Storage Networking: Enabling Internet Growth

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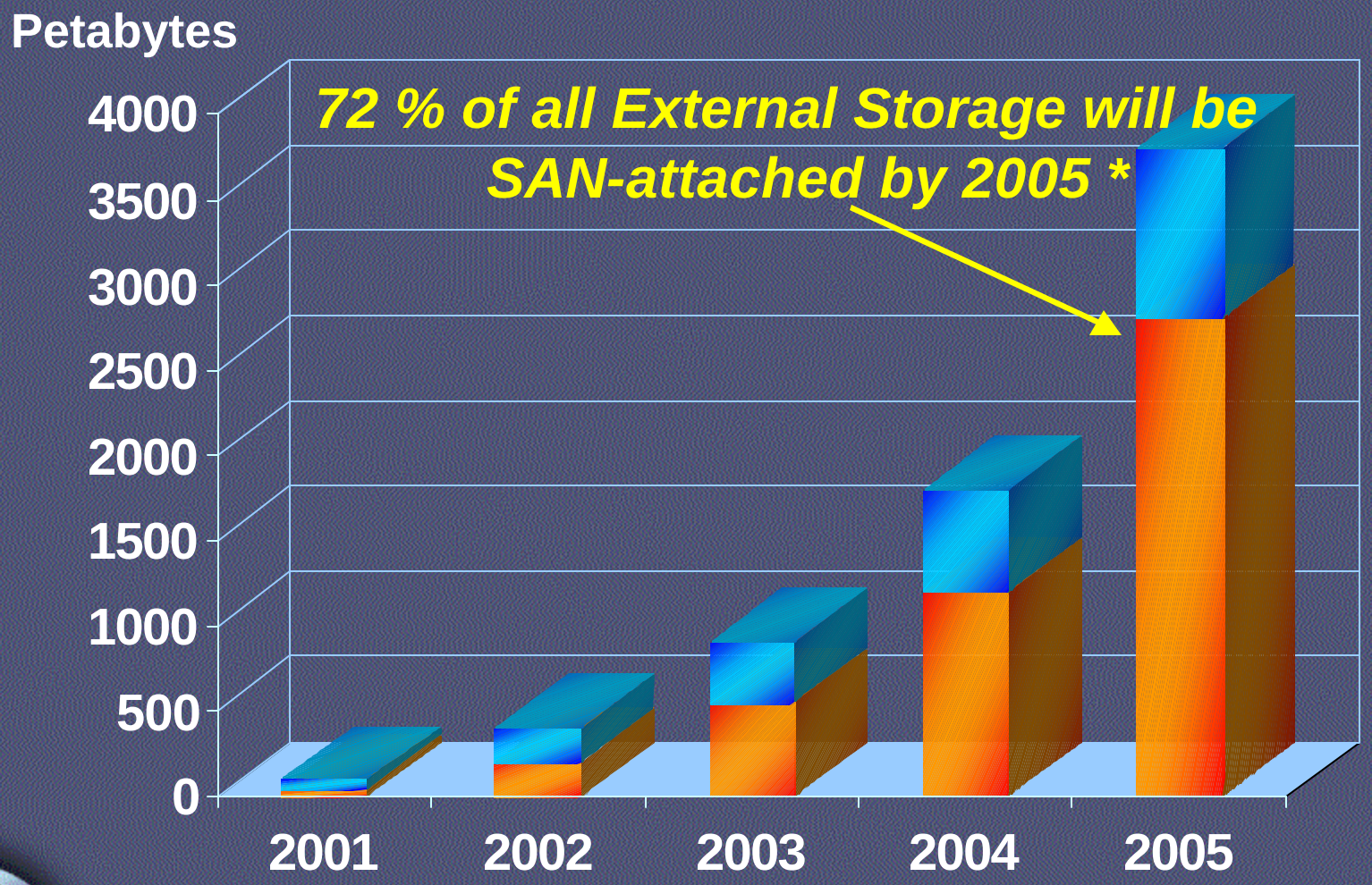
BROCADE

Agenda

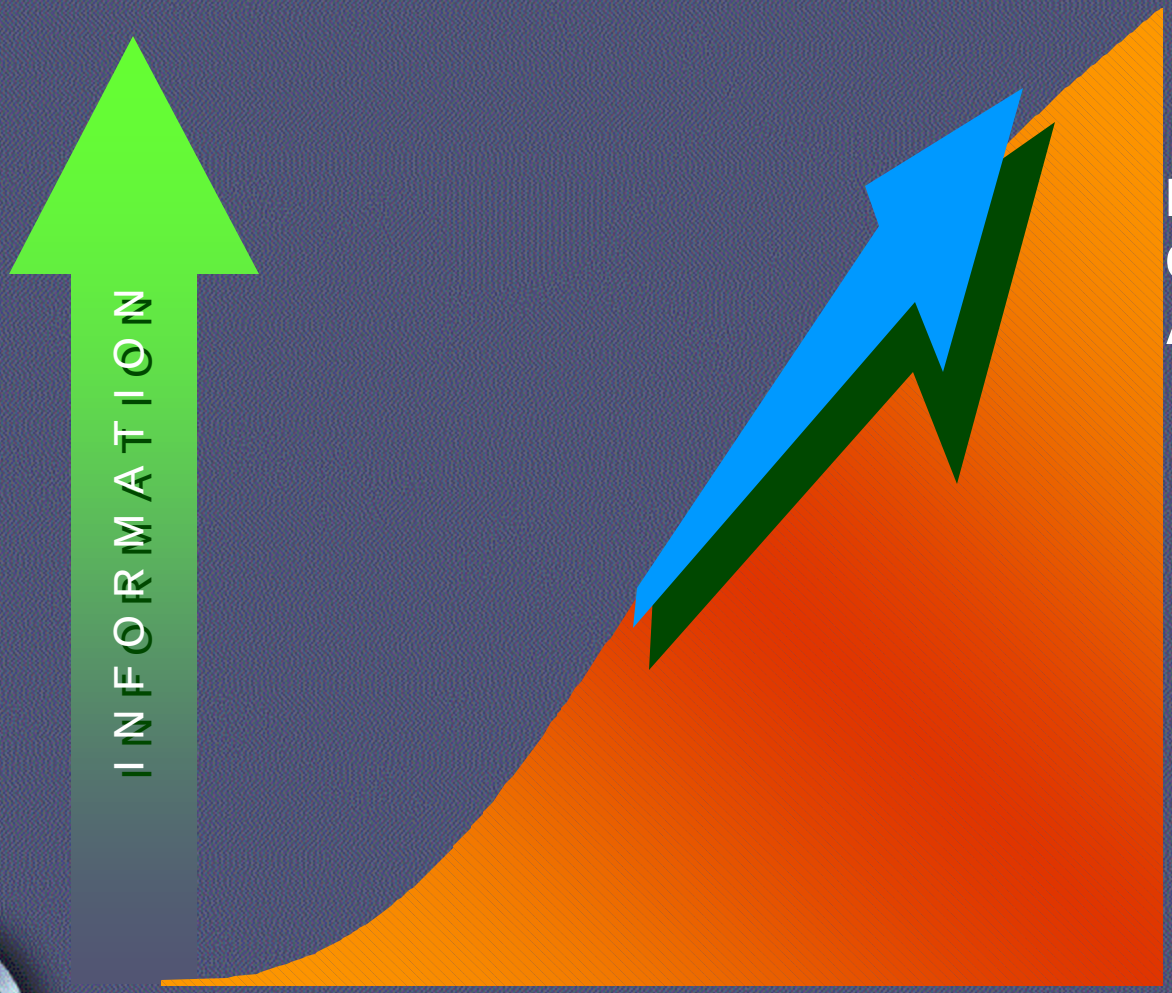
- **SAN Infrastructure for the Enterprise**
  - The Storage Market
  - Brocade Corporate Overview
  - SAN Benefits
  - Brocade Fabric Architecture
- **SAN Solutions**
- **Case Study**
  - A leading internet infrastructure provider

