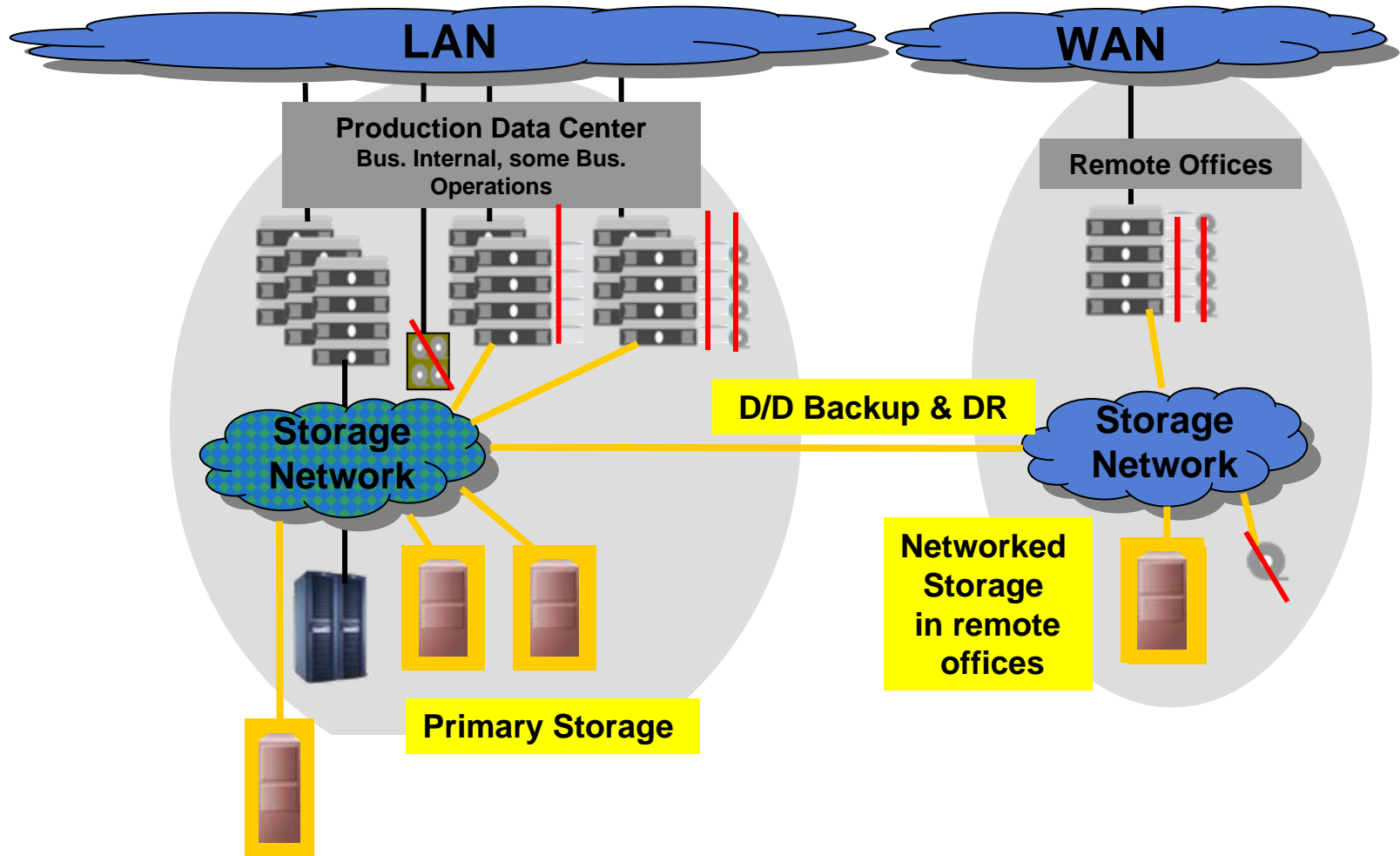
- ▶ Basic storage considerations
 - ◆ Redundant components
 - ◆ Dual active controllers with failover
 - ◆ RAID
 - ◆ SATA drives; FC drives (often); SAS drives (emerging)
- ▶ Storage features
 - ◆ Point in time copies (Snapshot)
 - ◆ Network Boot
 - ◆ Multi-path I/O for High Availability
 - ◆ Remote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



