Education

STORAGE CONSOLIDATION WITH IP STORAGE

David Dale, NetApp

SNIA Legal Notice

- The material contained in this tutorial is copyrighted by the SNIA.
- Member companies and individuals may use this material in presentations and literature under the following conditions:
  - Any slide or slides used must be reproduced without modification
  - The SNIA must be acknowledged as source of any material used in the body of any document containing material from these presentations.
- This presentation is a project of the SNIA Education Committee.

Abstract

Storage Consolidation with IP Storage

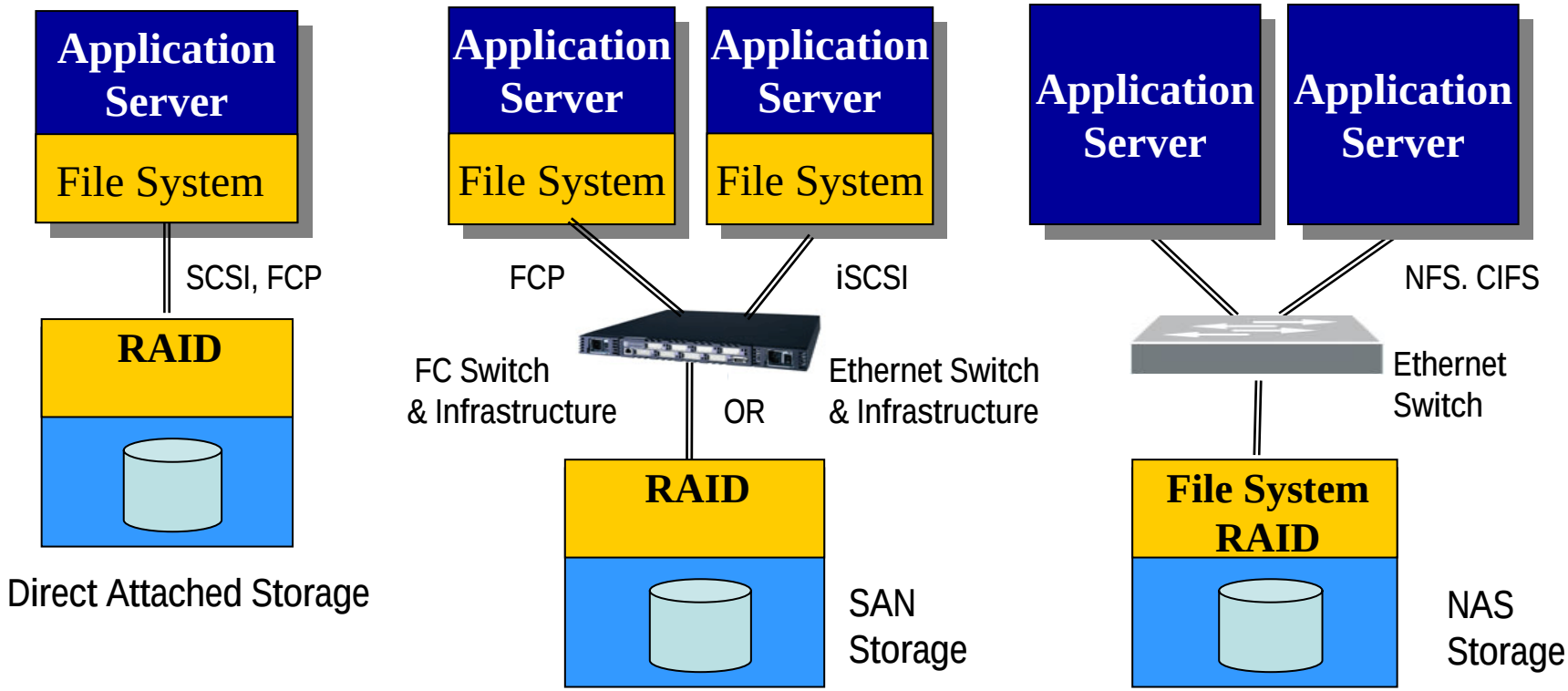
This session will appeal to IT managers, administrators and architects interested in best practices and deployment considerations of storage consolidation solutions available with IP Storage technologies today.

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. The presentation explains via customer case studies how these capabilities deliver distinct benefits to IT organizations. Finally, emerging and future technologies and capabilities are considered, including 10Gb Ethernet.