Growth of Fibre Channel-attached Storage



* ***Source:*** Gartner Dataquest

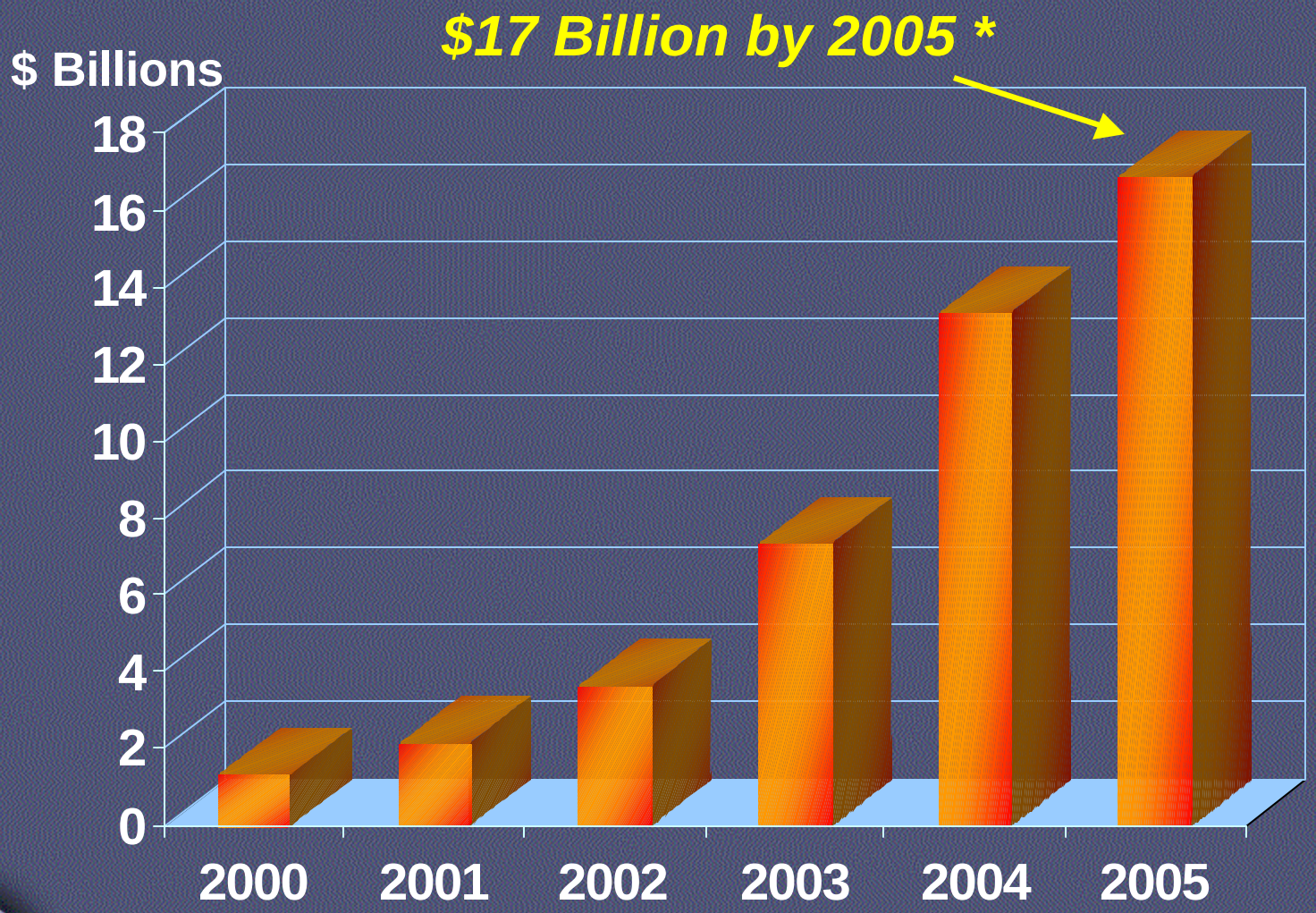
Containing Infrastructure Management Costs Is Critical



Data Management Costs are 5-7 times Acquisition Cost *

** Source: GartnerGroup*

SAN Infrastructure Opportunity



* ***Source:*** Gartner Dataquest

Brocade Corporate Overview

- **San Jose, CA based company founded in 1995**
- **Brocade has ~ 93% share of the Fibre Channel switch market***
- **Fortune 500 IT managers rated Brocade as one of the top 3 SAN companies**
- **Comprehensive switch product line - Entry level to Enterprise class switches utilizing a networking model for SAN infrastructure**
- **Industry exclusive Fabric OS**
- **Fabric Access Layer (API) integration with SAN management tools**
- **~1000 employees worldwide**
- **Major contributor to authoring and editing Fibre Channel standards**

*IDC, March 7, 2000

5 Major SAN Benefits

Improved Availability of Mission-Critical Applications

More Effective Storage Management

Improved Storage Utilization

Improved Availability of Enterprise Information

Foundation for Disaster Tolerance

BROCADE Product Architecture

Value-Added Fabric Software

- **Zoning**
- **WebTools**
  - Fabric Status
  - Events
  - Reports
  - Smart GBICs
- **QuickLoop**
  - Multiple
  - Zonable
  - **Fabric Assist**
- **Fabric Watch**
- **Remote Switch**
  - **Extended Fabrics**
- **Fabric Manager**
  - ***NEW***

API

Application Programming Interface

Base Services

Fabric Services
Management Server
Simple Name Server
Alias Server (multicast)
Cascading

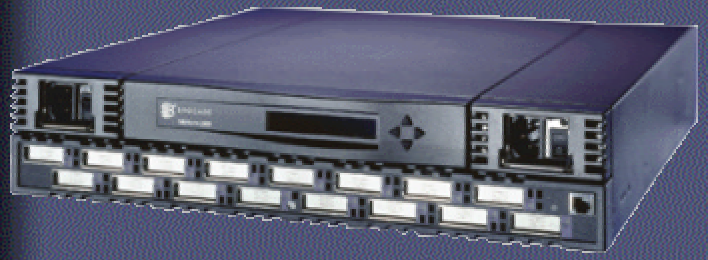
Management Services
SNMP
Telnet
Front panel

Hardware Platform

Silkworm Family ⟺ 6400
2400/2800
20x0 / 22x0

SilkWorm 2400 & 2800 Fabric Switches

SilkWorm 2400 (8 ports)



SilkWorm 2800 (16 ports)

- Robust Fibre Channel switch platform
- Universal ports (E, F, FL)
- Port level zoning
  - ASIC and WWN enforced
- Fabric OS™
  - Integration with HP management tools
  - Support for legacy (FC-AL) devices
  - Enables disaster tolerant solutions
  - Allows for flexible SAN design
  - Simplifies deployment of SAN based applications
- Foundation for disaster tolerant solutions
- Supports SWL, LWL and Copper GBICs

