



Education

# **Ideal Applications for iSCSI SANs**

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- IP SANs with iSCSI offer a number of advantages to organizations including flexibility, lower cost, and simplified management. Many applications are ideally suited for iSCSI SANs including server virtualization, infrastructure applications, storage consolidation, and business applications.
  - ◆ Why iSCSI - What is iSCSI and why it the fastest growing network storage protocol on the market?
  - ◆ Which applications are well suited for IP SANs and why.
  - ◆ What are the key features and value proposition of iSCSI.

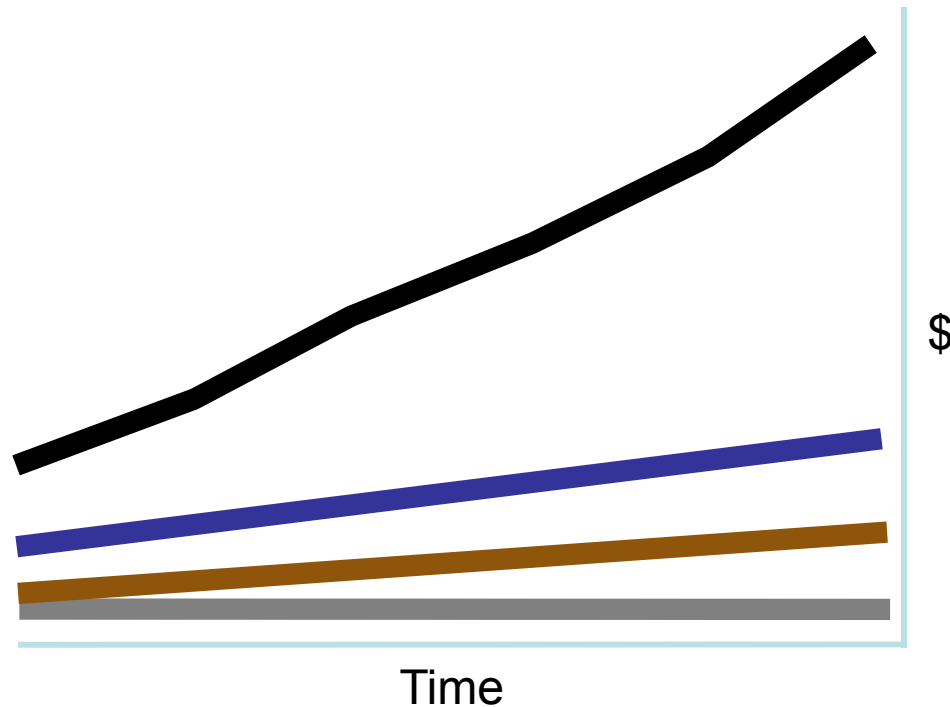
- IT Pressures – Storage
- Why Networked Storage - A Case for iSCSI
- Ideal Applications for iSCSI
- What Lies Ahead

# IT Pressures - Storage



# The Countervailing Forces

- IT Budgets
- TB Growth
- Storage as a % of IT budgets
- Mgmt of Storage as a % of Storage

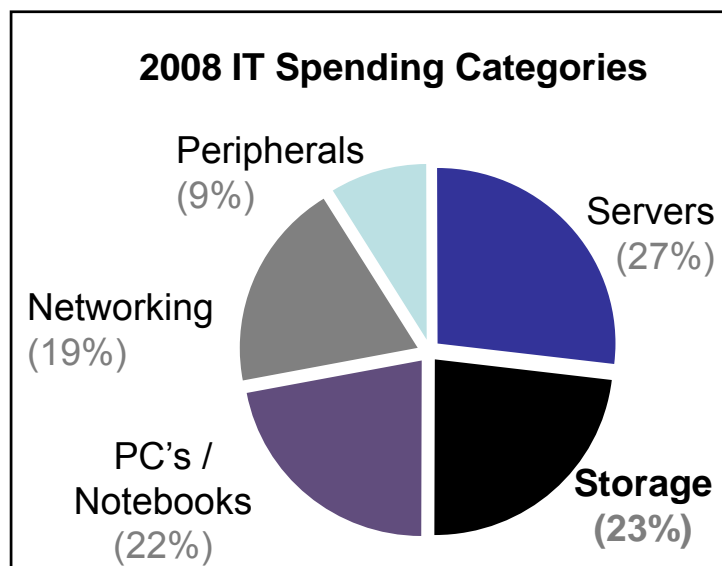


## IT Mandates

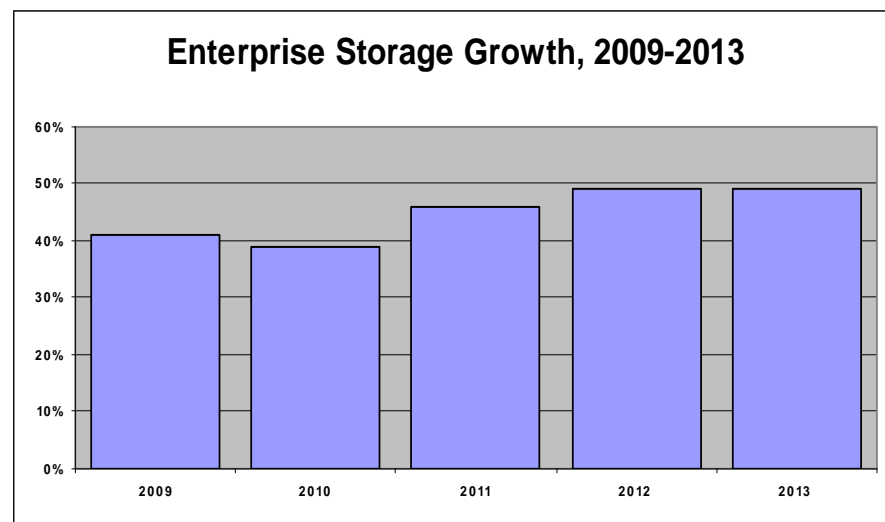
- Accommodate growth
  - ◆ Data
  - ◆ Additional services
- Do more with less
  - ◆ Utilization (Cap Ex)
  - ◆ Efficiency (Op Ex)
- Ensure 24x7 operations
  - ◆ Availability, DR/BC
- Secure data
- Increase agility

Source: Gartner's 25th Annual Data Center Conference "The Future of Storage" Roger Cox November 2006

- Data storage is one of the highest-cost categories for enterprise IT organizations.
- Storage consumption continues to grow, while IT budgets are being trimmed.



Source: IDC Perspectives Study



Source: IDC Worldwide Enterprise Storage Systems 2009-2013 Forecast

# Storage Growth = Power Consumption

- Significant energy used by data centers in U.S. (1.5% of total electricity consumption)
- Under current efficiency trends, consumption could double in five years
- Data storage represents the second highest and fastest growing power consumer



Data Center Power Consumption (Billion kWh)

	2000	% of Total	2006	% of Total	Growth
Volume Servers	8.0	56.7%	20.9	67.9%	161%
<b>Data Storage Devices</b>	<b>1.1</b>	<b>7.8%</b>	<b>3.2</b>	<b>10.4%</b>	<b>191%</b>
Network Equipment	1.4	9.9%	3.0	9.7%	114%
Midrange Servers	2.5	17.7%	2.2	7.1%	-12%
High-End Servers	1.1	7.8%	1.5	4.9%	36%
<b>Total</b>	<b>14.1</b>	<b>100%</b>	<b>30.8</b>	<b>100%</b>	<b>118%</b>

Source: U.S. Environmental Protection Agency "Report to Congress on Server and Data Center Energy Efficiency" – Figure 2.2  
Ideal Applications for iSCSI SANs

# Why Networked Storage A Case for iSCSI



## ➤ Why we use DAS...

- ◆ Inexpensive to implement
- ◆ Easy to deploy in small quantities
- ◆ Budgets are often departmentalized

In 2008, >49% of  
deployed disk  
storage was DAS\*

## ➤ Why use DAS if...

- ◆ It's difficult to manage in large quantities
- ◆ Backup / Restore and DR can be very complicated
- ◆ Storage islands prevent redeployment or reallocation – inefficient space utilization
- ◆ Capacity expansion in increments of a full disk
- ◆ Server virtualization features are limited