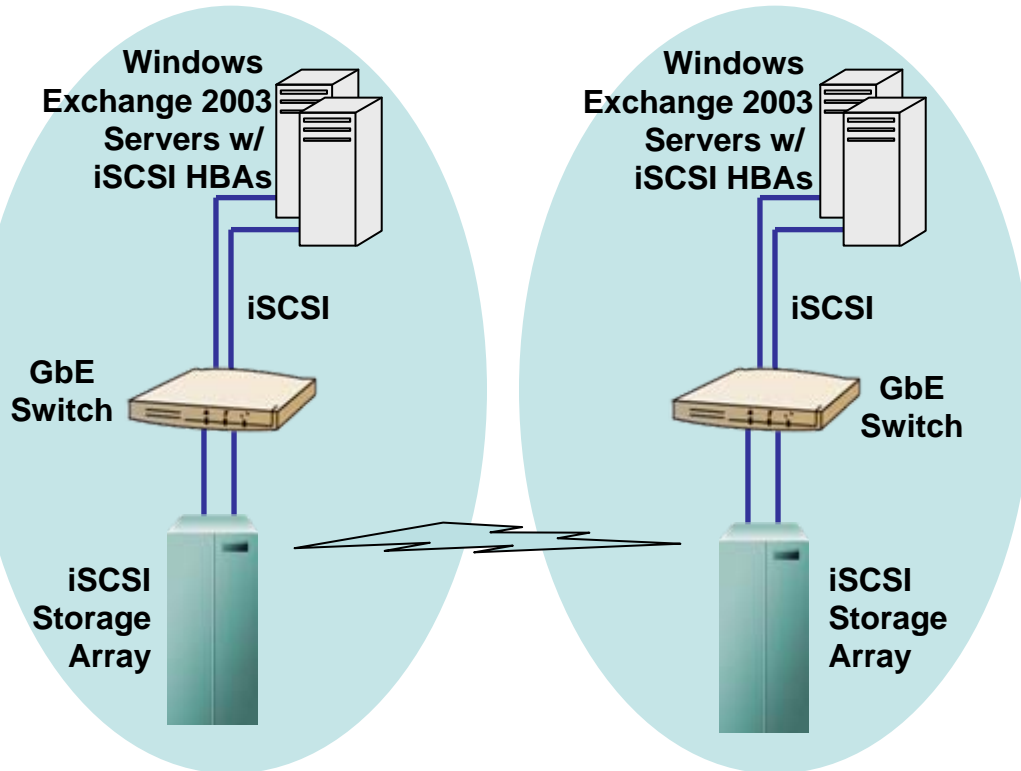
Where IP Storage Fits - Large Enterprise