Fabric Services

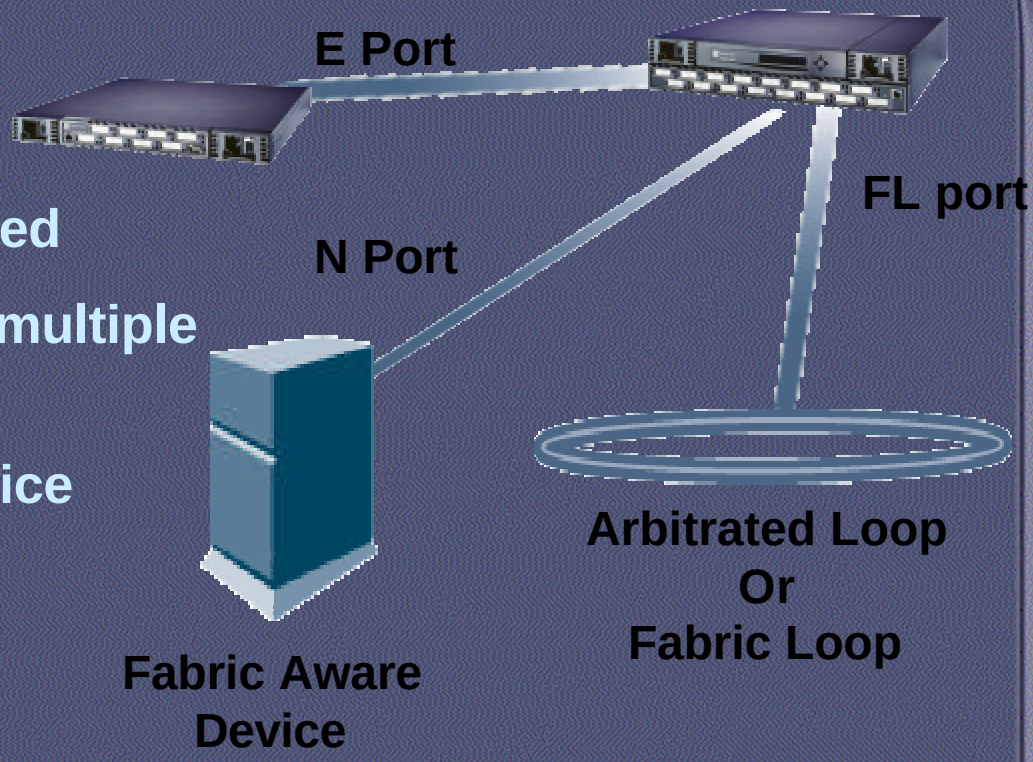
What is a Brocade Fabric

A Brocade Fabric is a network of intelligent Fibre Channel switches which provides Enterprise class

- **Reliability**
- **Availability**
- **Scalability**
- **Disaster Tolerance**
- **Management Features**
- **Performance**

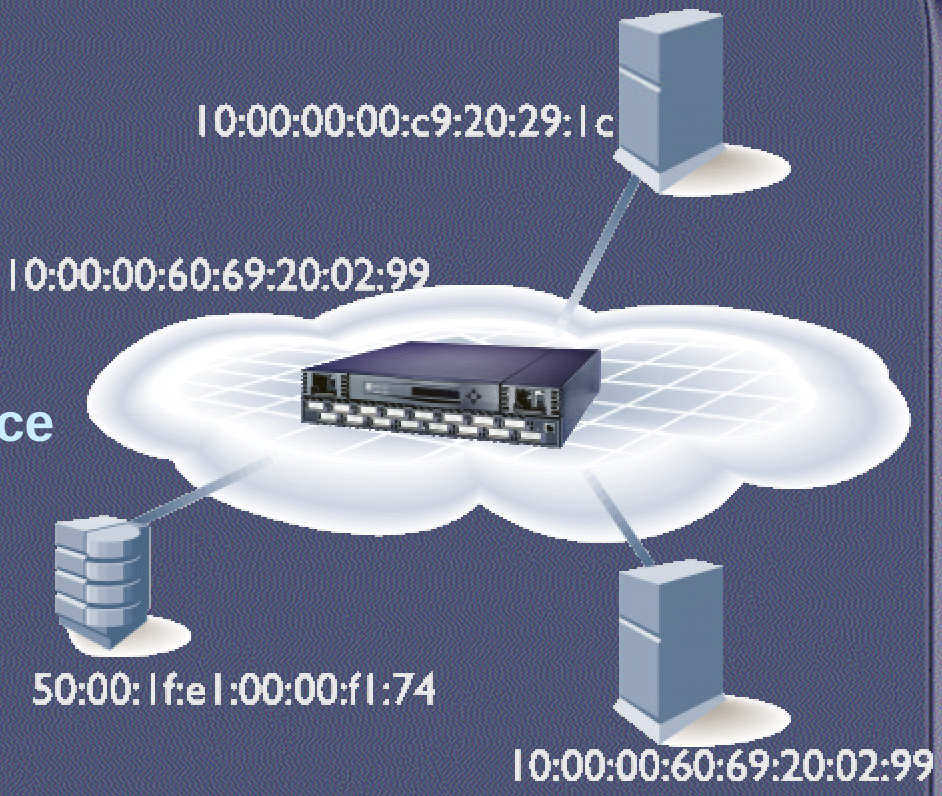
Universal Fibre Channel Port Support

- Auto configuring
- Self-discovery
- No user intervention required
- Brocade switches support multiple Inter Switch Links (ISL)
- Enables legacy (FCAL) device support



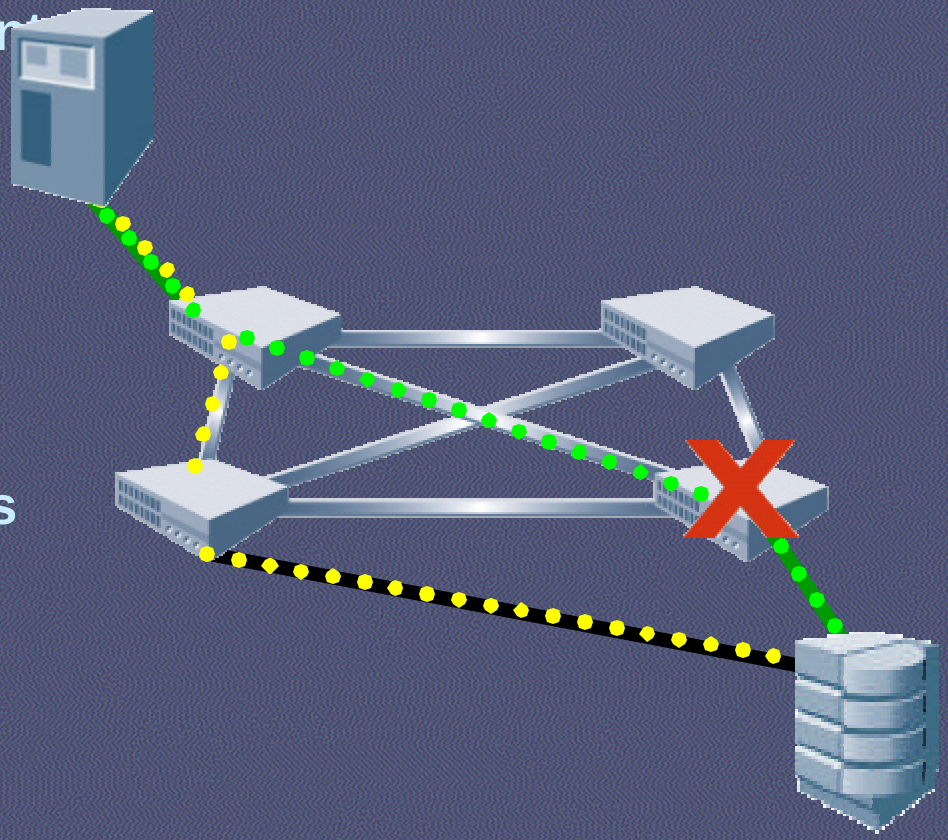
BROCADE: Simple Name Server

- **Standards based network address assignment**
- **Distributed across the fabric**
- **Auto Discovery**
- **Automatic legacy (FCAL) device support**
- **Dynamic scalability**



Fabric Shortest Path First - (FSPF)

- Automatically calculates routs (OSPF-like)
- Uses cost basis and hop coun
- Can apply static routes if needed
- Automatically rout around failures
- Fault detection ~150ms
- Alternate route live in <650ms



Management Services

SNMP

- **SAN event monitoring**
- **Traps can be presented to a management interface**