\* IDC, June 2009

# What SANs Deliver

## ➤ Value of Storage Area Networks

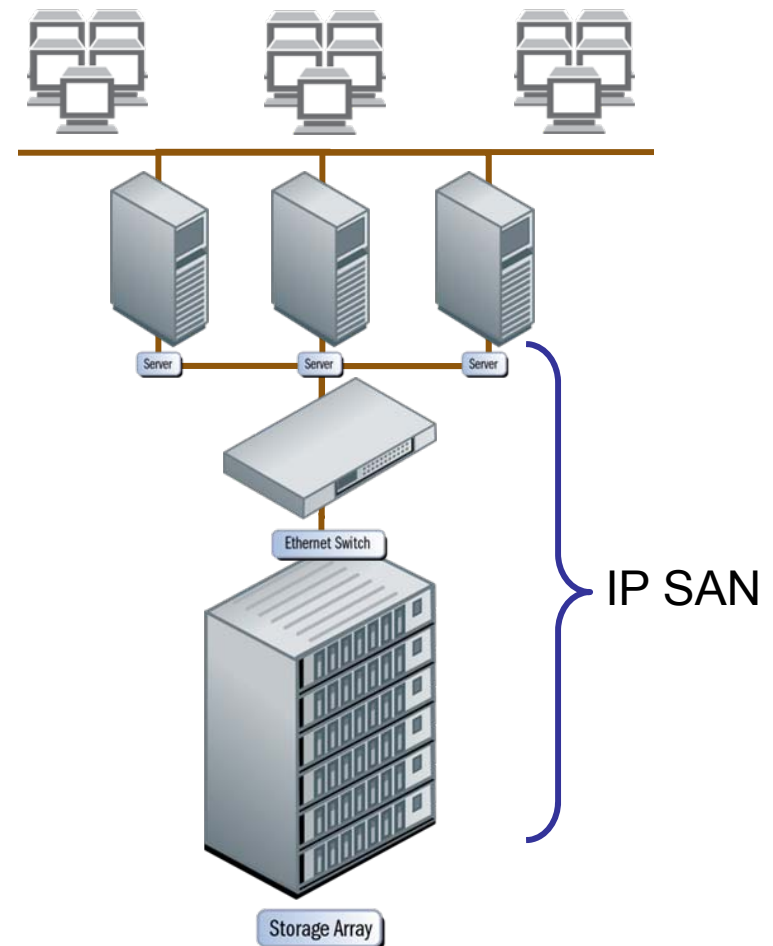
- ◆ Improved reliability and reduced cost of backup
- ◆ Improved scalability of storage capacity and performance
- ◆ Simplified storage provisioning
- ◆ Improved data availability

## ➤ Top reasons for deploying a SAN

- ◆ Back-up
- ◆ Storage consolidation
- ◆ **Server virtualization**
- ◆ Satisfy demands for additional capacity
- ◆ Performance
- ◆ Disaster recovery
- ◆ New project or application deployment

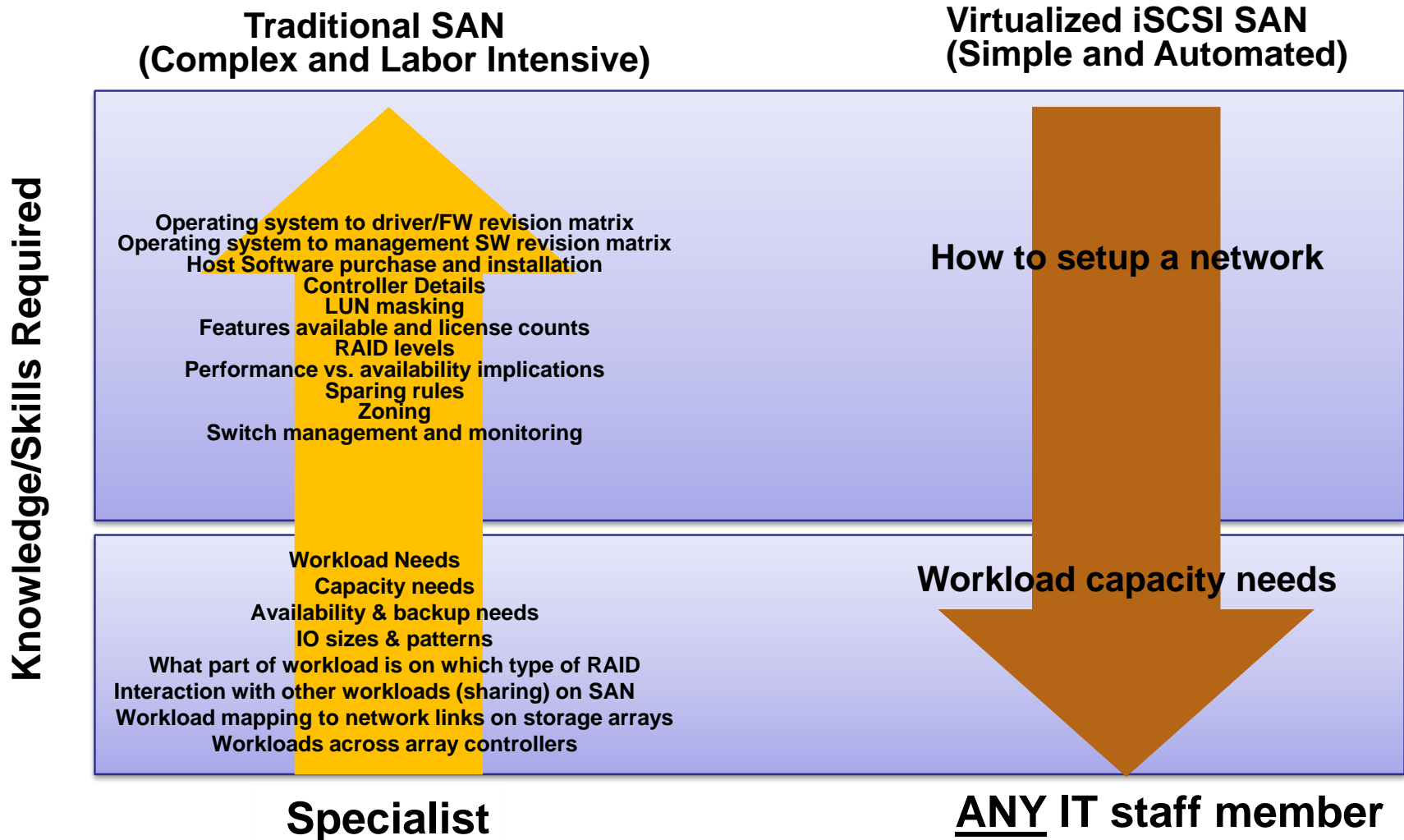
# Why IP SAN (iSCSI)?

- Mature standard (2004)
- Looks like a local SCSI disk
- Leverages IP Expertise
- Economies of scale
- Longevity / Performance
- Improved TCO vs DAS

