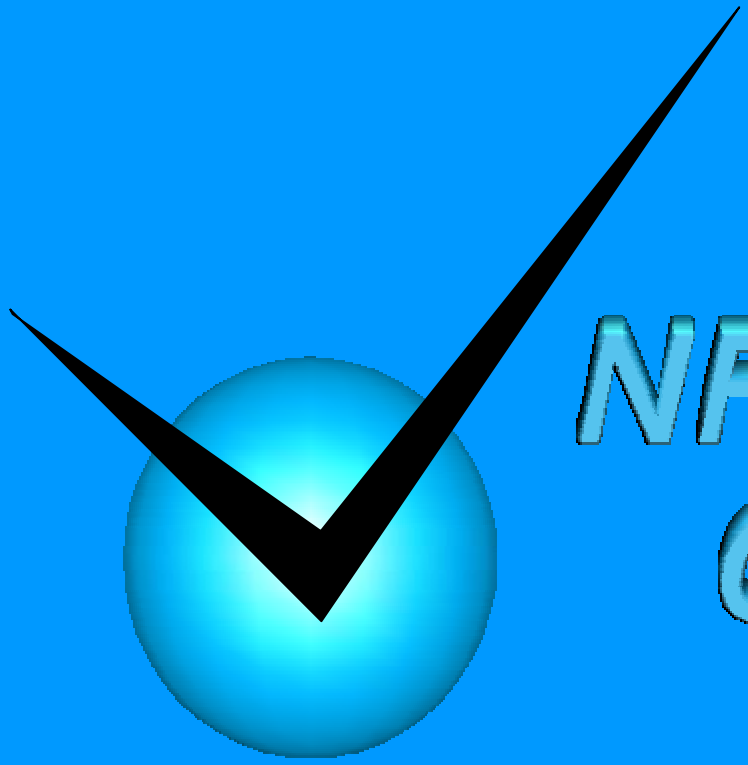
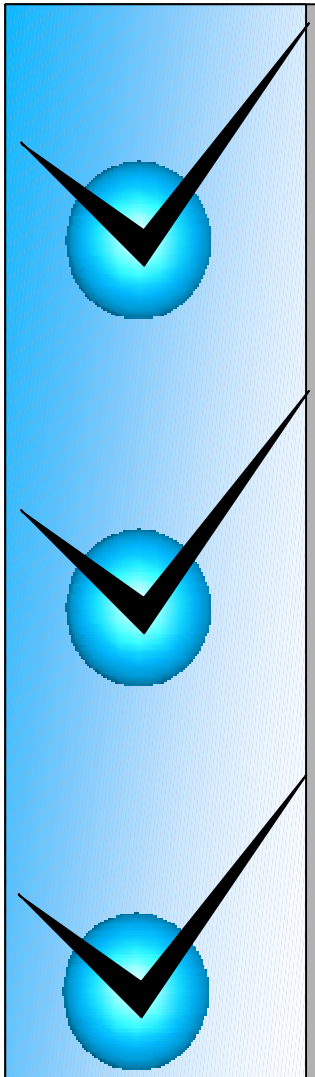