Telnet

- **Full telnet capabilities**
- **Enables script usage**

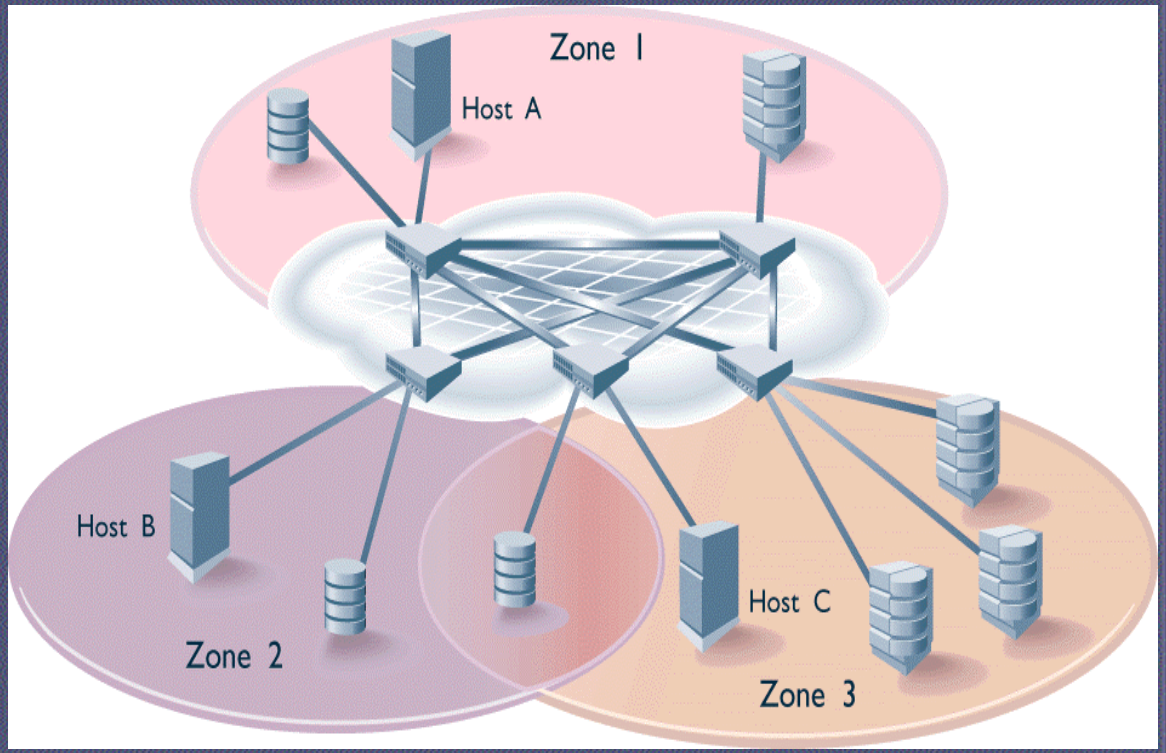
Front Panel

- **Complete management menu**

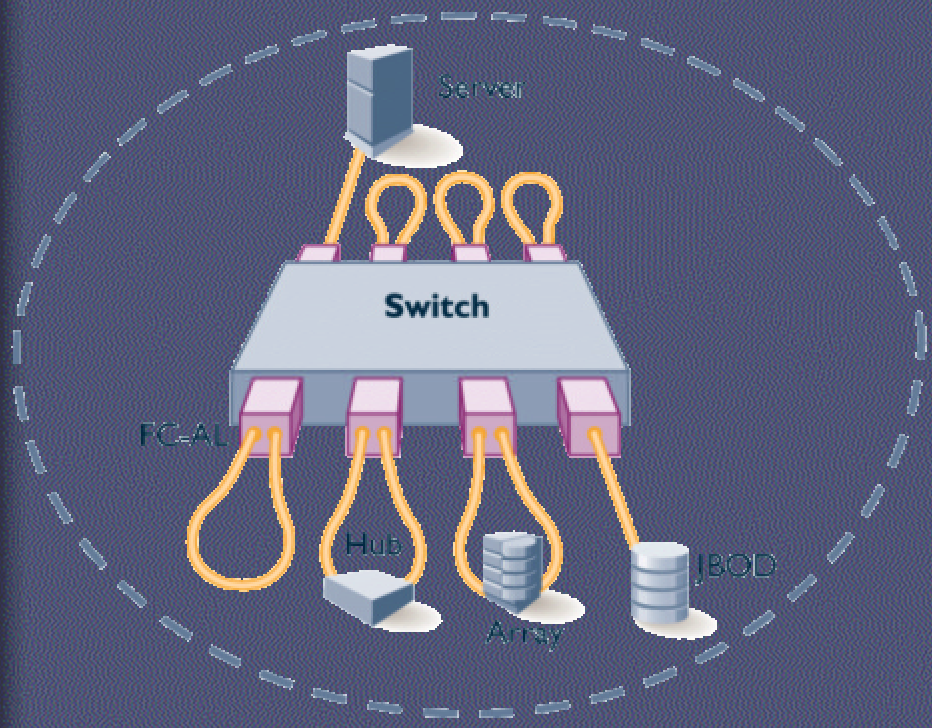
Fabric OS
Value Added Software

Zoning

- Zone by port – ASIC enforced
- Zone by World Wide Name (WWN)
- Zone by QuickLoop
- Overlap zones
- Unlimited zones



QuickLoop



Fibre Channel Arbitrated Loop

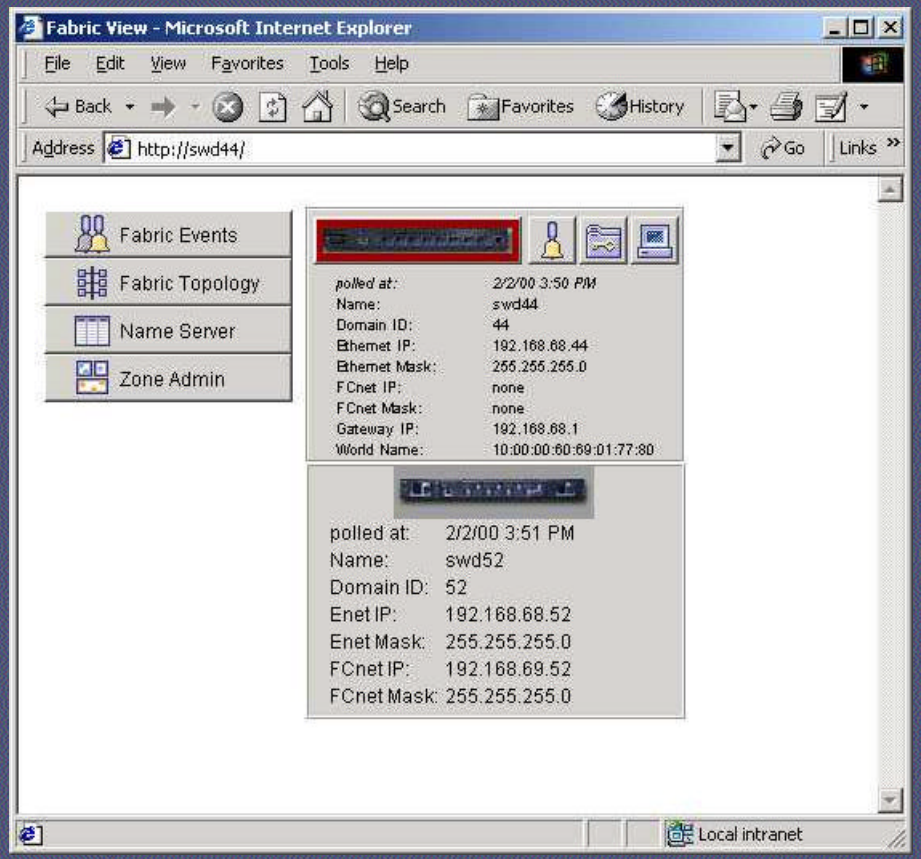
- Fabric hosts can access legacy (FCAL) storage devices
- Attach legacy loop (FCAL) devices
- Legacy devices can be managed and monitored in zones
- Provides Investment Protection

Brocade Extended Fabric

- Brocade exclusive Fabric OS based feature
- Brocade Fabric OS manages buffering between switches
- Managed as a single Fabric
- Full-speed (100 MB/sec) at distances of up to 70 Km
- Requires Extended Long Wave Length GBIC

WEB TOOLS

- Monitors switch status
- Zoning configuration
- Fabric topology
- Fabric events
- Requires browser & Java



Fabric Watch™
Active Switch Management

Monitors key switch events

- Fabric states
- Errors
- Performance

Escalates via SNMP to:

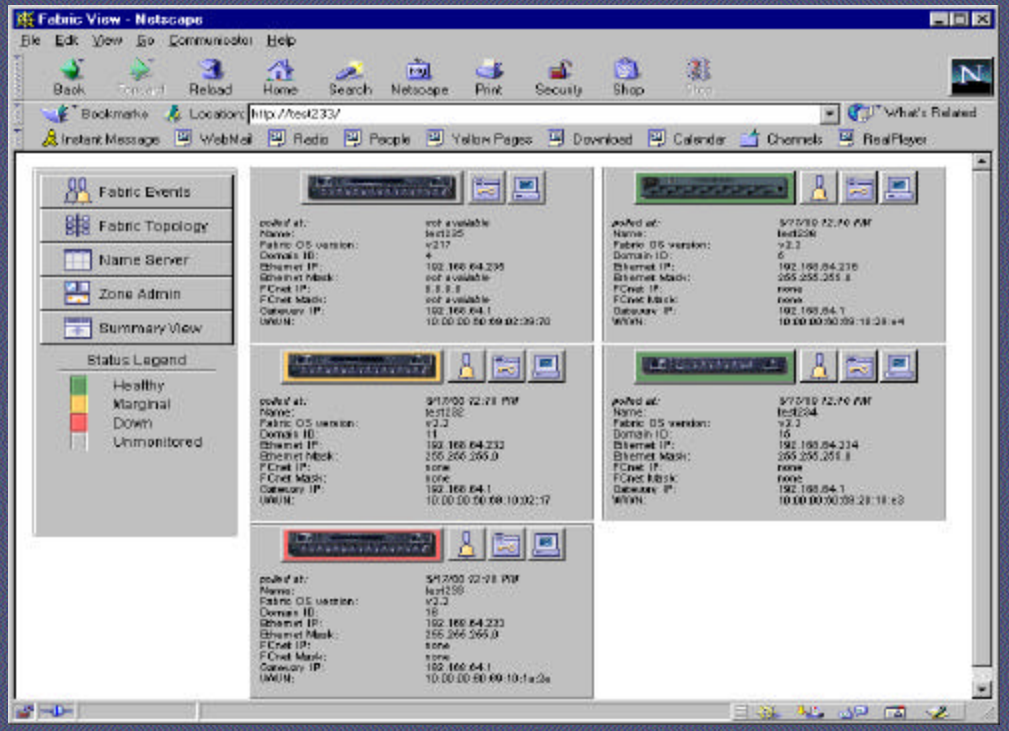
- Enterprise Managers
- Switch Event Log
- WebTools Event View

Base line functionality

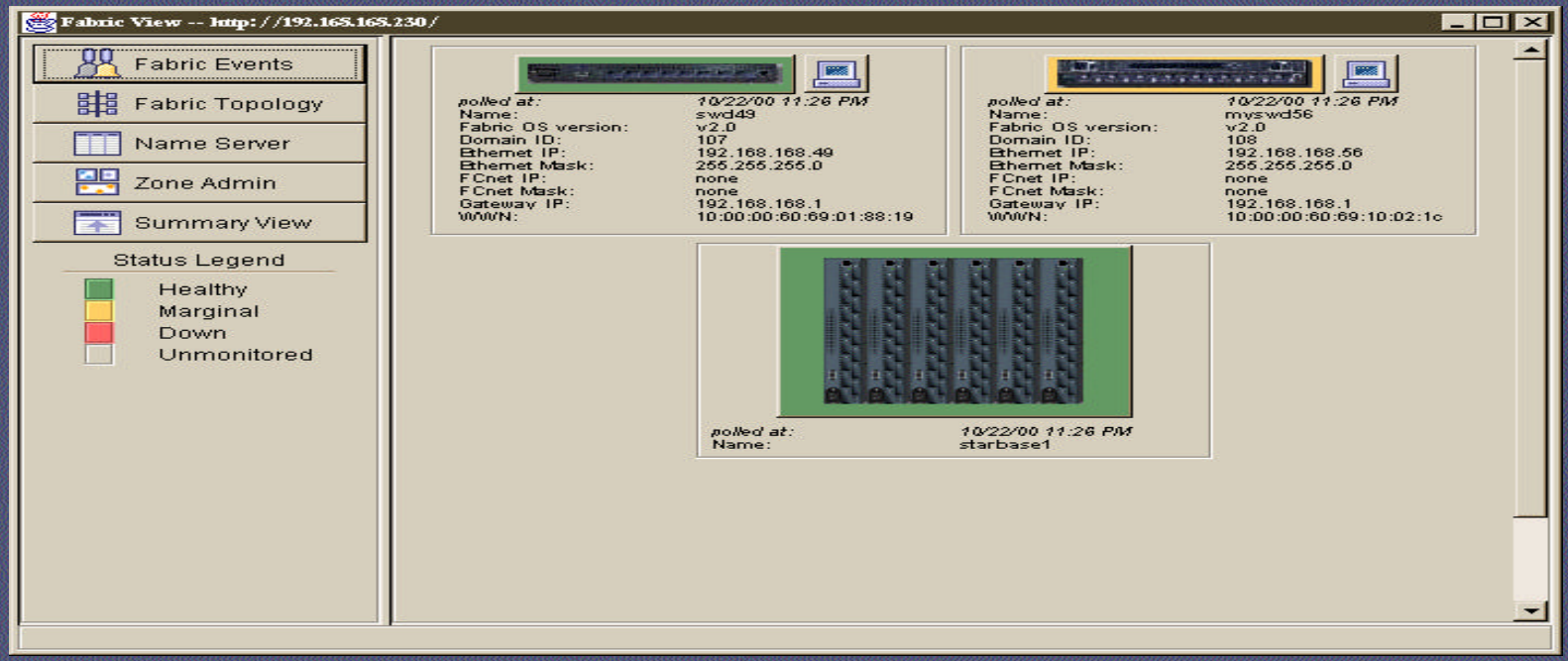
User can set thresholds

Useful for tuning Fabric

i.e. ISL traffic



Fabric Manager



Java based application bundled with the SilkWorm 6400

Individual switches are grouped and managed as a single entity

ISL configuration monitoring

Integrated into HP OpenView management infrastructure

Integration with Management Infrastructure

HP Open View Management Software

IP Network Administration

SAN Administration

Storage Administration

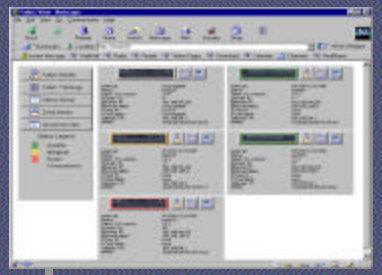
Fabric Access Layer
SNMP

Web Tools

- Browser based
- SAN configuration
- SAN administration

Fabric Watch

- Monitors key fabric events
- Escalates via SNMP to HPOV
- Enables proactive SAN management



Telnet
SNMP
FC-CT

SAN Solutions

SAN Design Criteria

A Fabric is an extremely flexible architecture

- Small Clusters - 1 to 2 switches, 2 – 4 servers, < 1TB
- Departmental Meshes - 4+ switch meshes, > 2 servers, > 1TB
- Enterprise Backbone - Multiple switch meshes, Backbone, Server/Storage 2 Tier

Design based on …

- Disaster tolerance requirements
- Growth rate
- Performance characteristics
- Future application deployment

SAN Solution for Server Clustering

- Server resource is not fully utilized
- Storage is internal or direct attach – No resource sharing
- No disaster tolerance at the application level
- Storage utilization typically is low
- Capacity planning is more difficult