Contents

- 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

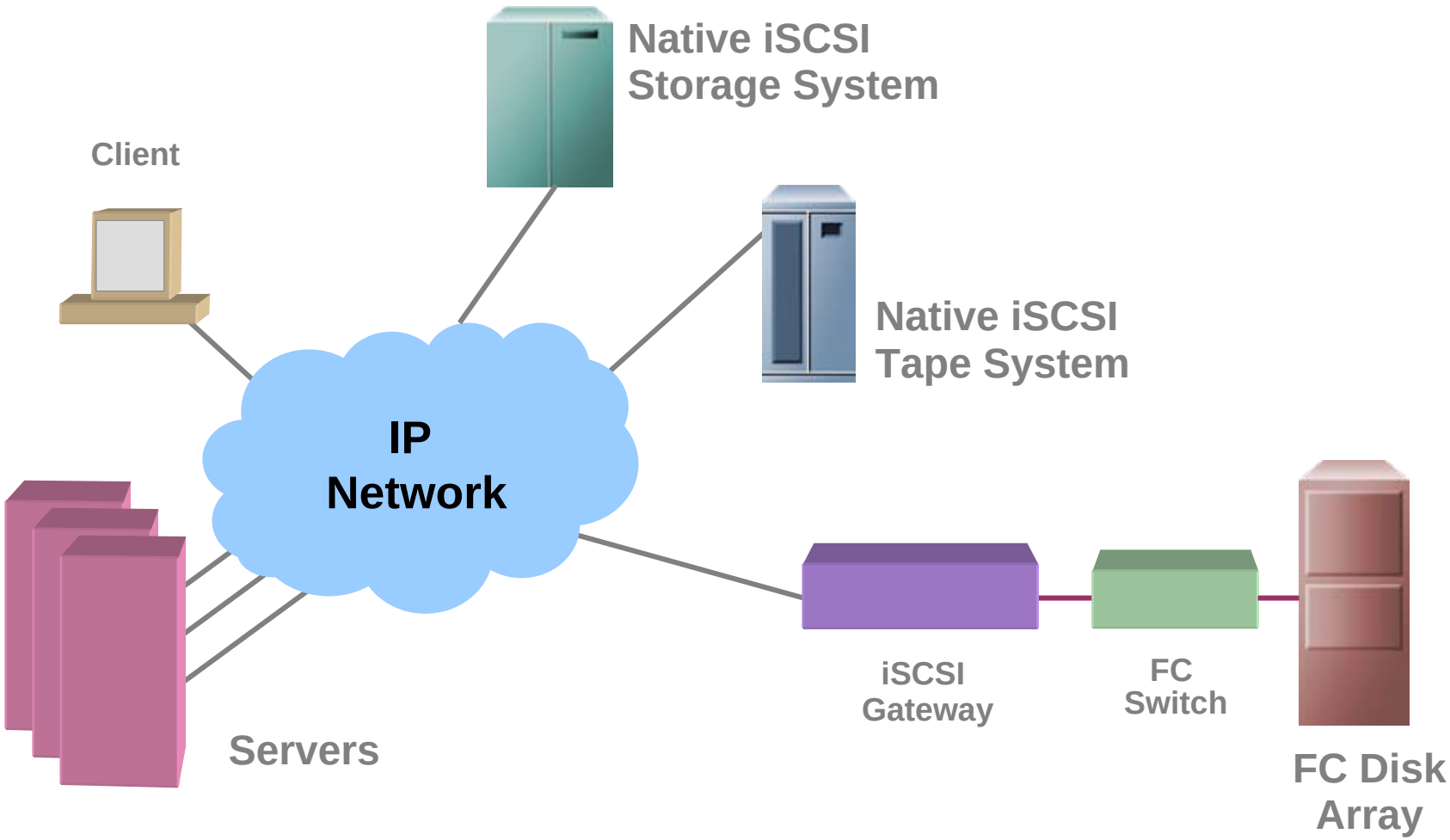
- Server-based data management
- Resource sharing
- No data sharing
- Works with all apps