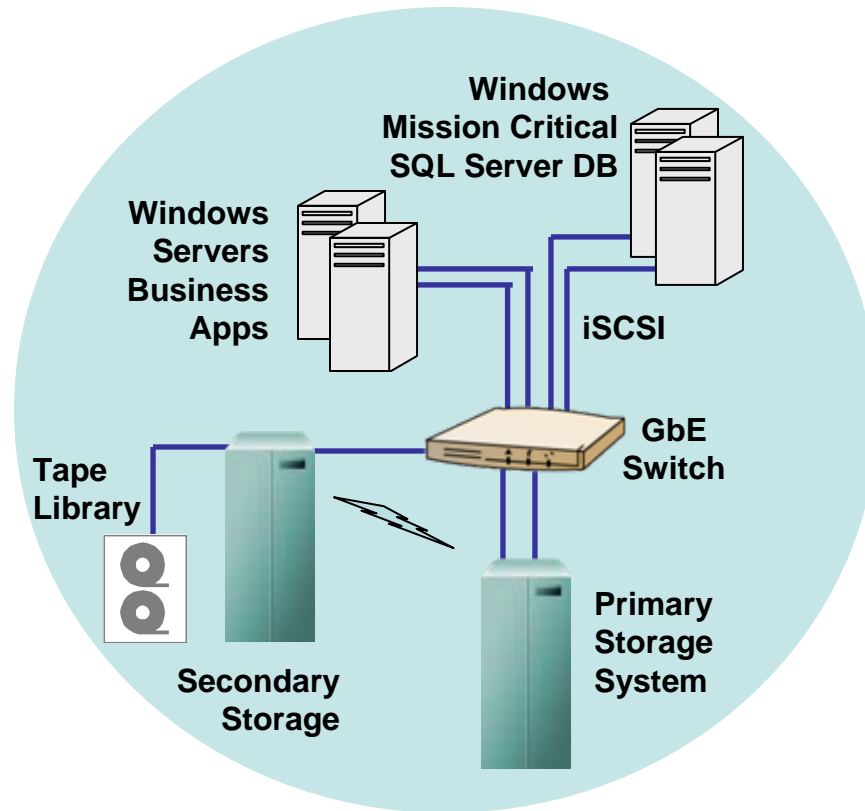
Where IP Storage Fits - Medium/Small Enterprise



Consolidated Regional Exchange 2003 Environment



- Application
 - ◆ *Microsoft Exchange 2003*
- Pain Points
 - ◆ *Exchange environment on 32 servers*
 - ◆ *Reliability issues with DAS*
 - ◆ *Unacceptable recovery time (18-24 hours)*
 - ◆ *No Disaster Recovery solution*
- Solution
 - ◆ *Consolidation using IP-SAN*
 - ◆ *Async mirroring between sites*
- Benefits
 - ◆ *No downtime or outages*
 - ◆ *Exchange recovery now <25 minutes*
 - ◆ *Support costs cut by one third*
 - ◆ *Affordable*
 - ◆ *Disk-to-disk backup cuts admin costs by 90%*
 - ◆ *Diskless boot improves server support environment*