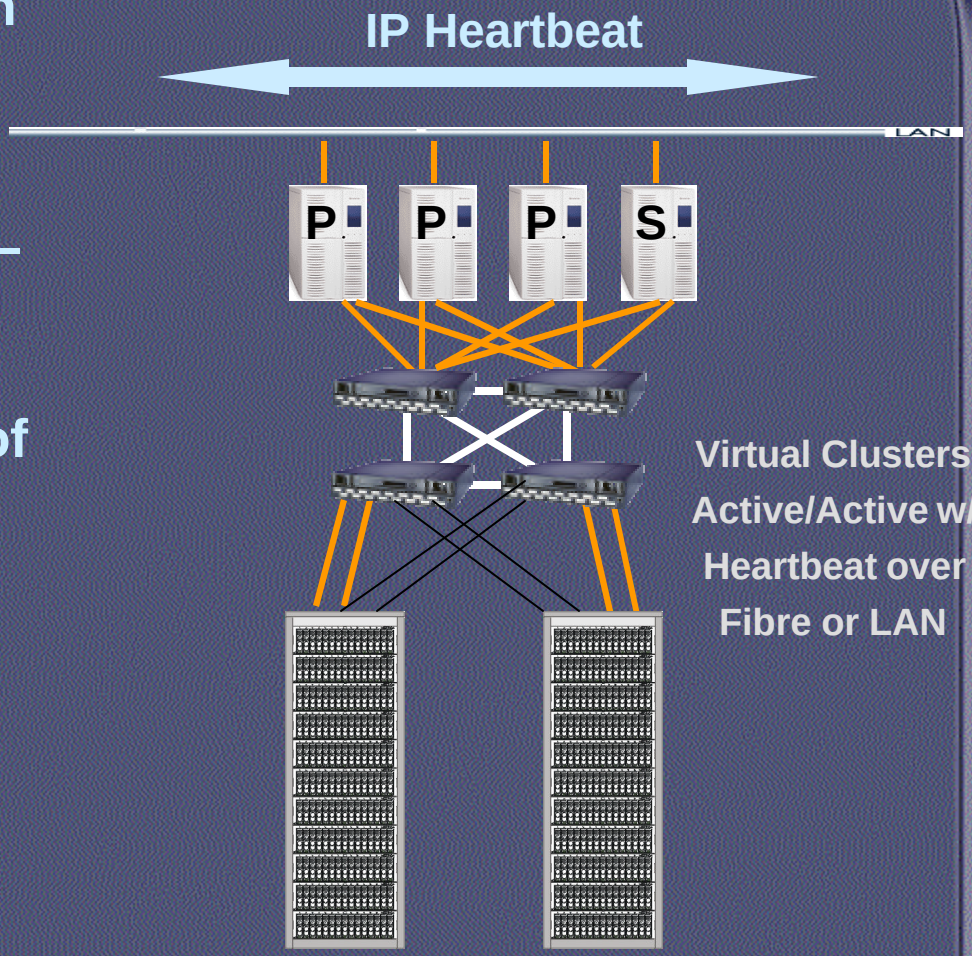
Non-Clustered

SAN Solution for Server Clustering

Clusters increase application availability and disaster tolerance

Better Utilization of Servers – Active/Active

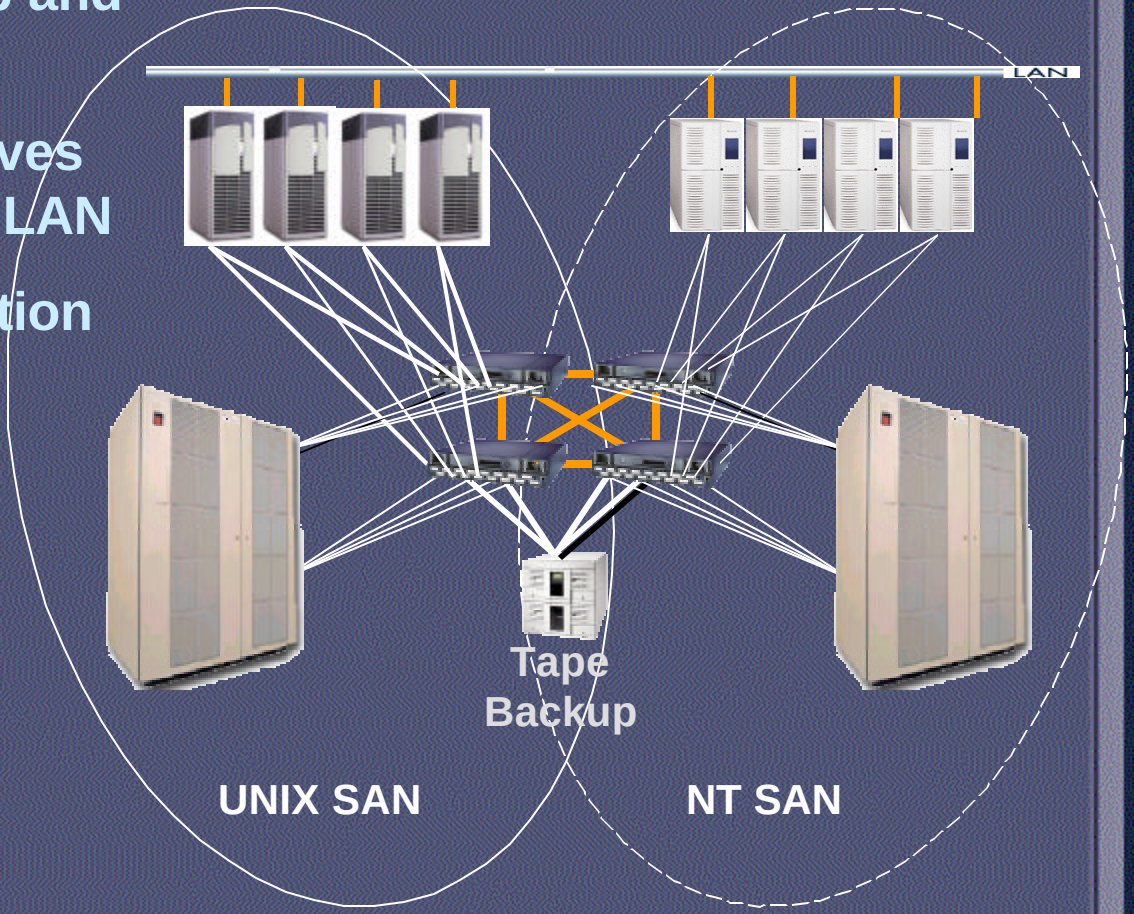
Non disruptive deployment of servers, storage arrays and applications



Virtual Clusters Active/Active w/ Heartbeat over Fibre or LAN

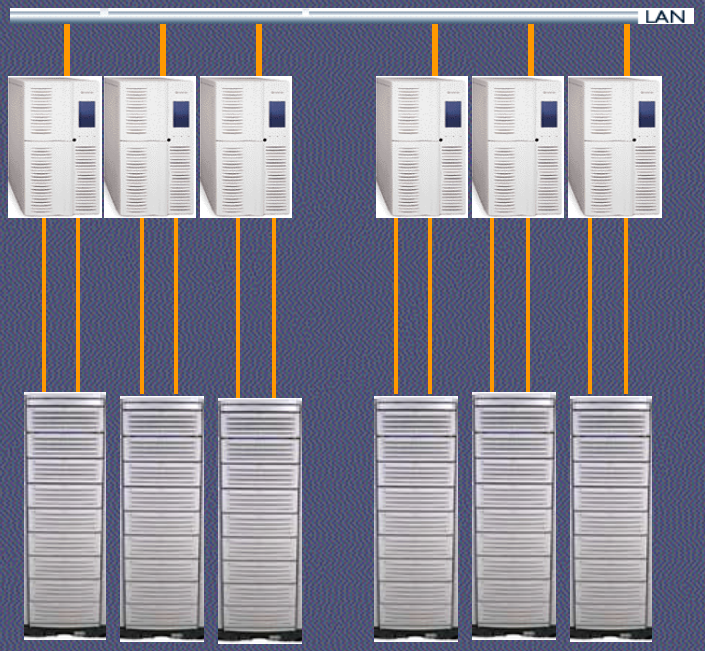
SAN Solution for LAN-Free Backup

- A SAN enables a centralized tape backup and restore implementation
- LAN-Free backup removes backup traffic from the LAN
- Allows for better utilization of valuable server and storage resources