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

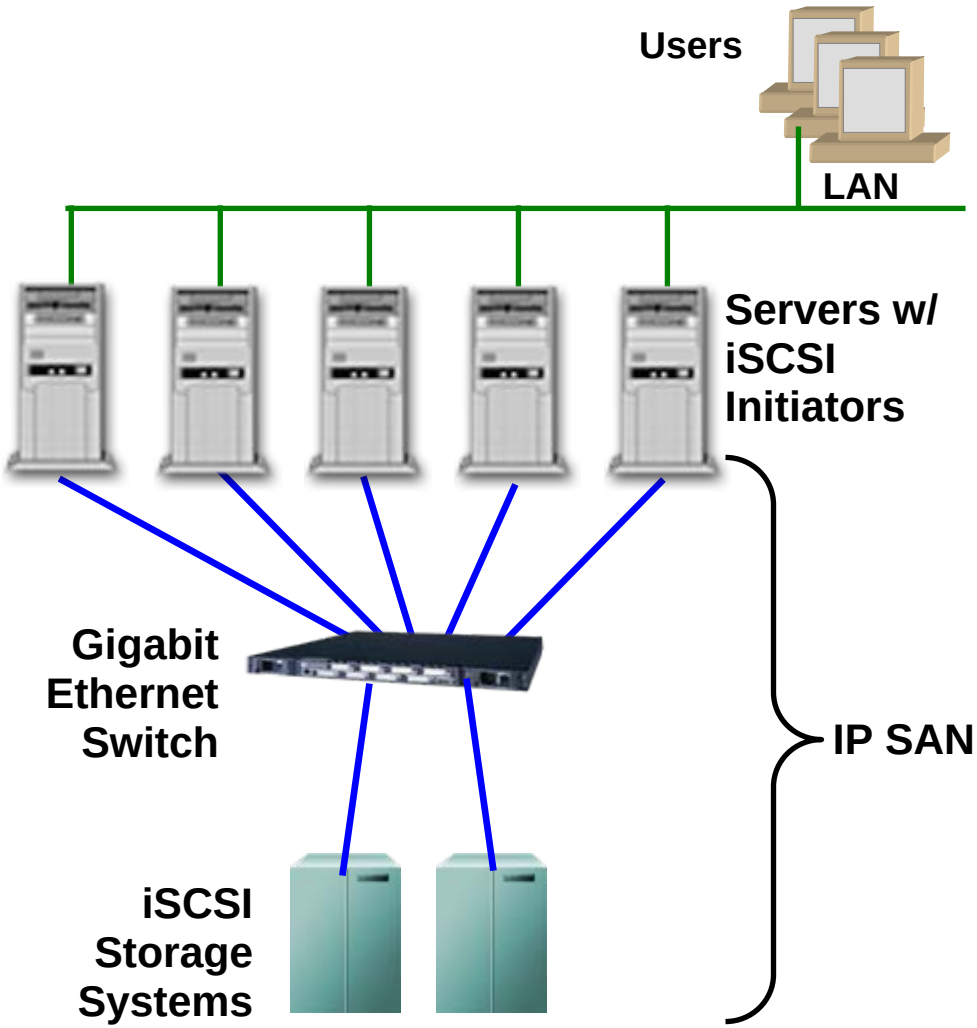
What SANs Deliver

- 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

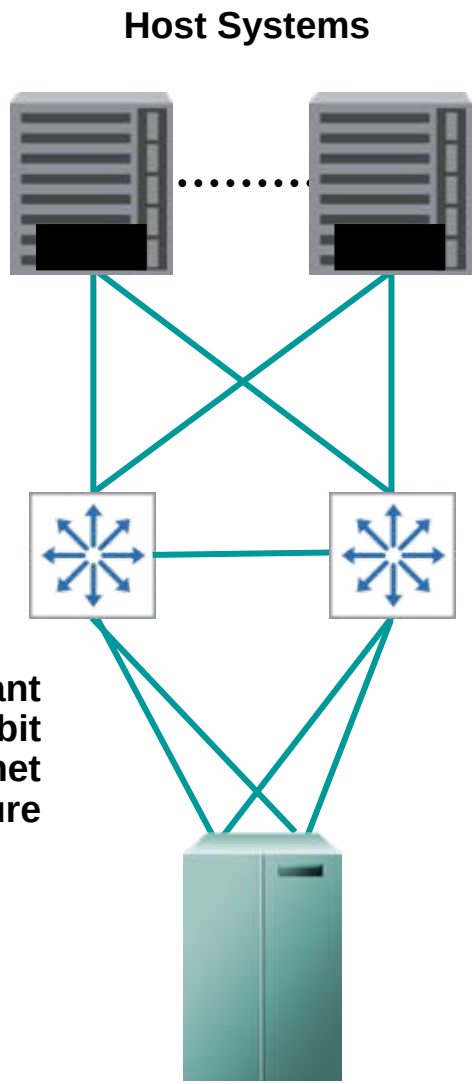


IP SAN Benefits



- 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

iSCSI Host Connectivity/Security



Connectivity:

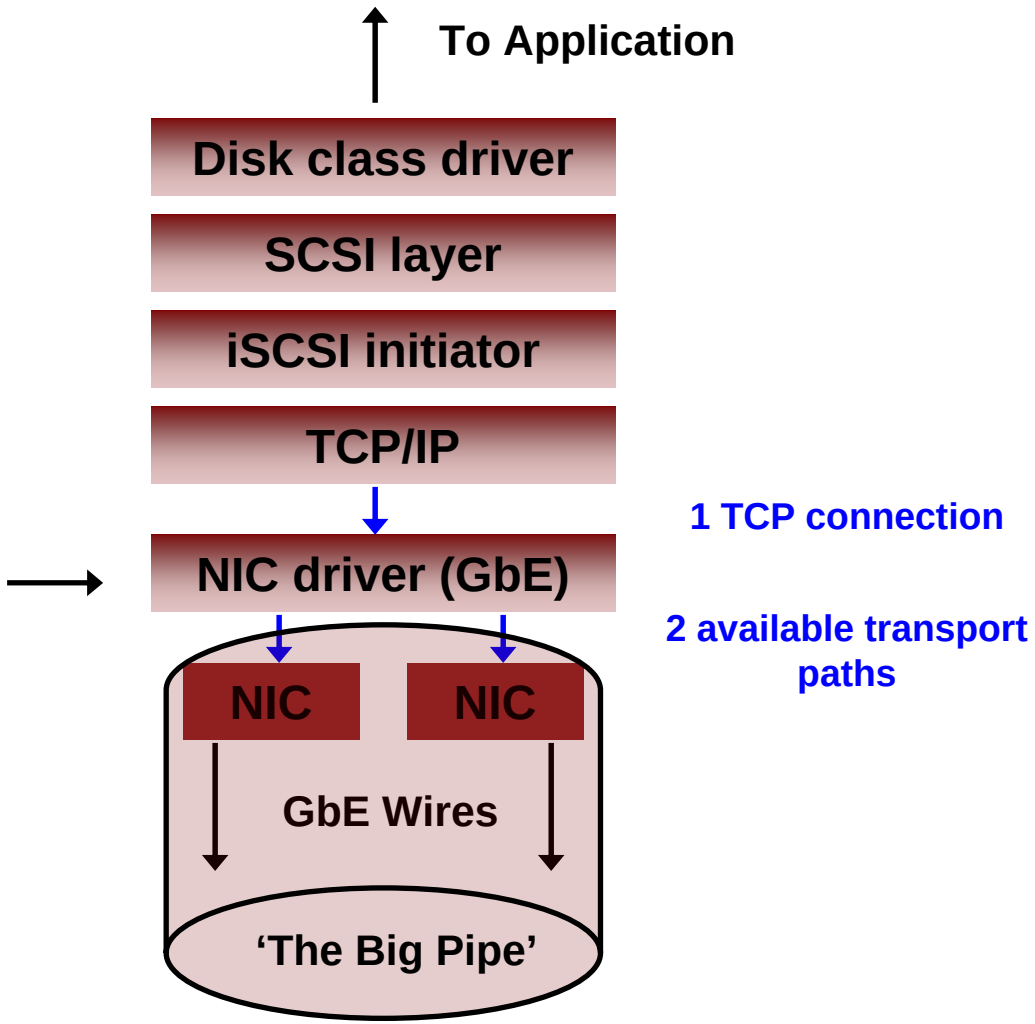
- Gigabit Ethernet (10Gb emerging)
- Jumbo frames (recommended)
- Link aggregation (bandwidth)

Security:

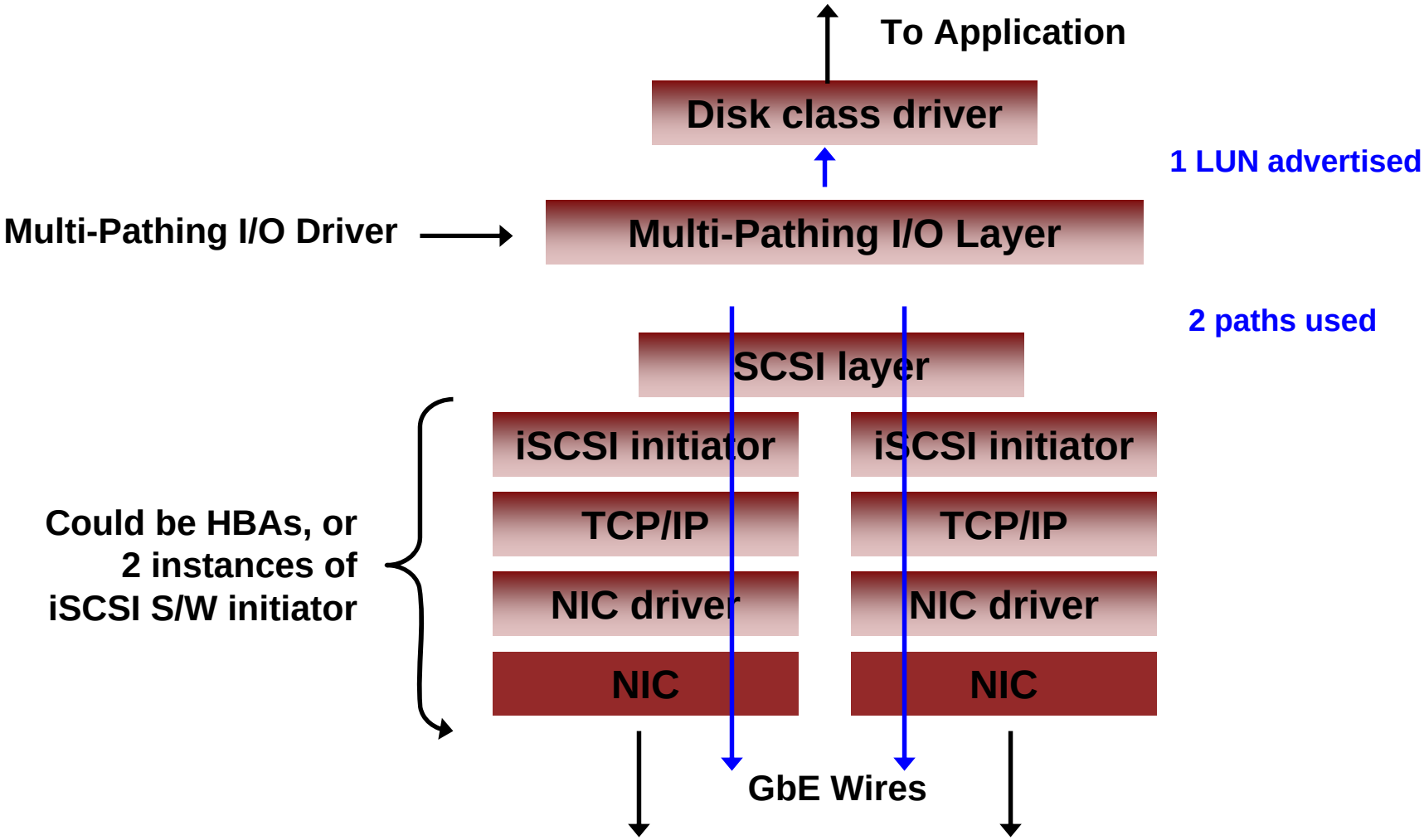
- Host authentification (CHAP)
- Private network
  - Physical
  - VLAN (zoning)
- Array LUN masking
- Optional firewall
- Optional IPSec appliance

HA Options: Link Aggregation

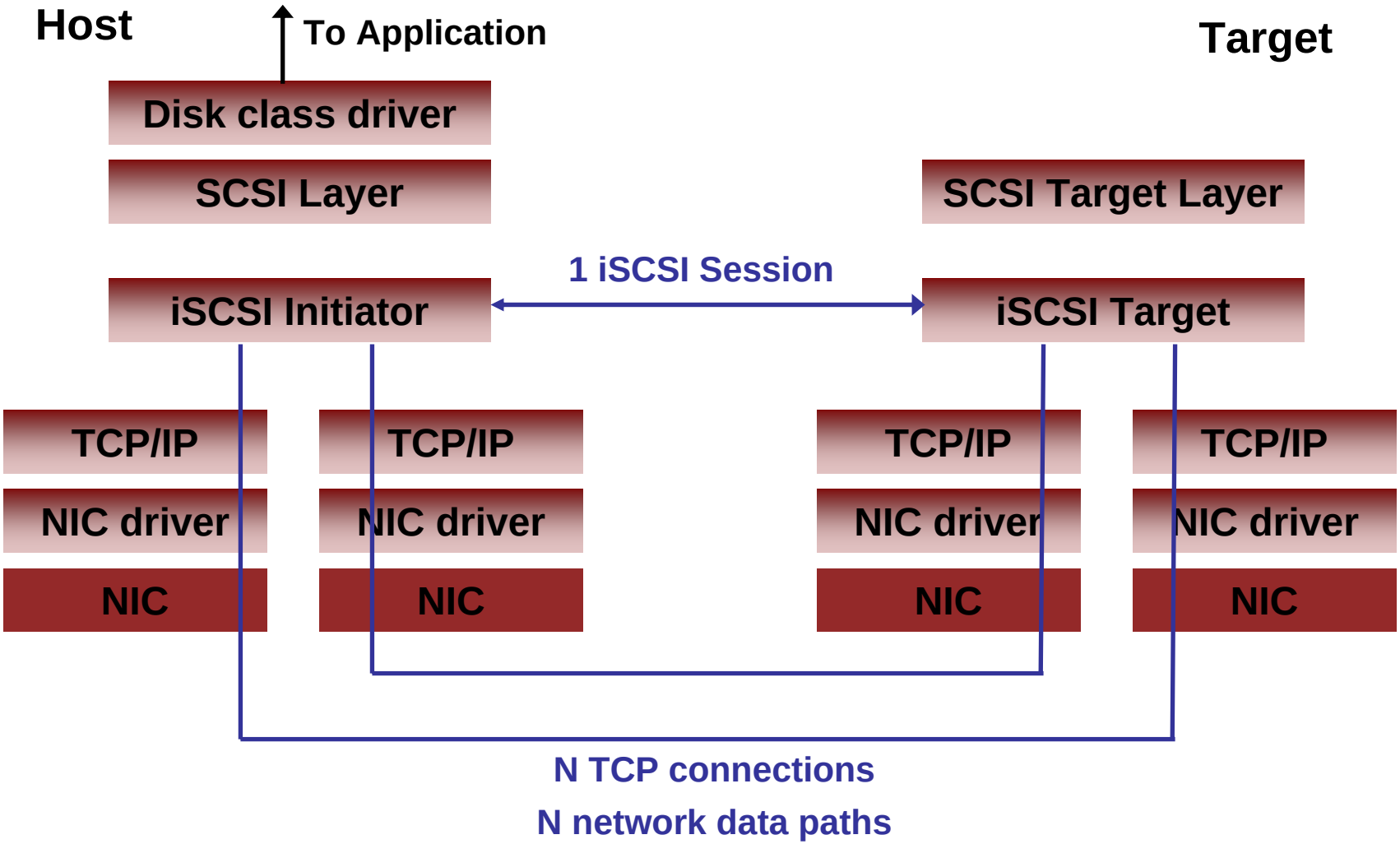
- Paths combined at Ethernet NIC level
- TCP/IP sees one data path