# NFS Vendors Conference



# NAS for the Enterprise

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NAS Principle Architect

EMC Corporation

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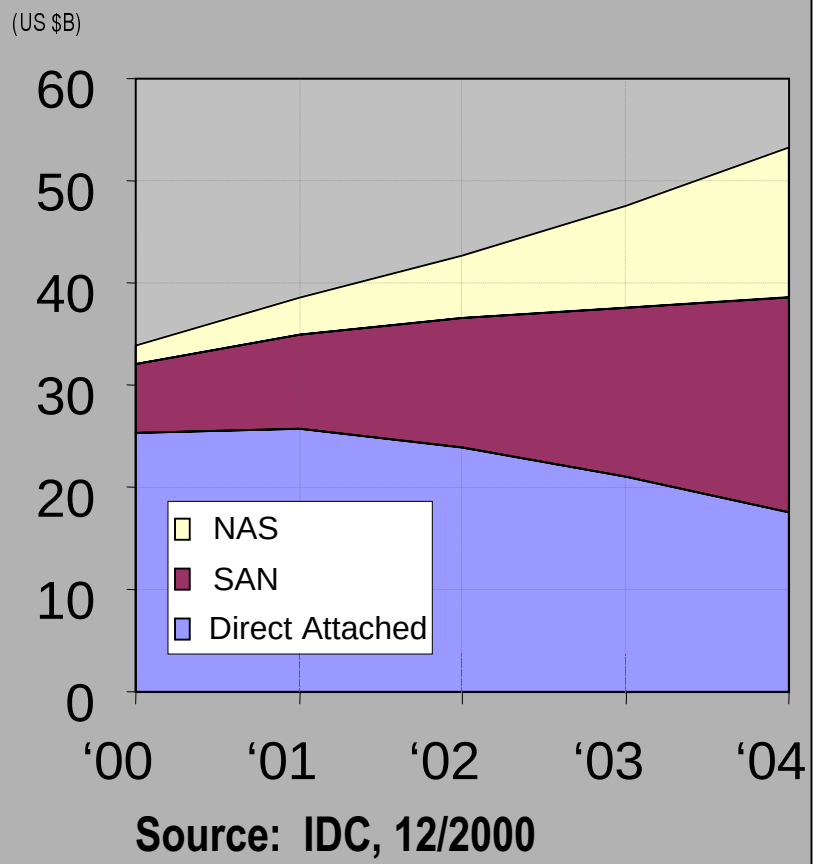
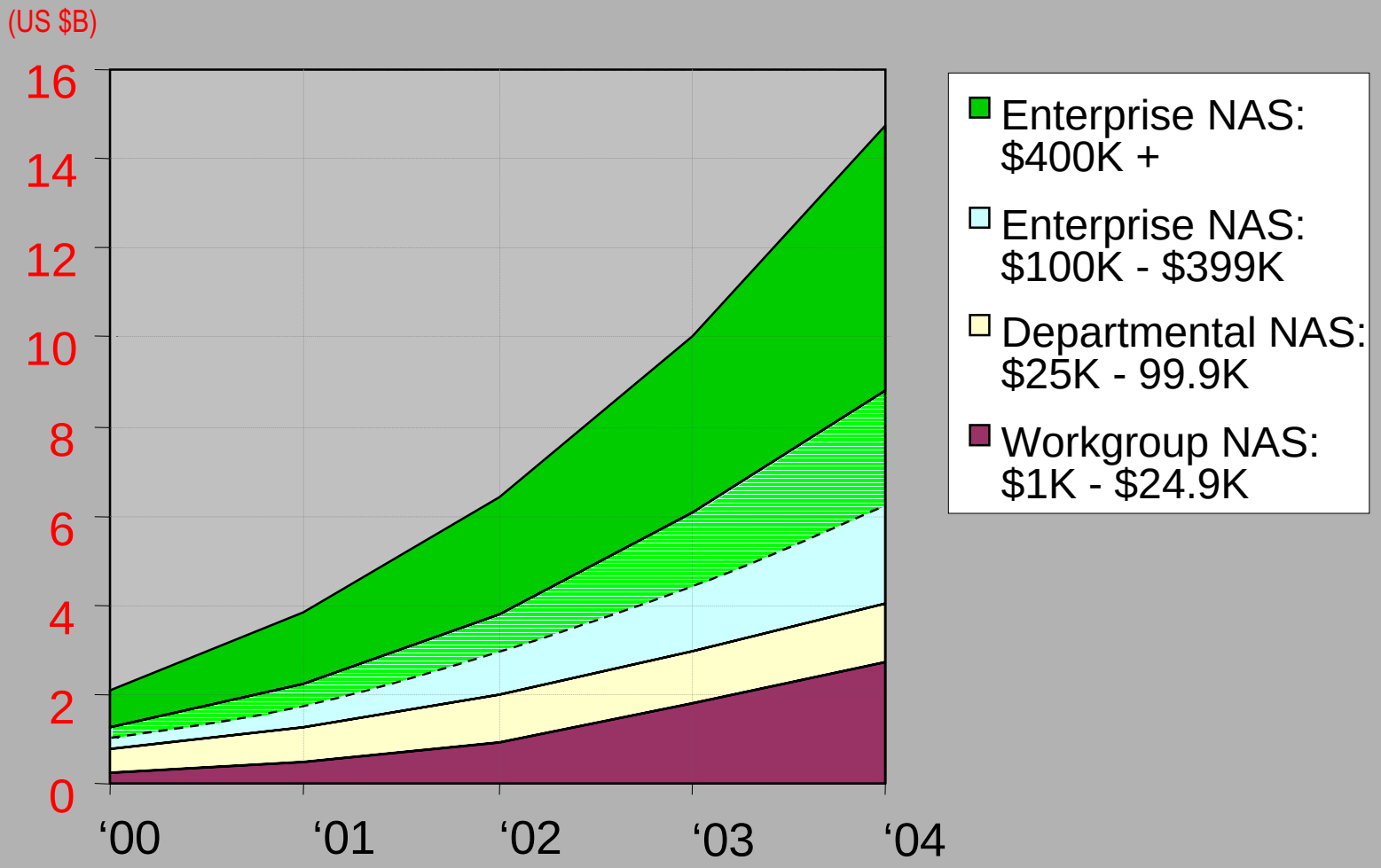
# Disk Storage Market by Connectivity, 2000-2004