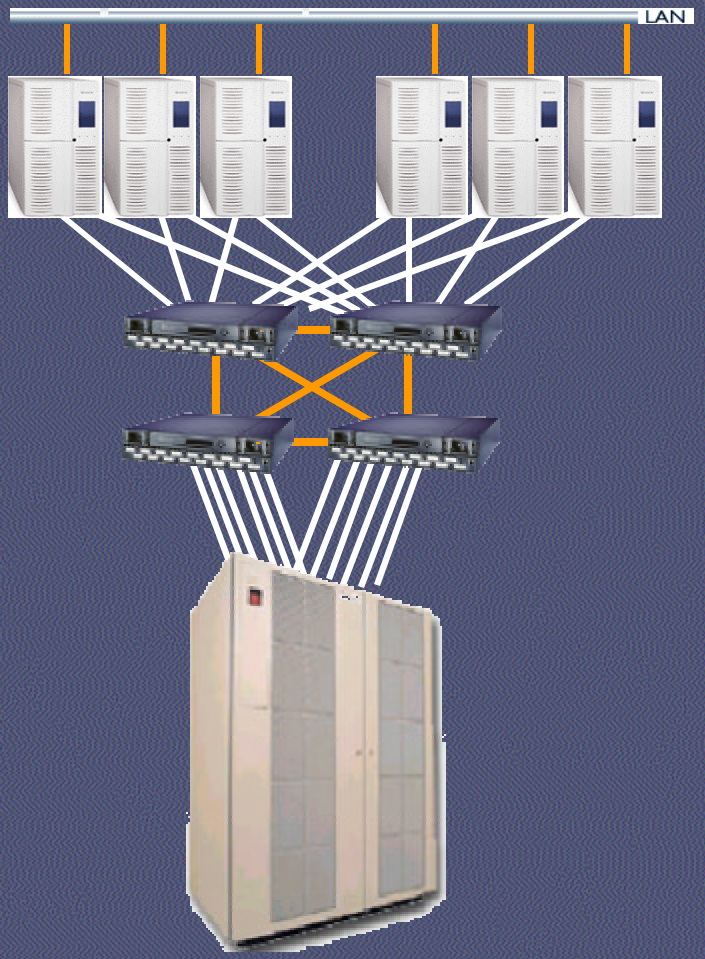
SAN Solution for Storage Consolidation

- **Windows NT/2K based applications typically grow by adding 1 server and 1 storage device**
- **Windows NT/2K server storage utilization averages 30 - 50%**
- **Capacity planning is more difficult**

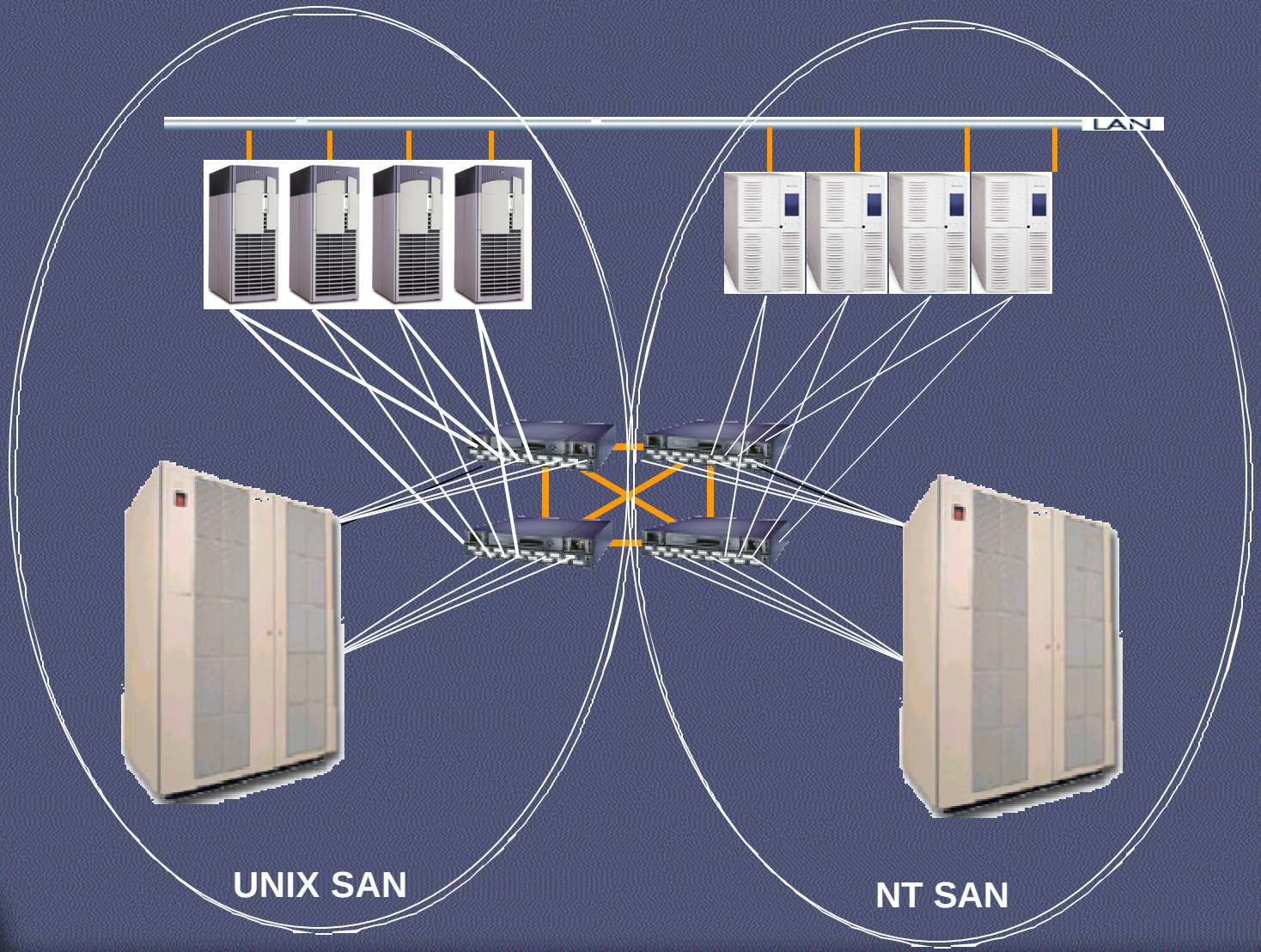


SAN Solution for Storage Consolidation

- Storage consolidation makes the storage a shared resource
- Storage utilization can be increased
- SANs enable the addition of an enterprise class storage array to better manage storage capacity
- Enterprise class storage array enables additional SAN applications