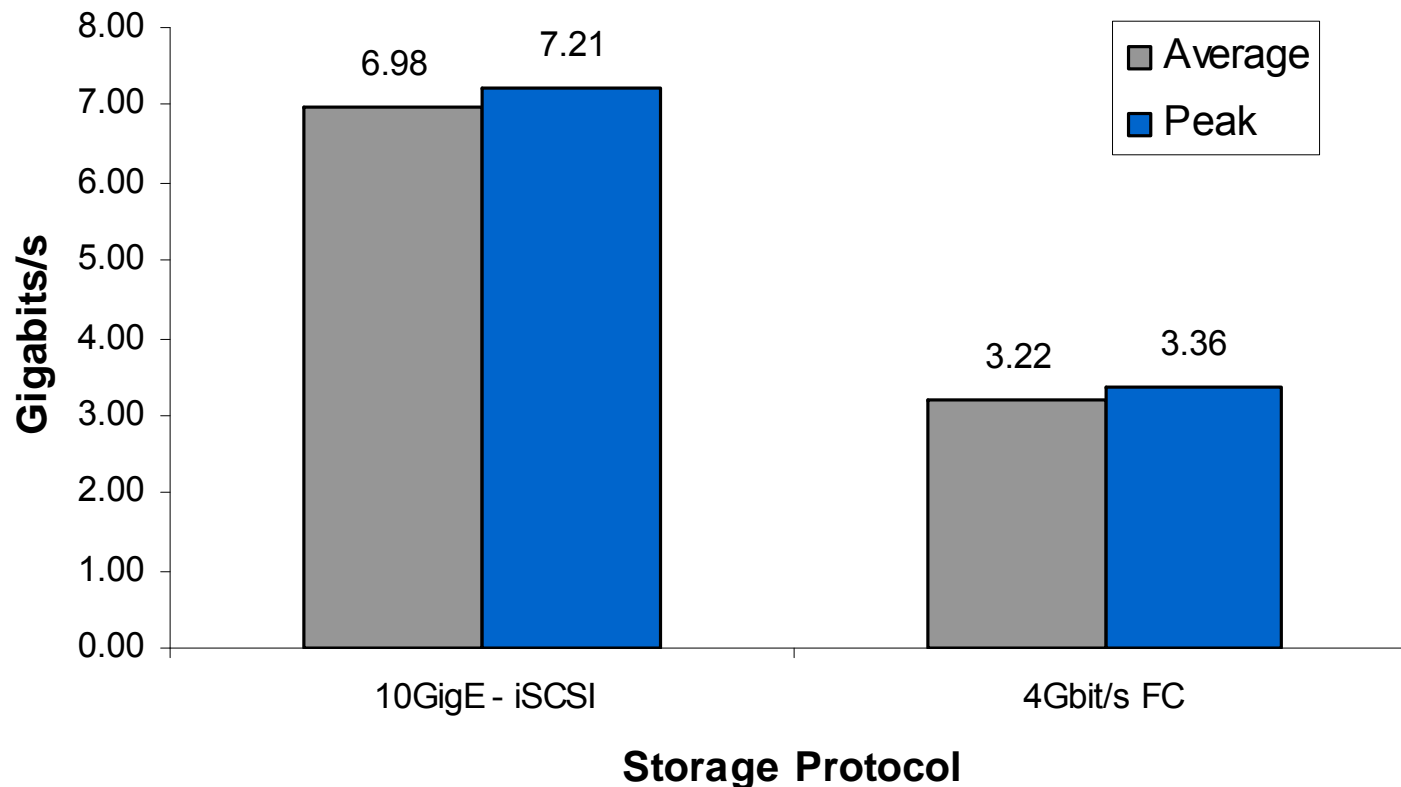


# TRADITIONAL SAN VS. VIRTUALIZED iSCSI SAN

## IT'S ABOUT REDUCING COMPLEXITY



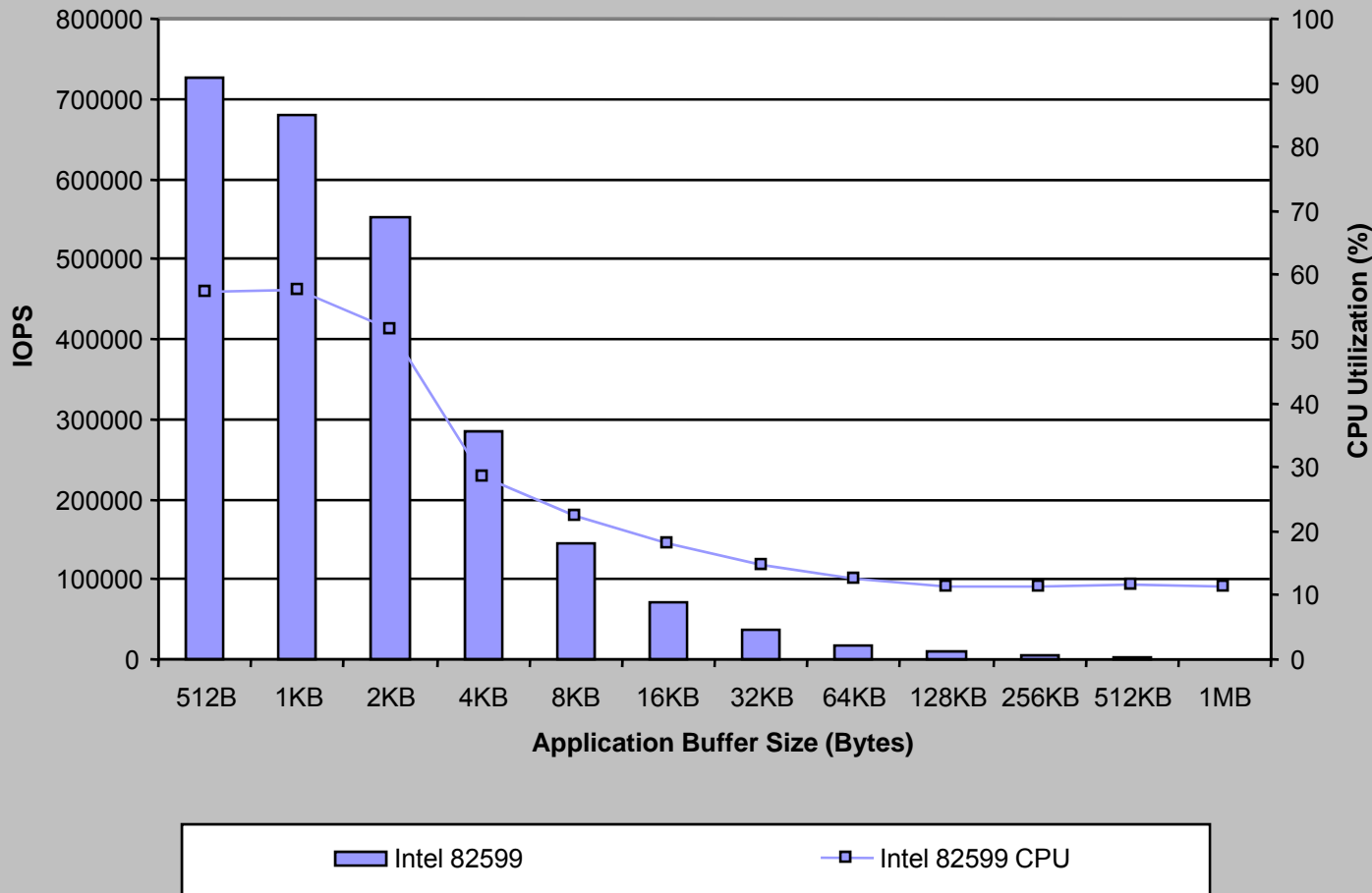
## I/O Between Storage and Switch per Wire (Oracle Work Load)



Source: *Blade.org* "10Gb iSCSI Performance with Blade Servers", Oct 2007

# Single Port iSCSI Performance - Example

Intel 82599 iSCSI Read IOPS  
 Windows Server 2008



**Test Configuration**

Iometer v. 2006.7.27  
 No. of Managers = 1  
 No. of Workers/Manager = 20  
 (Total no. of Workers) = 20  
 No. of luns / Worker = 1  
 (Total No. of luns) = 20  
 I/O size = 512B-1MB  
 MTU= 1500

**SUT: Intel® Shady Cove**

Intel® Xeon® Processor W5580  
 (8M Cache, 3.20 GHz, 6.40 GT/s  
 Intel® QPI)  
 Memory - 8GB DDR3  
 BIOS - S5500.86B.01.10.0038  
 Windows\* Server 2008 SP1  
 x86\_64

**Network Configuration**

Cisco\* Nexus\* 5020  
 Intel 82599 (2.3.10.0)  
 connected through 10Gbps  
 Ethernet port.

**Storage (iSCSI Soft Target):**

Super Micro 6015T-TV  
 Intel® Xeon® CPU 5355 @  
 2.67GHz8GB FBDIMM @  
 667MHz  
 BIOS - 1.3c  
 Oplin 2.2.9.0  
 Windows Server 2003 SP2 x64  
 Starwind - 4.0

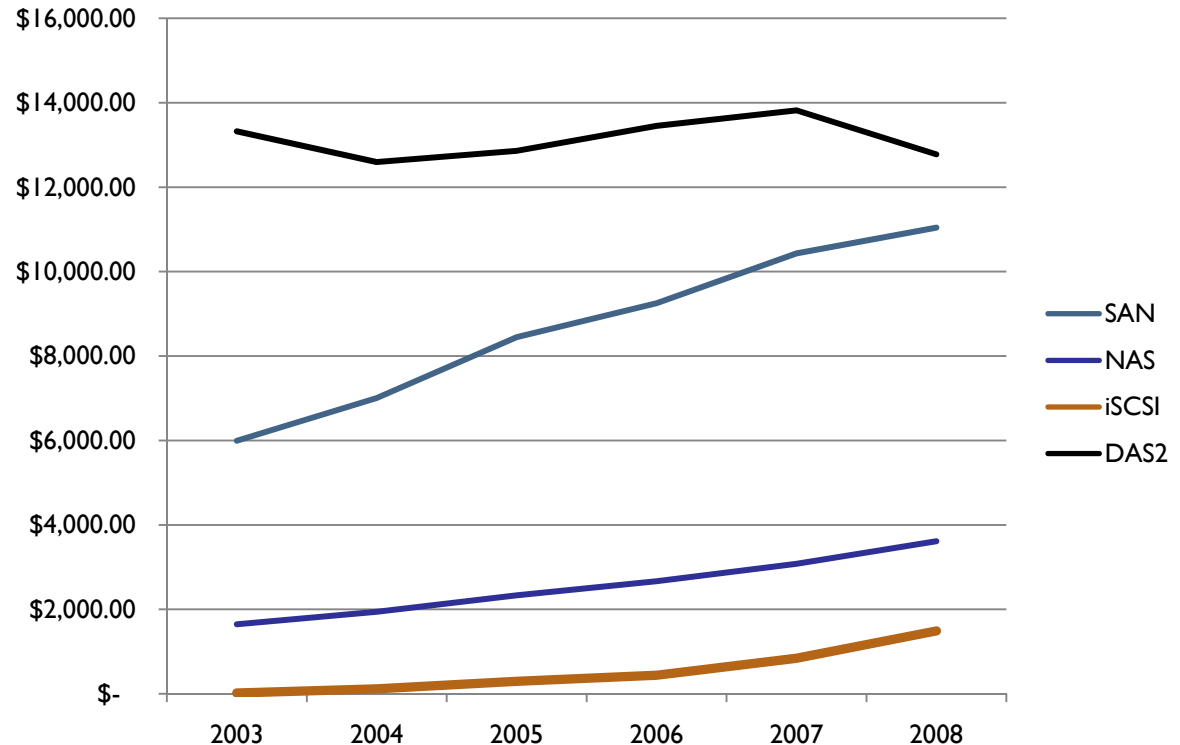
Source: LAD SW Performance Lab

August 2009

*Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit [http://www.intel.com/performance/resources/benchmark\\_limitations.htm](http://www.intel.com/performance/resources/benchmark_limitations.htm).*