- By 2004, 67% of all storage will be networked
- NAS fastest growing segment with 65% CAGR.




**Source: IDC, 12/2000**

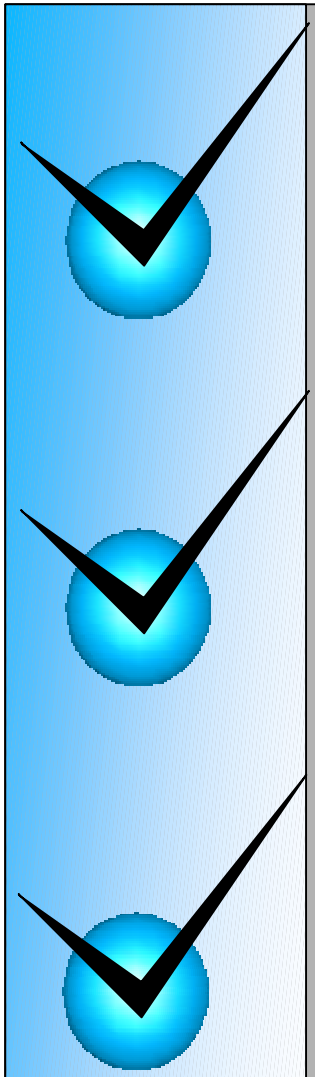
# NAS Market Breakdown




**Source: IDC Jan 2001, EMC Market and Customer Analysis**

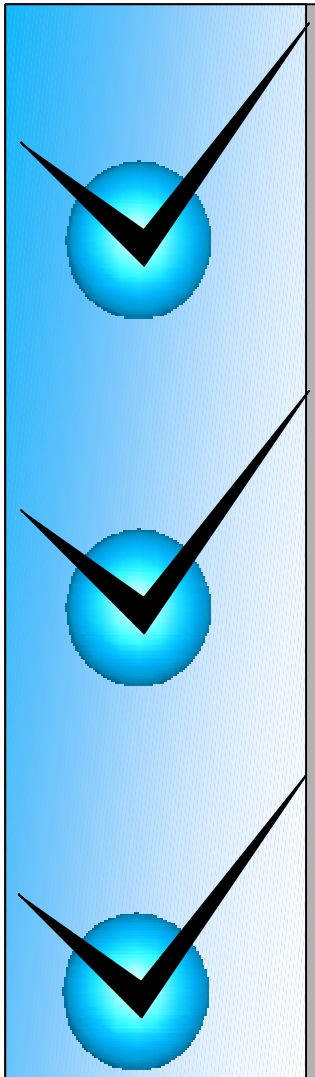
# Enterprise Customers

- Financial
- Manufacturing
- R & D
- Telco
- Internet
- …



# NAS in the Enterprise

- Availability
- Scalability
- Data Protection
- Data Mobility
- Security
- Multiprotocol
- SAN integration
- Backups (restores too)