SAN Solution for Heterogeneous Server Growth



Case Study

Internet Service Provider
SAN Project Goals

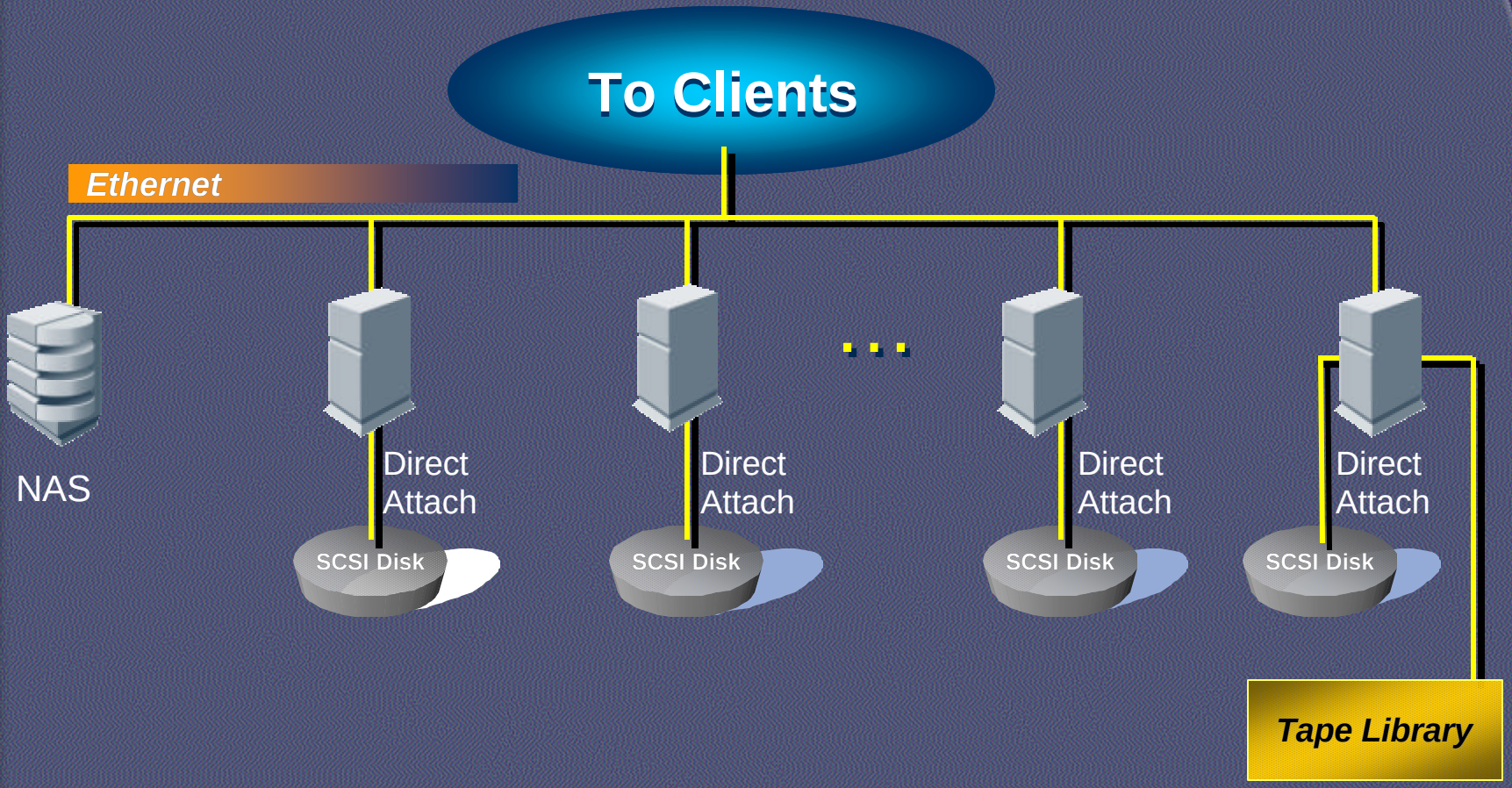
Provide fast, reliable access to databases from any server

- Avoid the unpredictable behavior of IP-based front-end networks
- Reduce the amount of time required to reconfigure servers
- Overcome the restrictions of SCSI-based storage
  - Cabling distances
  - Number of devices
- Separate client, backup, and shared file system network traffic
- Reduce backup time

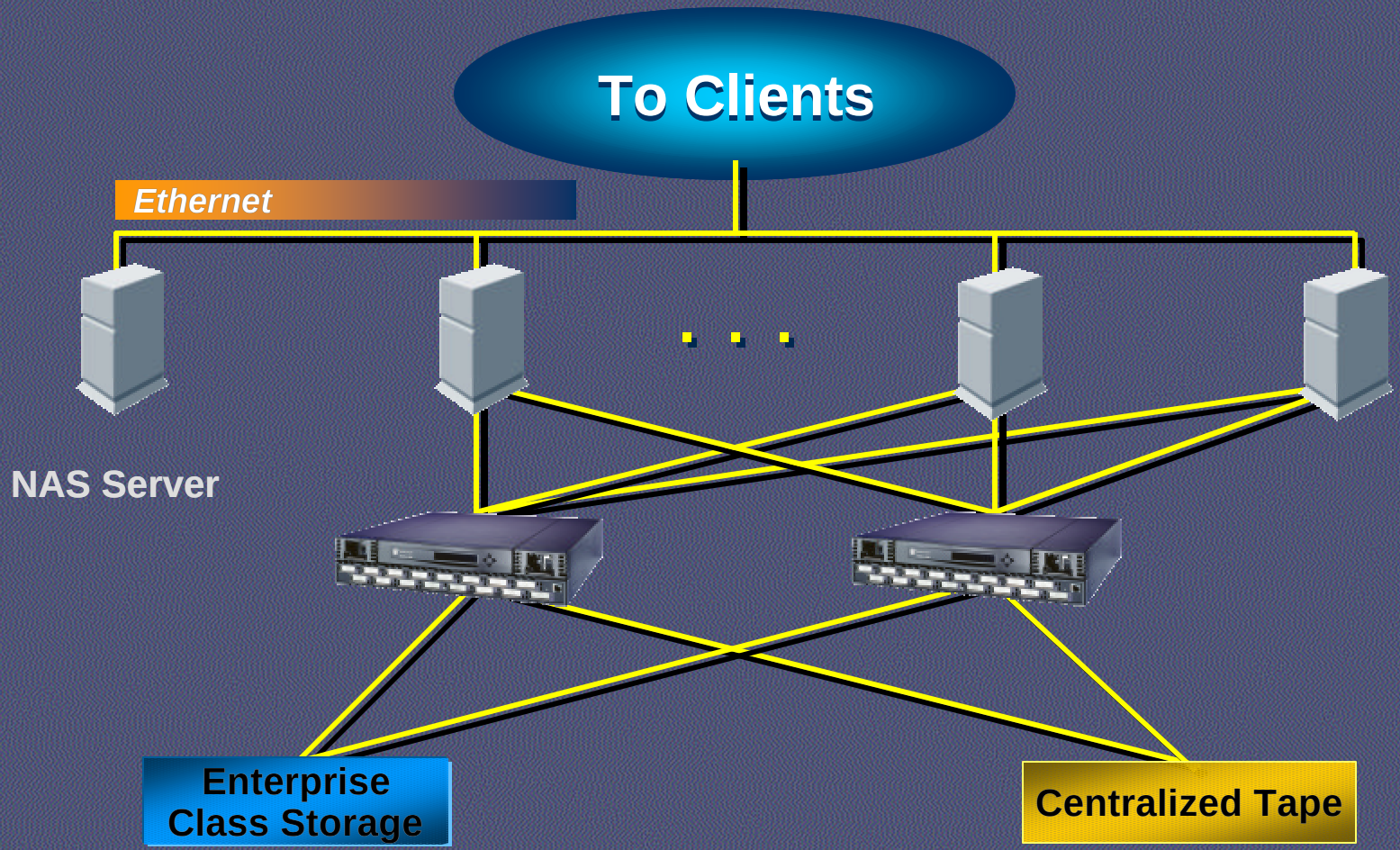
Build an infrastructure in which to deploy a high performance shared file system

Use clustering to implement scalable, highly available services

Internet Service Provider
Pre-SAN Configuration



Internet Service Provider
SAN Configuration



Internet Service Provider
Post SAN Implementation Results

Increased database reliability and performance

Higher service (application) availability

- Immediate access to a failed server's database files
- Reduction of time required to add/move storage from 2-4 days to hours
- Reduced backup time from 10 to 4 hours
- Elimination of re-cabling for configuration changes

Improved network performance by removing server database traffic

Enhanced architecture that provides for future growth and functionality

Improved system administration productivity

Internet Service Provider
SAN Return on Investment (ROI)

SAN Benefit	Savings/year
Reduced HA infrastructure and higher application availability	$266,000
Improved System Administration productivity	$110,000
Improve storage utilization and availability	$11,000
Reduction in backup window	$32,000
Total SAN Savings per year:	**$419,000**
SAN Costs:	**$250,000**

7 month SAN ROI

Summary

SAN infrastructure enables SAN based application solutions

- High availability clusters increase application availability
- LAN-free backup decreases backup time and LAN congestion
- Storage/Server consolidation better utilize valuable IT resources
- Centralized management of SAN infrastructure

SAN infrastructure simplifies the management of IT resources

- How do you want to manage the SAN?
- Integration with existing management infrastructure
- Non disruptive addition/deletion of IT infrastructure (server, storage, switch)

SAN infrastructure provides investment protection

- Support for legacy devices
- Compatibility with next generation SAN Fabric switches
- Compatibility with current IP based storage (NAS) and future (iSCSI?)

SAN infrastructure provides security in a heterogeneous environment

- Zoning of devices
- Securing access points

Thank you

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