HA Options: Multi-Pathing I/O



HA Options: Multi-Connection iSCSI Sessions



IP SAN Host Support

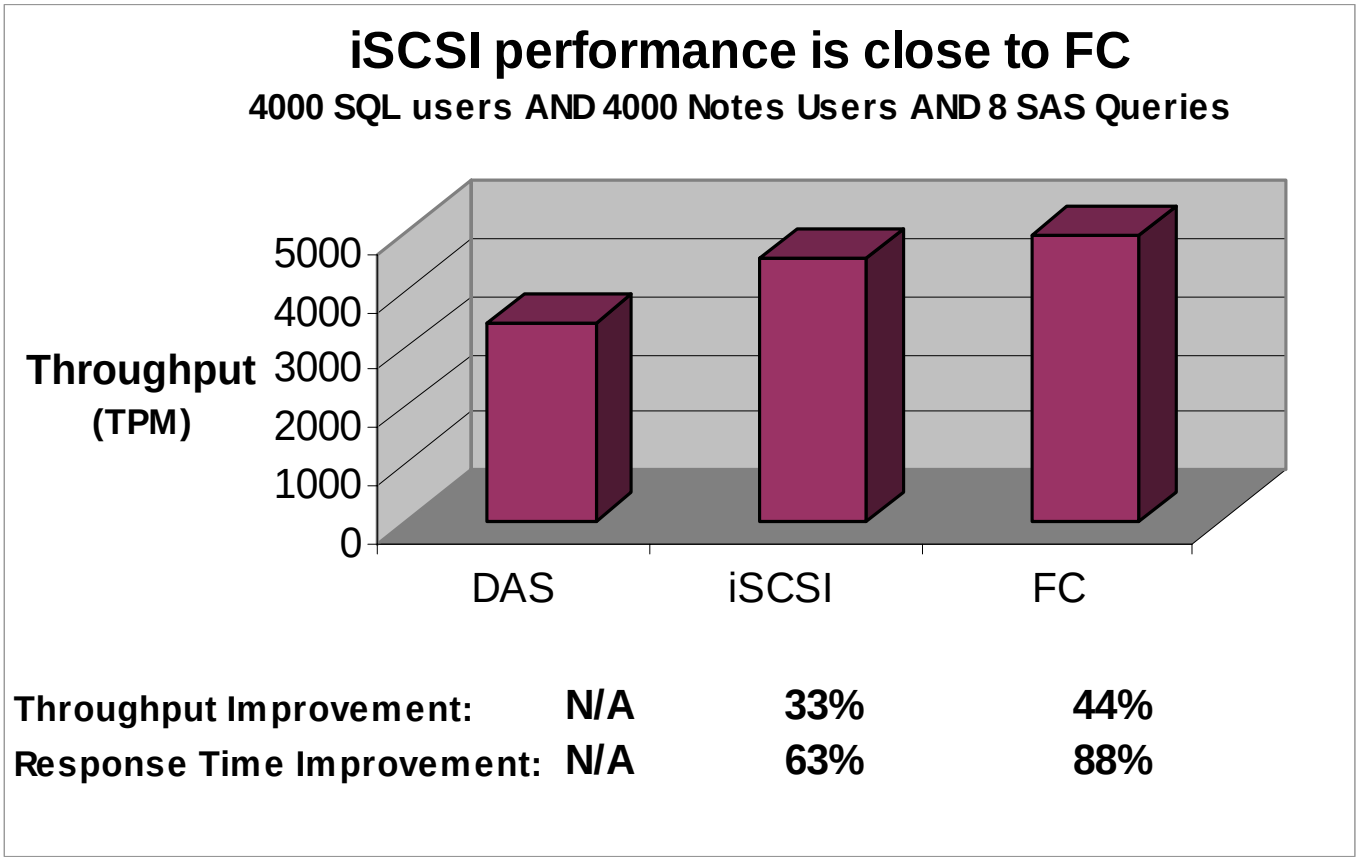
OS	Initiator	Certified	Multi-pathing	Cluster
Windows Server System	Hardware, Software	☑	Trunking, MPIO, MCS	Yes
Sun microsystems	Hardware, Software	☑	Trunking, MPxIO	Yes
hp	Software	☑	PV Links	TBD
IBM	Software	☑	Trunking	TBD
redhat	Hardware, Software	☑	Trunking; MPIO	Yes
suse A NOVELL BUSINESS	Hardware, Software	☑	Trunking, MPIO	Yes
Novell. NetWare.	Software	☑	Trunking	Yes
vmware	Software	☑	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)
- 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

Application Performance

- Enterprise Strategy Group Validation study (4/04)