## ➤ Fastest growing storage protocol (revenue)

- ◆ Highest incremental revenue of any protocol in 2008
- ◆ 77% YoY growth in 2008

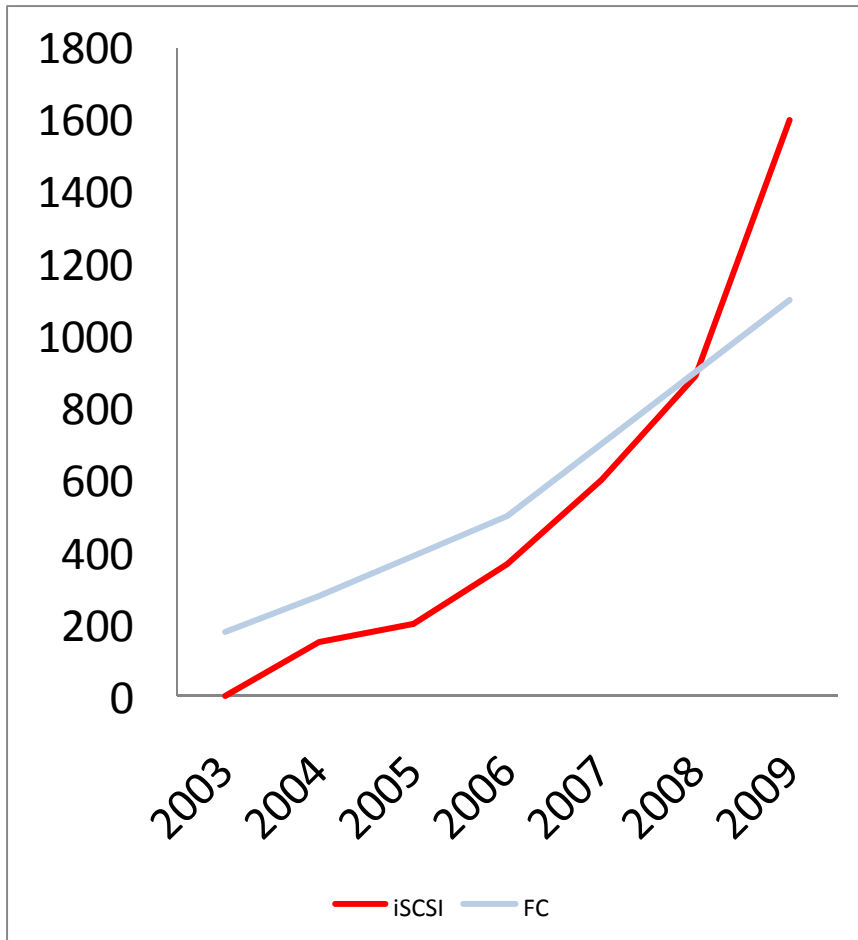


Source: IDC Storage Tracker,  
June 2009

# The Emergence of iSCSI

## ISCSI CONNECTIONS ARE PROJECTED TO EXCEED FC IN 2009

Thousands



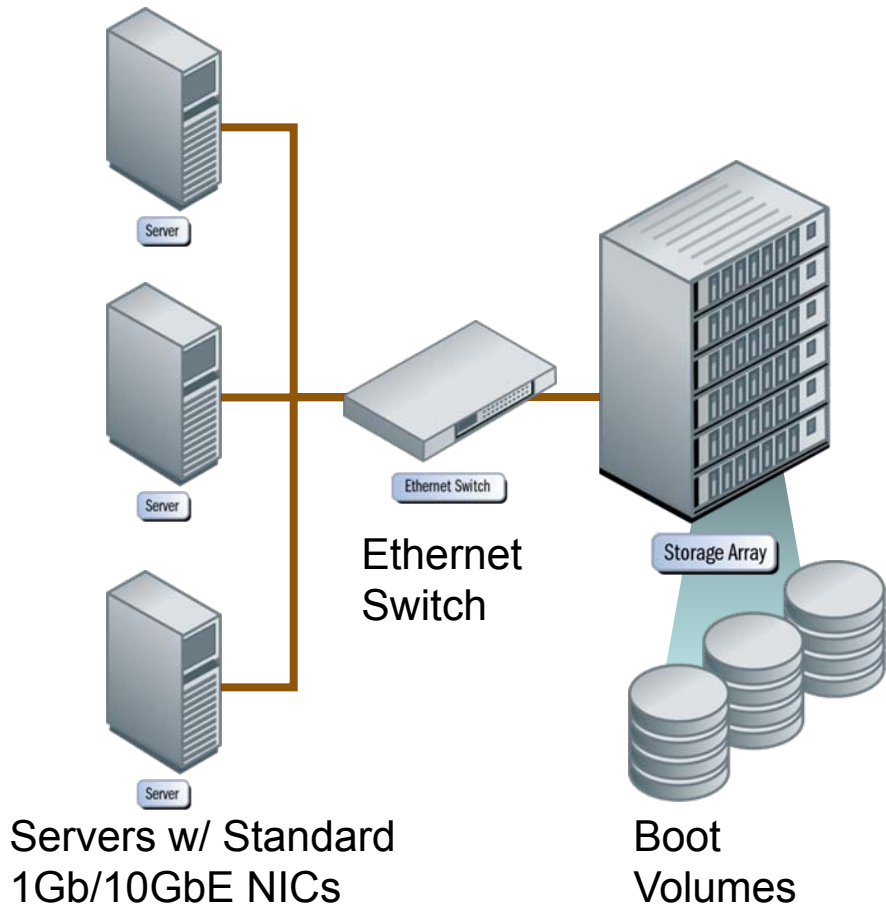
You can expect iSCSI to become ubiquitous throughout the enterprise community due to economies of using existing network infrastructure and improvements in iSCSI SAN functionality.

-The Clipper Group March 2007

# Ideal Applications for iSCSI

- Network boot
- Server consolidation and virtualization
- Windows Consolidation
- Cloud storage service provider
- Backup & Recovery / Disaster Recovery
- Infrastructure / Other