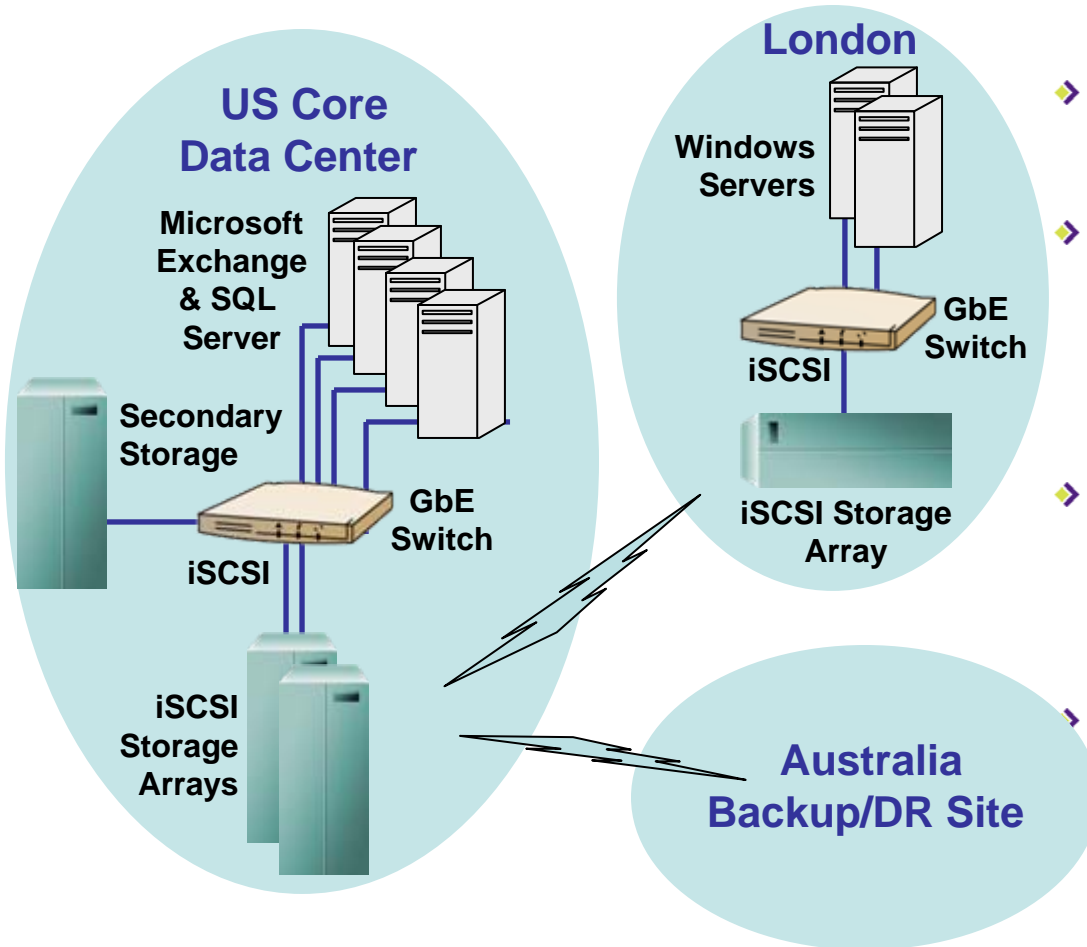


- Application
 - ◆ *SQL Server Databases; Business Apps*

- Pain Points
 - ◆ *Difficult-to-manage infrastructure*
 - ◆ *Mission critical data at risk*
 - ◆ *Isolated storage islands*
 - ◆ *Fragmented backup process*

- Solution
 - ◆ *IP SAN*
 - ◆ *3-tier storage architecture*

- Benefits
 - ◆ *High performance SQL databases*
 - ◆ *100% data availability*
 - ◆ *Highly flexible backup process*
 - ◆ *User-initiated data restores*
 - ◆ *Improved IT admin productivity*



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

- Mainstream deployment in multi-OS host environments (Windows, Linux, Unix)
- Mainstream deployment in virtual server environments (VMWare, Xen)
- Broad deployment in small blade server environments
- Deployment in large grid (blade) scale-out environments with 10GbE backbone
- High performance environments with 10GbE
- New standards
 - ◆ FCoE
 - ◆ RDMA/10GE (DDR and RDMAP)
 - ◆ iSCSI Extensions for RDMA (iSER)

10 Gb Ethernet Background

- High-speed networking solutions for LAN, MAN & WAN environments
- IEEE 802.3ae ratified 2002
 - ◆ Supports all layer 2, 3 and higher network services
- Optical and copper physical media supported
 - ◆ 10GBASE-E, 10GBASE-L, 10GBASE-S
 - ◆ 10GBASE-CX4; 10GBASE-T
- Requirements for proliferation
 - ◆ Affordable Price
 - ◆ Server architecture support
 - ◆ Standard TOE-supporting software architecture
 - ◆ Affordable TOE hardware

10 Gb Ethernet Today

➤ Deployment/applications

- ◆ MAN connectivity plus SONET alternative in MAN
- ◆ Backbone and port aggregation for 1Gb LANs
 - Driven by acceleration in 1Gb deployment over past 4 years
- ◆ Storage over 10GbE
 - NFS and iSCSI

➤ Pricing

- ◆ Greatly reduced pricing over past 5 years
- ◆ Cost effective aggregation alternative to 10x 1Gb

➤ Architecture and System Support

- ◆ High-speed I/O (PCI-X and PCI-express) now mainstream
- ◆ Defacto standard software TOE support with “TCP Chimney”
- ◆ 10Gb Ethernet connections available on many storage products

Summary - IP 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: trackstorage@snia.org

**Many thanks to the following individuals
for their contributions to this tutorial.**

SNIA Education Committee

**David Dale
SNIA IP Storage Forum Members**