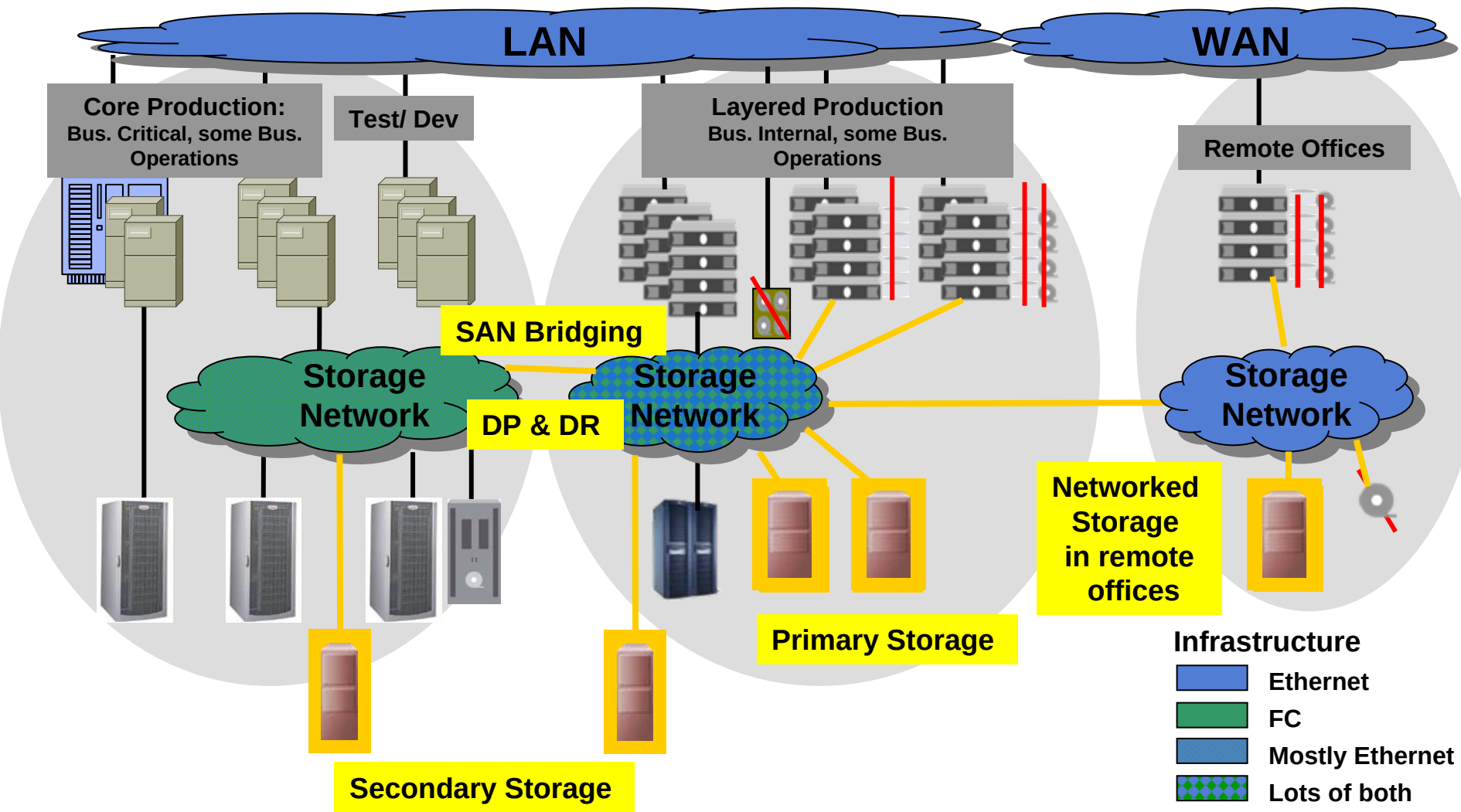


Throughput Improvement:	N/A	33%	44%
Response Time Improvement:	N/A	63%	88%

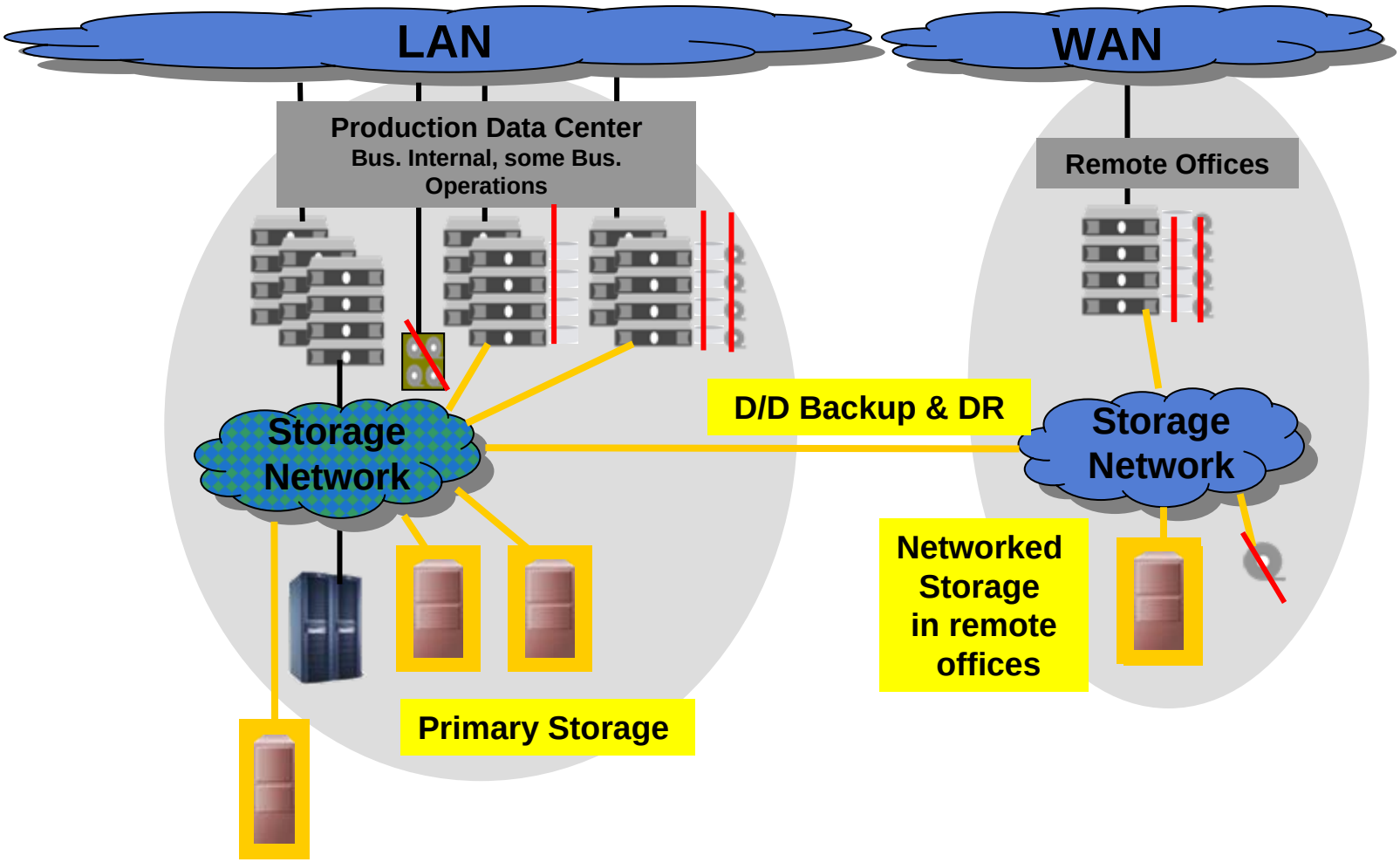