# Network Boot with iSCSI

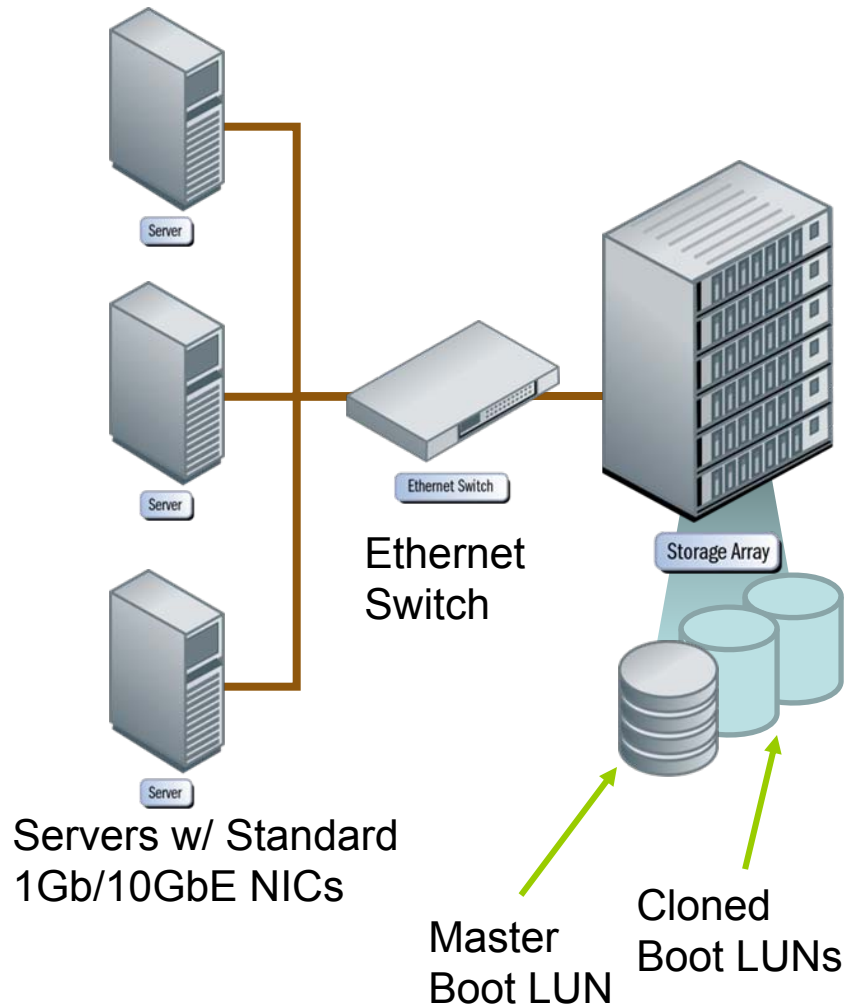


- Network drive appears to server as a local drive
- Benefits:
  - ◆ No special purpose hardware
  - ◆ Broad OS support
  - ◆ Lowers server costs
  - ◆ Boot volumes protected
  - ◆ Improved performance
  - ◆ Simplified OS updates / management
  - ◆ Improved disk efficiency
  - ◆ Easy to scale

# iSCSI OS Network Boot Support

OS	Initiator	Boot
Microsoft	Native S/W, 3rd Party HBA	HBA, S/W
Red Hat	Native S/W, 3rd Party HBA	HBA, S/W
Oracle	Native S/W, 3rd Party HBA	HBA, S/W
SUSE	Native S/W, 3rd Party HBA	HBA, S/W
IBM (AIX)	Native S/W, Native HBA	HBA, S/W
Sun (Solaris)	Native S/W, 3rd Party HBA	HBA
HP (HPUX)	Native S/W	No
VMware	Native S/W, 3rd Party HBA	HBA
Novell (Netware)	Native S/W	No

# Network Boot w/ Rapid Cloning



- LUN cloning reduces capacity required for common boot images
- Master boot image is replicated with space efficient copies
- Clones created in seconds/minutes
- Benefits:
  - ◆ Reduced storage capacity requirements
  - ◆ Rapid server deployment
  - ◆ Rapid server scaling and redeployment

# Case Study: Network Boot

- Test & development lab with over 1500 blade servers operating near 100% utilization
- Over 1200 blades boot off iSCSI SAN
- Can reconfigure all or subset of grid in minutes with host-specific personalization
- Native SAN boot OS: Red Hat Linux, SUSE Linux, Windows, VMware ESX, Solaris 10
- Lab needs only 252 disk drives instead of typical 3000 disks to boot 1500 blade servers

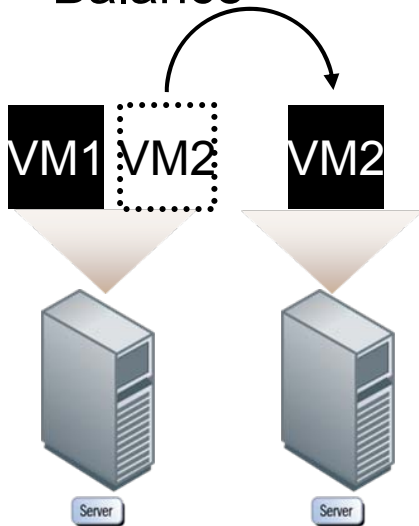


Engineering Data Center Lab

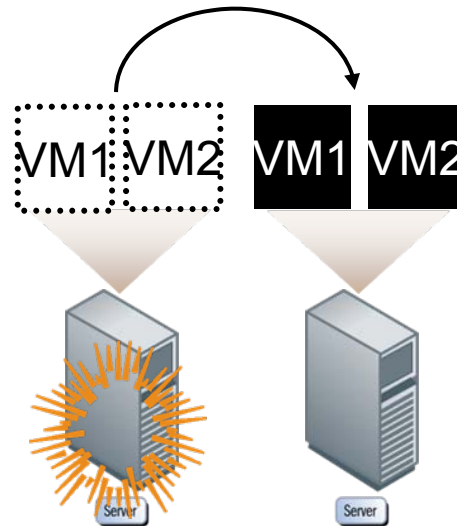
- Blade servers reduce physical server footprint
  - ◆ High compute per rack U
  - ◆ Less real estate
  
- Benefits of iSCSI for Blades
  - ◆ Network boot
  - ◆ Economics of onboard or backplane Ethernet
  - ◆ Unified storage and data network
  - ◆ Server admins familiar with Ethernet
  - ◆ Leverage infrastructure as a Resource Pool
  - ◆ Affordable hardware
  - ◆ Lower TCO

Advanced virtualization features are only enabled through the use of networked storage.

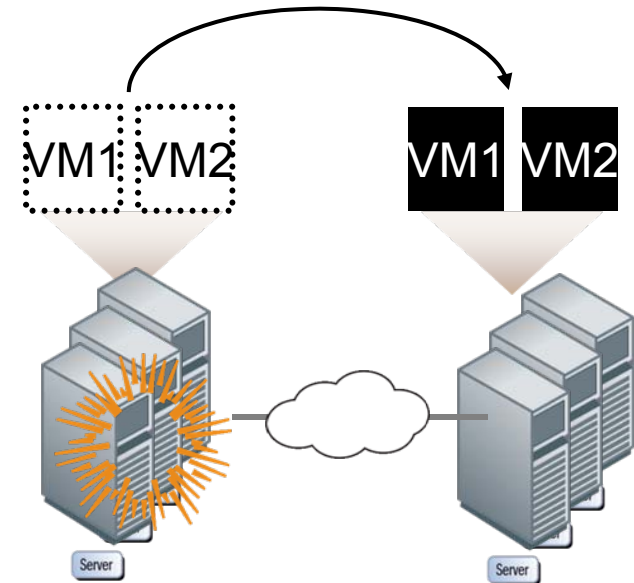
Move VMs  
To load  
Balance



Simple VM  
Failover



VM Failover upon  
site failure



## ➤ Adoption:

- ◆ 7% of all x86 servers virtualized now
- ◆ 80-90% of Fortune 1000 customers using now
- ◆ ~100% annual growth rate forecast
- ◆ IDC estimates that only 17% of the worldwide server market will be virtualized by 2010 – up from 5% in 2005

## ➤ Why iSCSI for Virtualization:

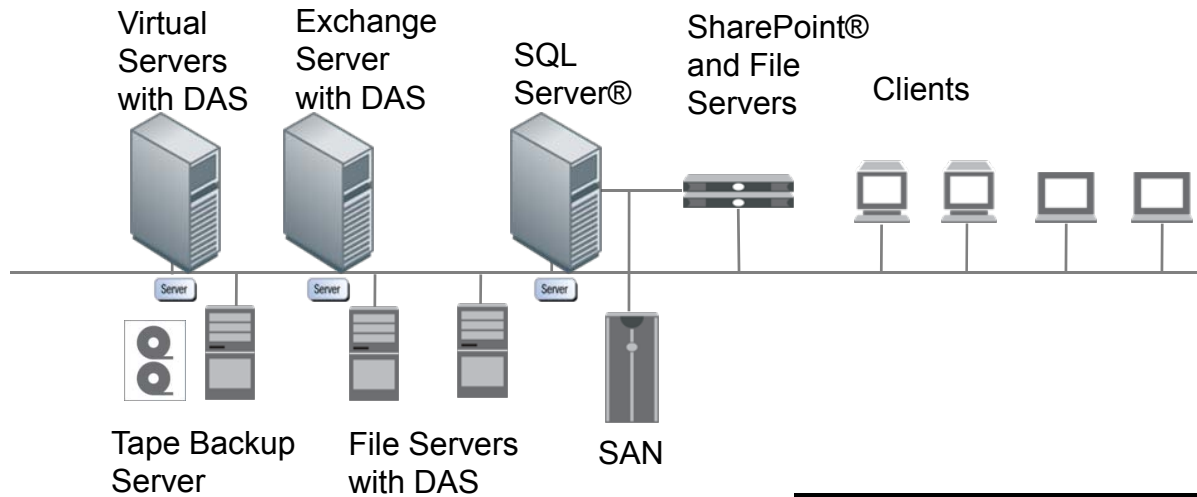
- ◆ Lower cost solution consistent with economic benefits of virtualization
- ◆ Server administrators are primary implementers of virtualization – familiar with Ethernet
- ◆ Virtual IP addressing aids mobility and scaling