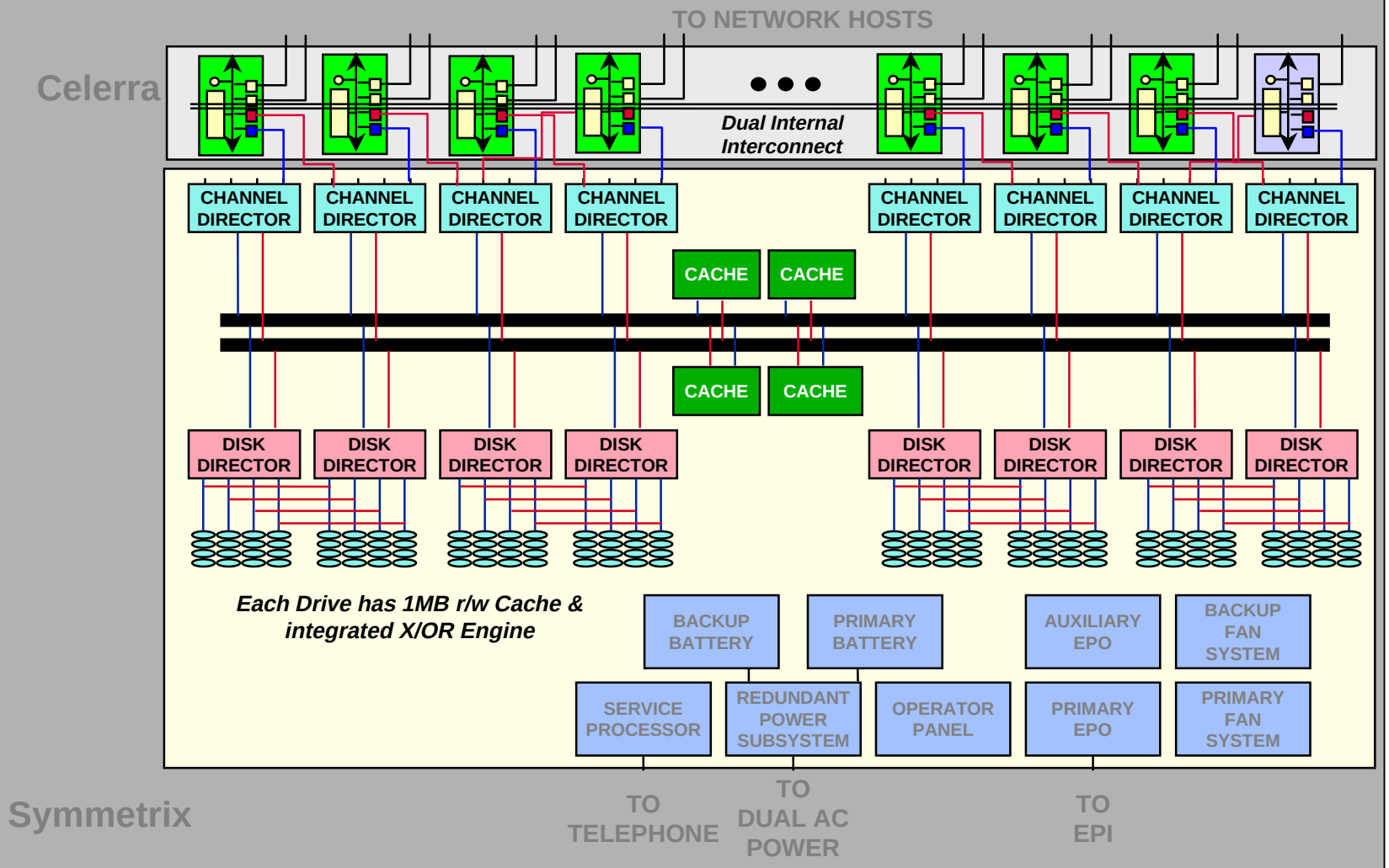


# High Availability is an End-to-End Problem

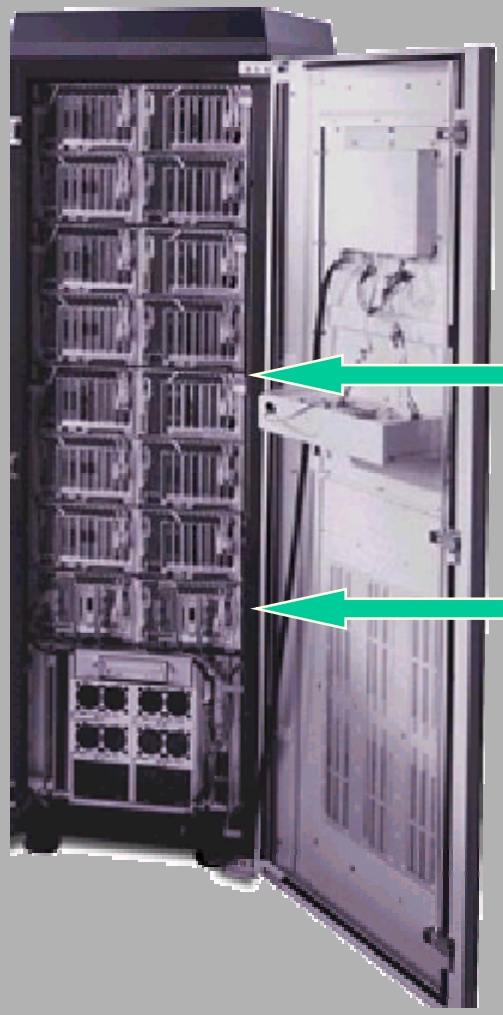
- Storage
- Server
- File System
- I/O channels
- External network
- Disaster recovery

*No single point of failure*

# HA Storage – End-to-End Dual Connectivity

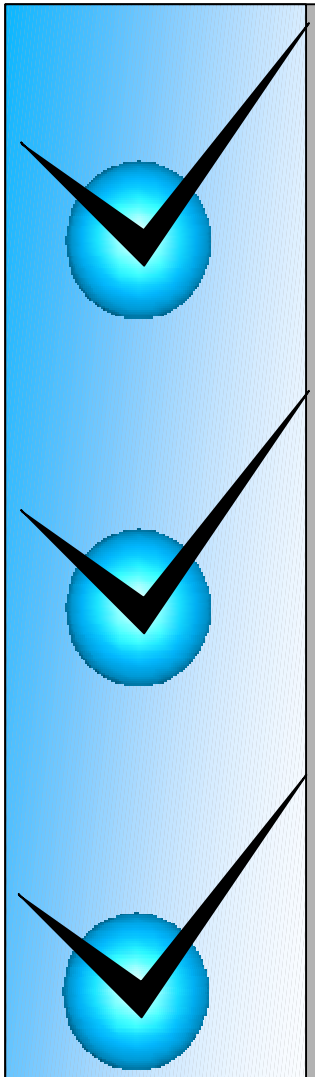


# HA Server Solution



Data Movers
(1-14)

Control Stations
(1-2)



# HA File System

- Recoverability
- Fast reboot - No *chkdsk* on reboot
- Persistence - Commit guarantees for metadata and data
- Online maintenance - Preferably without slowing to a crawl
- Quick repair times - Unless you are bug free

# HA I/O Channels

- Multiple paths from server to storage - Load balancing and failover
- Multiple network connections to Control Station
- Trunking/EtherChannel for network failover and throughput