Typical iSCSI Array Capabilities

- 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

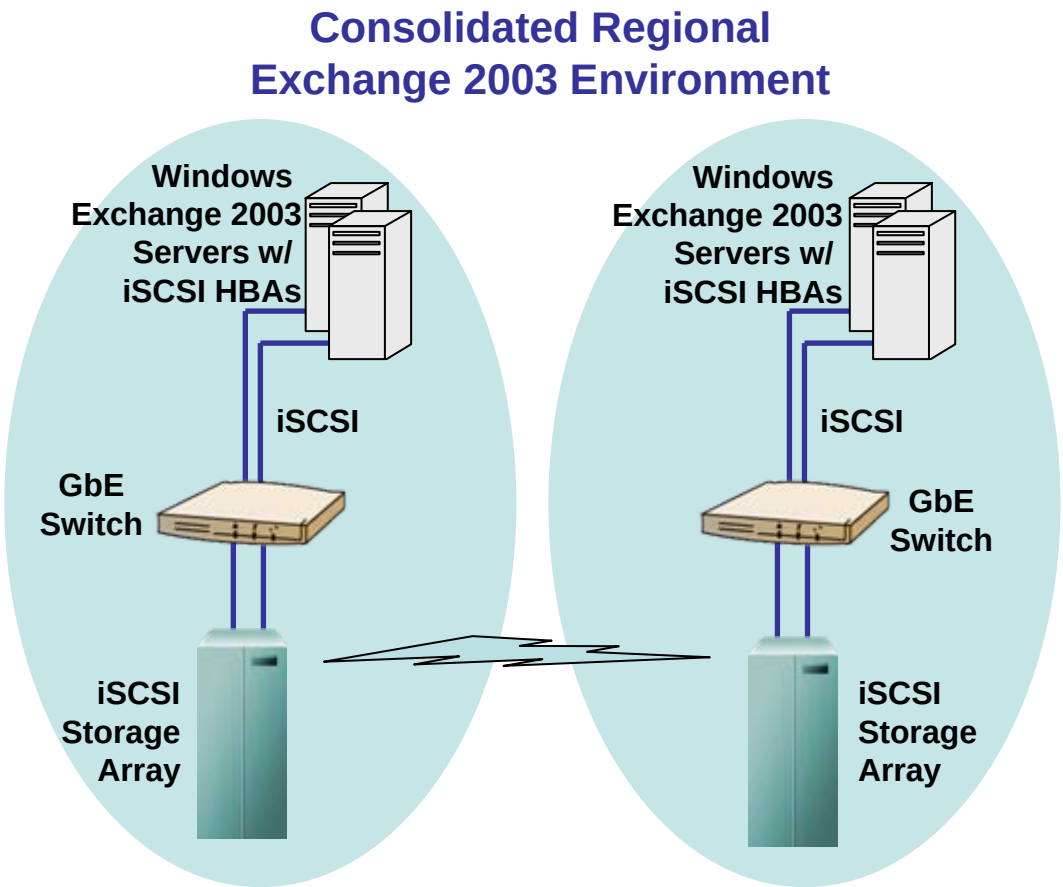
Where IP Storage Fits - Large Enterprise