Sources: Gartner Survey (11/2006. N=215), IDC, Thom. Weisel, Forrester,

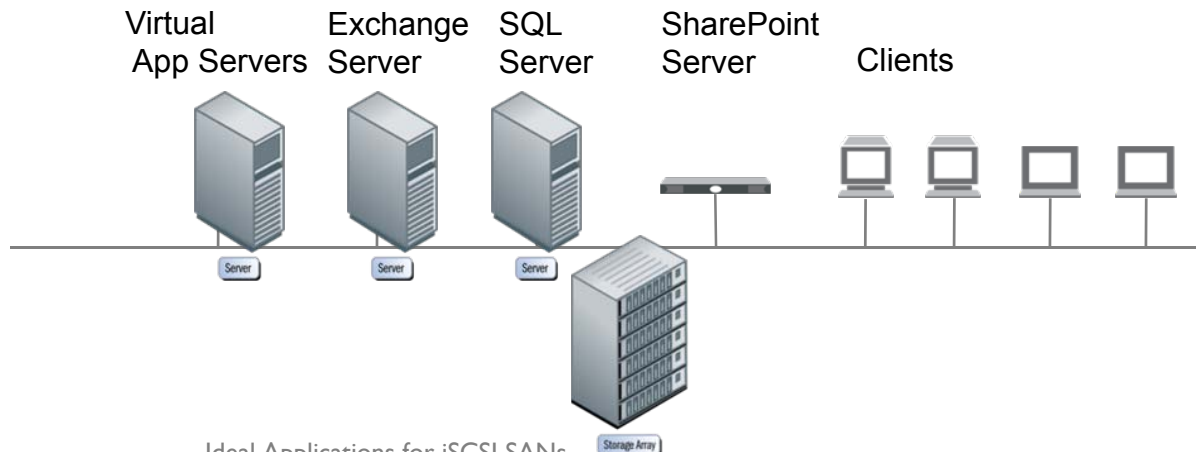
Ideal Applications for iSCSI SANs

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# Windows Consolidation

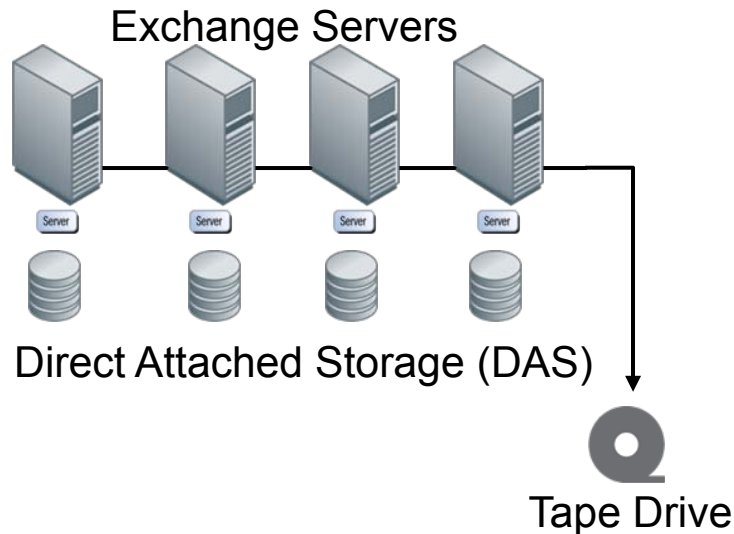


## Consolidating DAS, NAS, and SAN



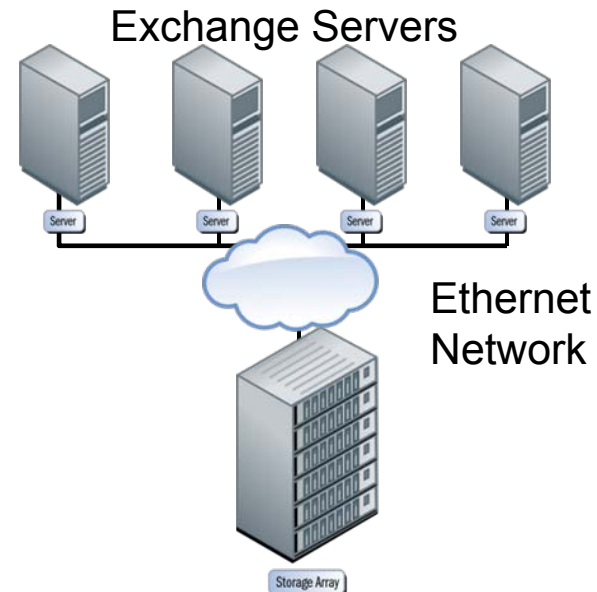
# Storage Consolidation for Exchange

## Current Environment



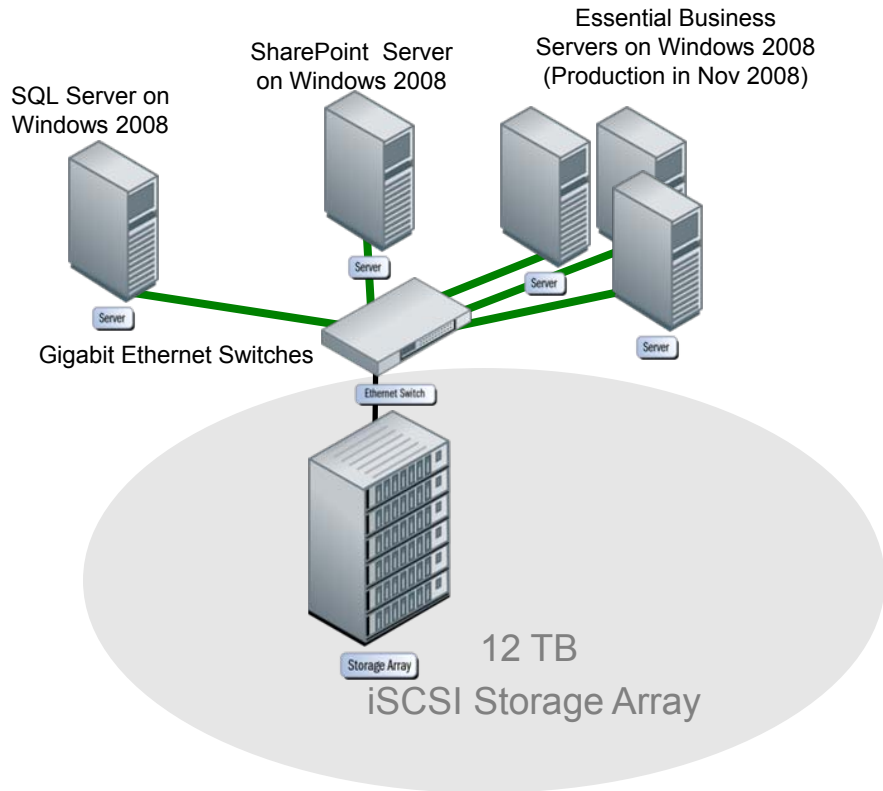
- Inefficient storage utilization
- Management complexity
- Unsatisfactory data availability

## Consolidation Solution



- Increased data availability - failover
- Simplified data management
- Efficient storage utilization
- Highly scalable

# Case Study: Windows Consolidation

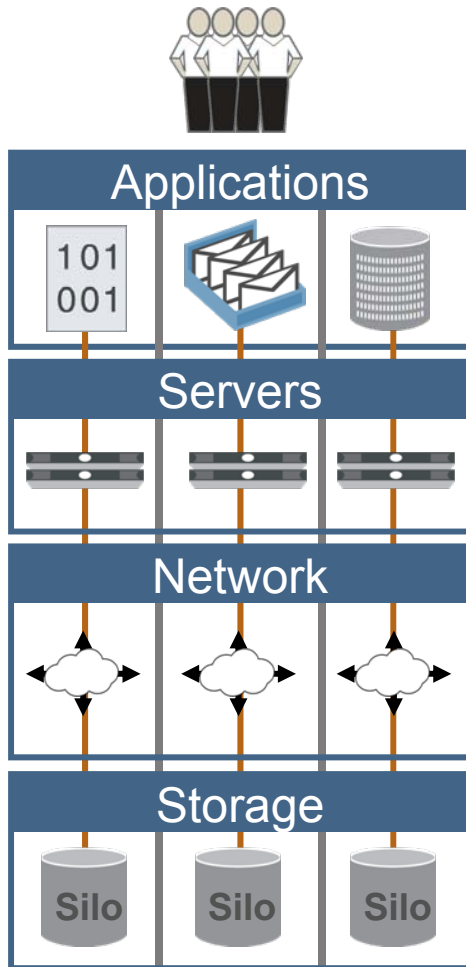


“The [iSCSI] SAN is easy to setup and manage; and it scales effortlessly. I can quickly backup and restore my applications using snapshots.” Logistic and IT Manager

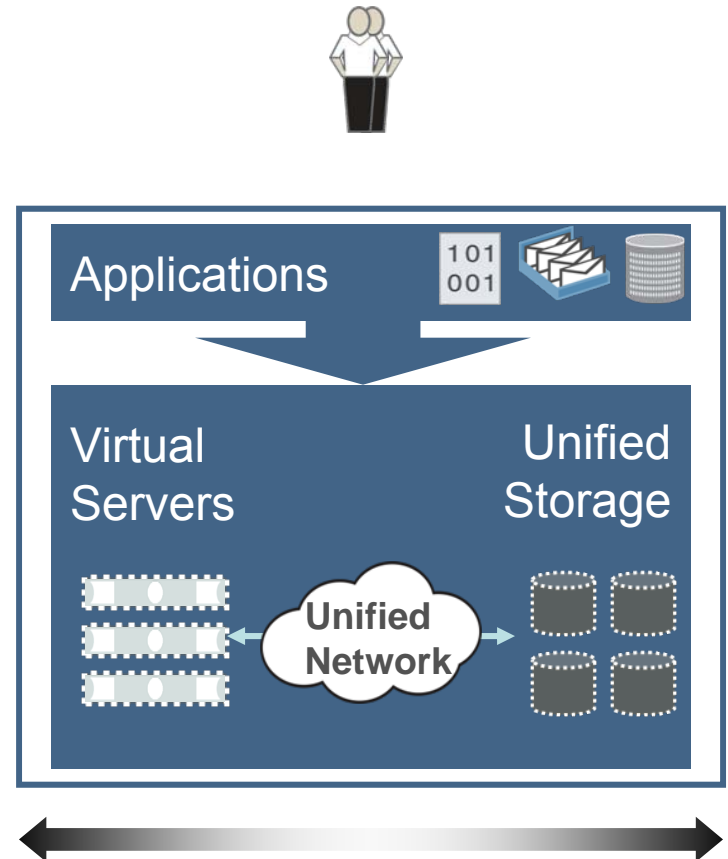
- Applications:
  - ◆ Current: SQL Server, SharePoint Server, Essential Business Server BETA, WennSoft Project Managers Portal, Microsoft Dynamics Great Plains
  - ◆ Planned: Exchange Server 2007
- Pain Points:
  - ◆ DAS storage difficult to scale and manage with growing need to keep more data online
  - ◆ Insufficient backup window and restores from tape takes too long
  - ◆ FC SAN too complex and costly
- Solution:
  - ◆ Updated to iSCSI SAN with Gigabit NICs and software initiator
  - ◆ Consolidated storage onto a 12-TB iSCSI SAN with array-based snapshots
- Benefits:
  - ◆ Simplified server and storage management with boot from SAN and transparent SAN expansion
  - ◆ Fast backup and restore using SAN-based snapshots

# Enabling Data Center Infrastructure Efficiency

## Project-based Decision Making



## Service-oriented Decision Making



## IT as a Service (ITaaS)

### IaaS

**Infrastructure**  
as a service

IT Services:

- Servers
- Network
- Storage
- Management
- Reporting

Examples:

BT

Telstra

T-Systems (ITaaS)

### “PaaS”

**Platform**  
as a service

Application  
building  
blocks and  
standards

Examples:

Amazon EC2

Force.com

Navitaire

### “SaaS”

**Software**  
as a service

Applications

Examples:

Yahoo! E-mail

SalesForce.com

Google apps

### “StaaS”

**Storage**  
as a service

Storage

Services:

- Primary
- Backup
- Archive
- DR

Examples:

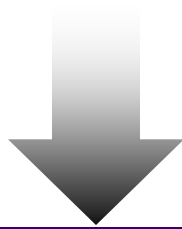
Amazon S3

Nirvanix

# What Drives Cloud Adoption

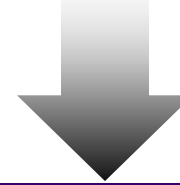
## Business Benefits

- Turn capex into opex
- Faster business innovation
- Risk sharing with vendors
- Increased productivity



## Enterprise IT Benefits

- Elastic scalability
- Pay-as-you-go efficiency
- Data access any time, any where
- Predictable cost structure
- Operational efficiency



Scalable

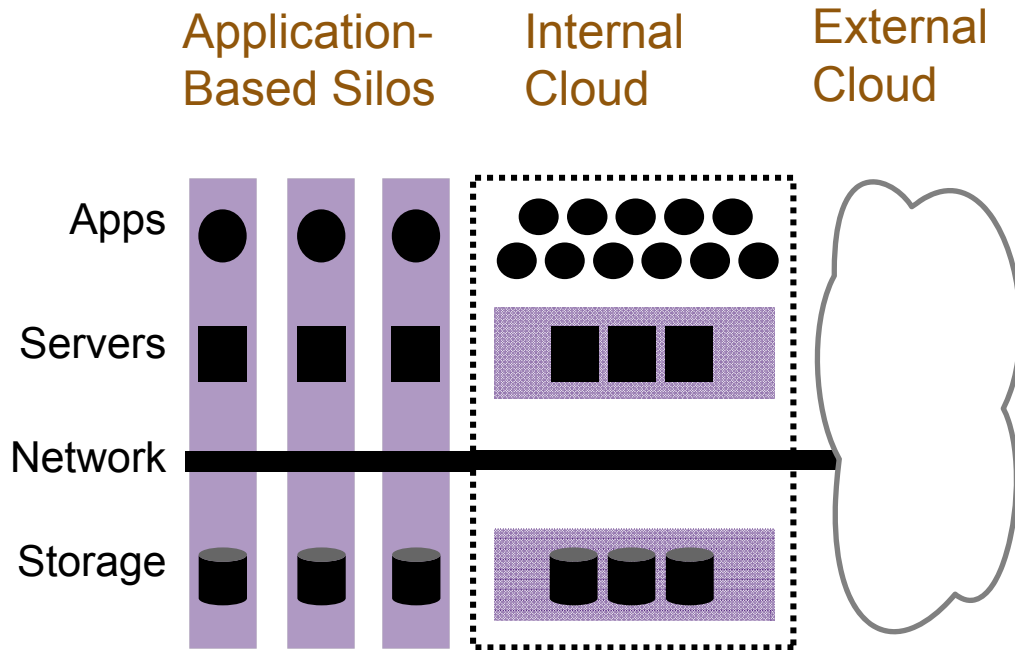


Cost efficient



Flexible

# Hybrid Model for IT Services



- Historically, IT infrastructure is an application-centric silo
- Virtualization technology enables a shared and service-oriented infrastructure
- Service providers can now offer a lower-cost business model
- All three models are likely to coexist at the enterprise data center

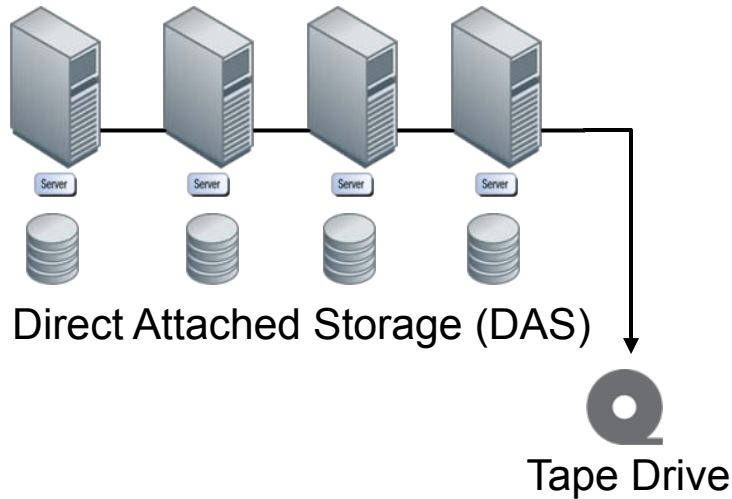
Ethernet / iSCSI is ideal technology for Cloud

Large European telecom operates information and communications technology for multinational corporations and public institutions.