Where IP Storage Fits - Medium/Small Enterprise

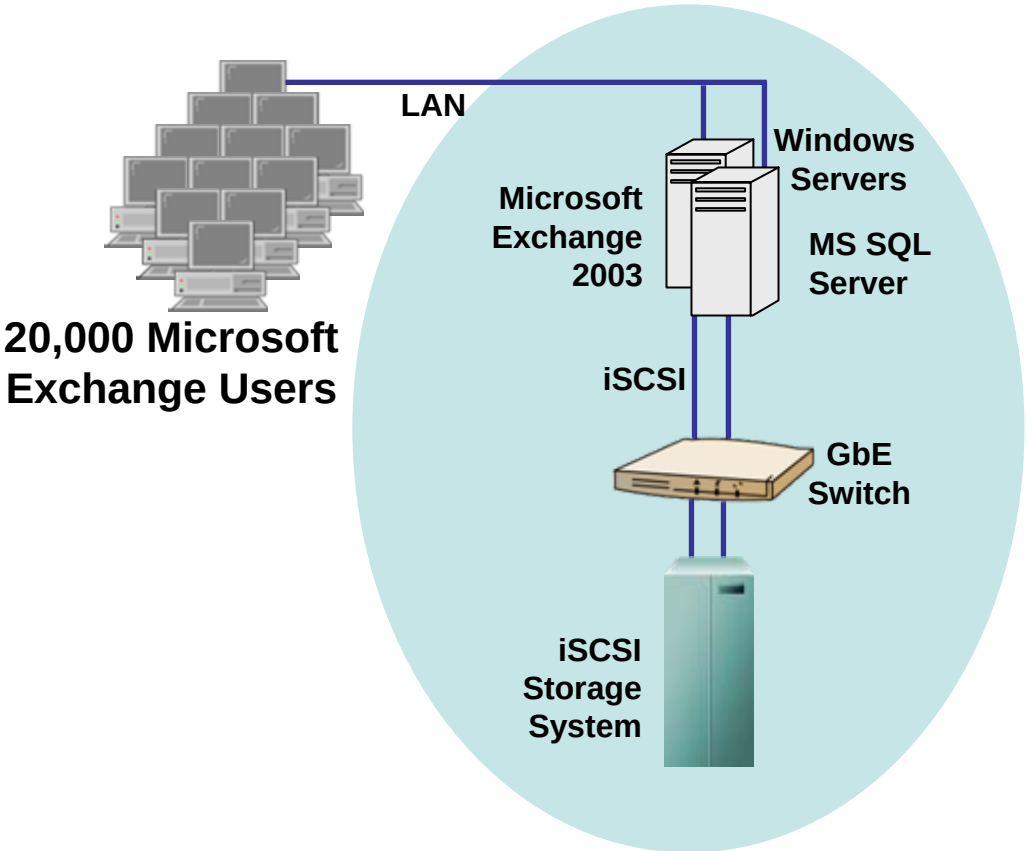


Case Study: Civil Engineering Consultancy



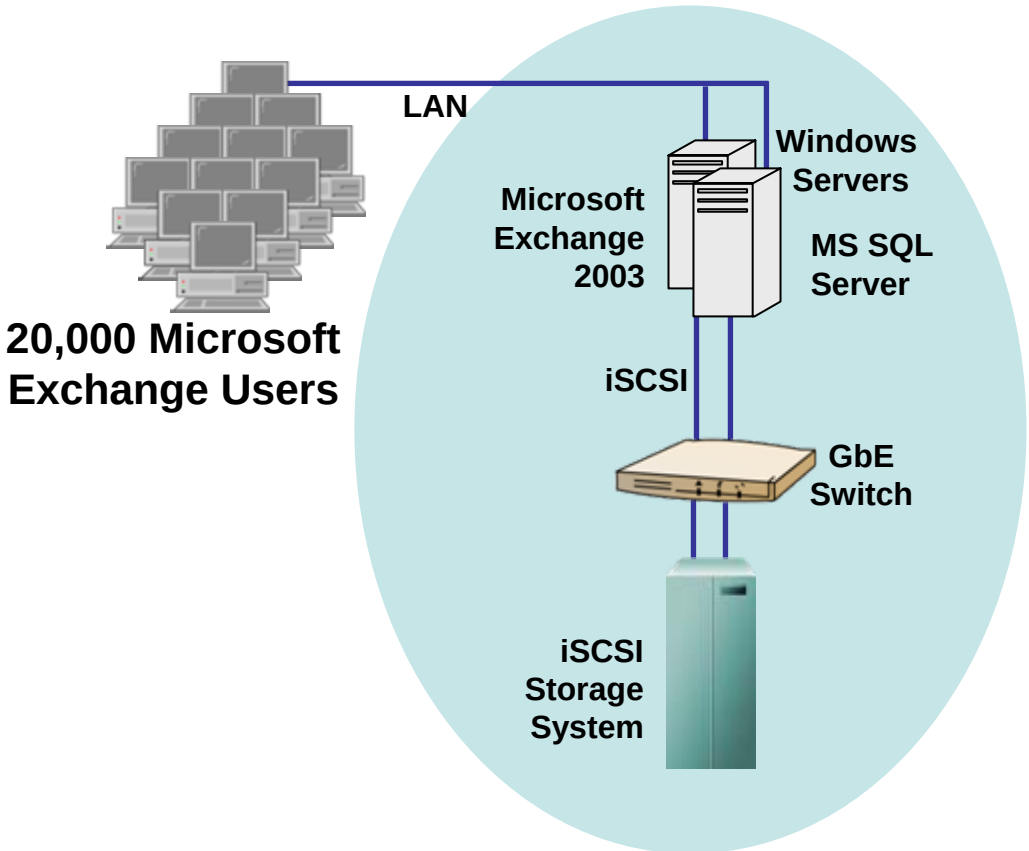
- Application
  - *Microsoft Exchange 2003*
- Pain Points
  - *Exchange environment on 32 servers*
  - *Reliability issues with DAS*
  - *Unacceptable recovery time (18-24 hours)*
  - *No Disaster Recovery solution*
- Solution
  - *Consolidation using IP-SAN*
  - *SnapMirror between sites*
- Benefits
  - *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*

Case Study: University



- Application
  - *Microsoft Exchange 2003*
  - *SQL Server Databases*
- Pain Points
  - *Messaging infrastructure on 24 servers with DAS*
  - *Unworkable admin overhead*
  - *Massive data growth*
  - *Downtime a major issue*
  - *Unacceptably long backup and restore times*
- Solution
  - *NetApp IPSAN*
- Benefits
  - *Simple scalable storage solution*
  - *Backup window eliminated*
  - *Data restores in <1 hour*

Microsoft Exchange Infrastructure



- Application
  - *Microsoft Exchange 2003*
  - *SQL Server Databases*
- Pain Points
  - *Messaging infrastructure on 24 servers with DAS*
  - *Unworkable admin overhead*
  - *Massive data growth*
  - *Downtime a major issue*
  - *Unacceptably long backup and restore times*
- Solution
  - *NetApp IPSAN*
- Benefits
  - *Simple scalable storage solution*
  - *Backup window eliminated*
  - *Data restores in <1 hour*

Case Study: FC SAN extension

IP Storage – What's Emerging

- Mainstream deployment in multi-OS host environments (Windows, Linux, Unix)
- Mainstream deployment in virtual server environments (VMWare)
- 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
  - SONET alternative in MAN
  - Backbone and port aggregation for 1Gb LANs
    - Driven by acceleration in 1Gb deployment over past 4 years
  - Storage over 10GbE
- Pricing
  - Greatly reduced pricing over past 4 years
  - Cost effective aggregation alternative to 10x 1Gb (2007)
- 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 for 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

Q&A / Feedback

- 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