- Since 2004: flexible IT over the cloud
- SAP and other applications “as a service” to multinational enterprise customers
- More than 300 large customers now using their dynamic IT services
  - ◆ One petroleum enterprise outsourced **all** global IT services
- Storage infrastructure deployed with iSCSI

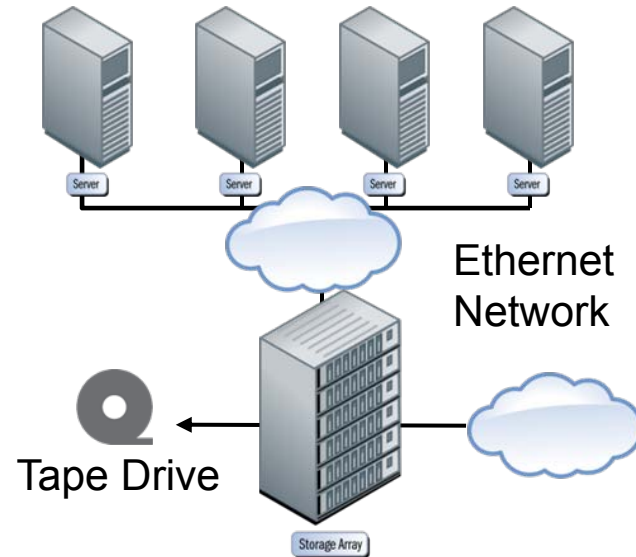
# Backup and Recovery with iSCSI

## Current Environment



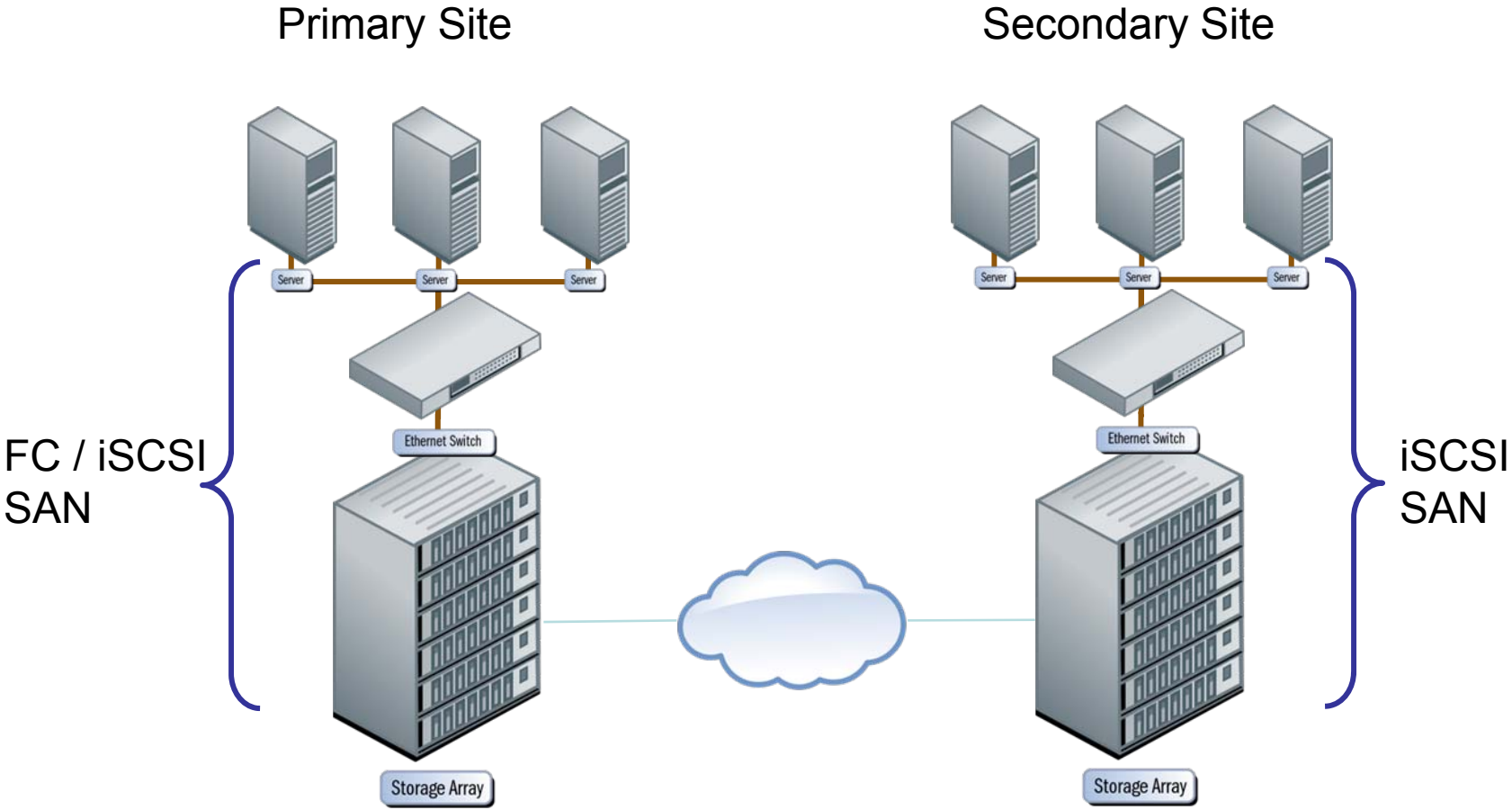
- Multiple backup sources
- Inefficient storage utilization
- Management complexity
- Unsatisfactory data availability
- Requires network bandwidth

## Consolidation Solution

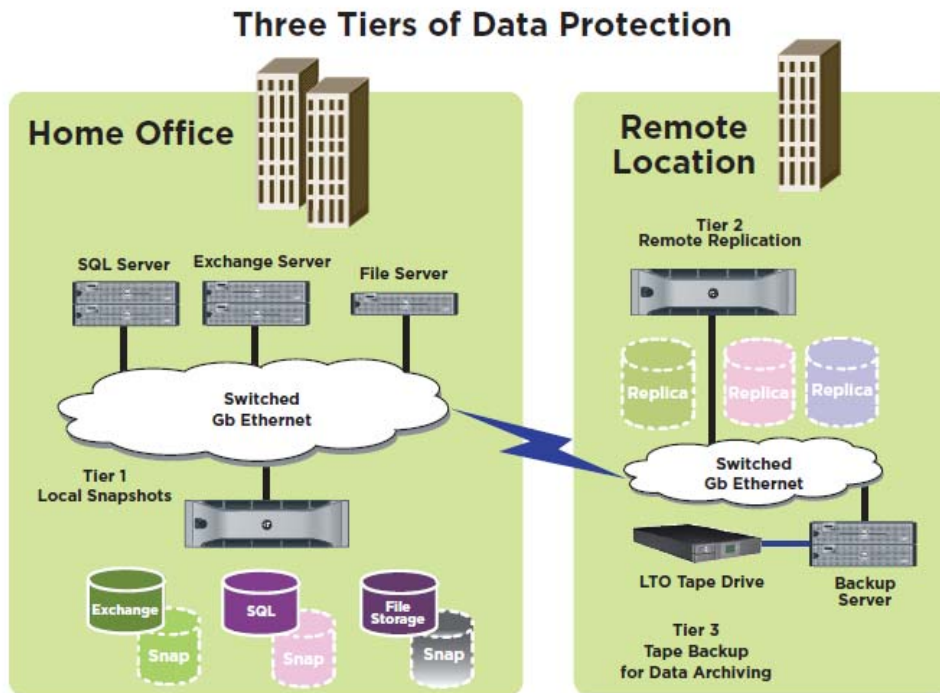


- Single source backup / recovery
- Simplified data management
- Efficient storage utilization
- Highly scalable
- No LAN bandwidth required

# Disaster Recovery



# Case Study: Disaster Recovery



Tier 1: Local Snapshots  
Tier 2: Remote Replication  
Tier 3: Tape Backup for Data Archiving

## Asset Management Company Requirements

- ◆ Resilience
  - ◆ “No human single point of failure”
  - ◆ Component failure / multiple scenarios
  - ◆ Detailed risk analysis; servers, network and applications
- ◆ Automation
  - ◆ Recovery procedures
  - ◆ Relevance
  - ◆ Declaration must be manual
- ◆ Recovery
  - ◆ 95% of DR servers are virtual. DR relevance is automated when combined with iSCSI
  - ◆ Can provision new, fully patched server in less than 20 minutes (from request to completion)
  - ◆ Physical capacity expansion is very simple
  - ◆ Expanded file server volume in less than 5 minutes with ZERO impact to users (SAN and server volume)

# Other Applications

- **Accessibility of stranded servers**
  - ◆ Lower workload servers without FC access but Ethernet onboard
- **Web services**
  - ◆ ftp
  - ◆ http
- **Infrastructure services**
  - ◆ Active Directory
  - ◆ DNS and iSNS

# What Lies Ahead



- Robust roadmap
  - ◆ 10Gb today, 40Gb, 100Gb future
  
- Enhanced Ethernet with Data Center Bridging (DCB)
  - ◆ Improved QOS
  
- Fibre Channel over Ethernet
  - ◆ Converged Ethernet fabric enables greater efficiency / options
  
- IPv6

# Questions?



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

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