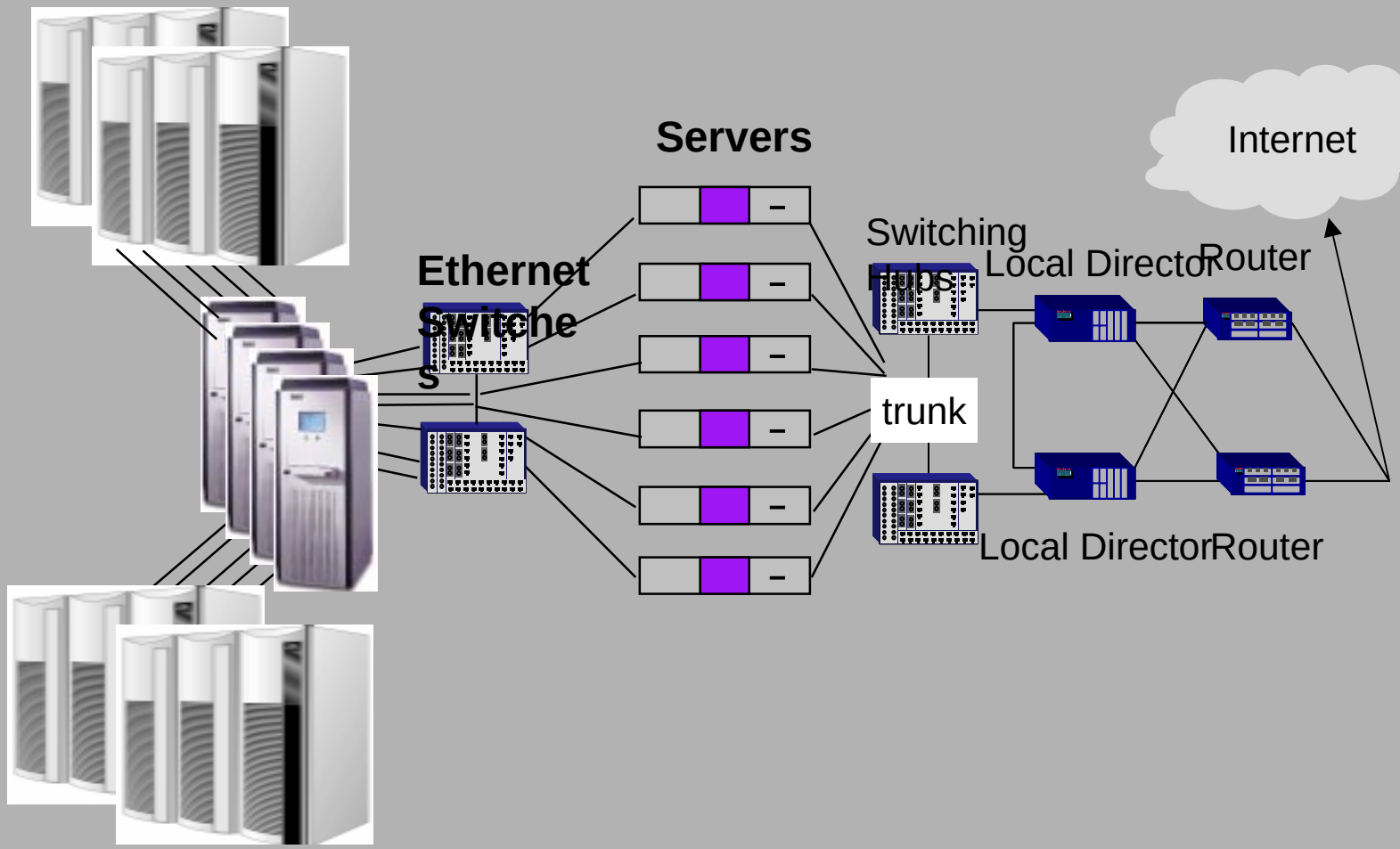
# HA in the Network

- Cannot shirk the responsibility
- Active/standby network ports
- Connect to different switches

# Scalability

- Eternal debate – big iron or clusters?
- Customers at both end of the spectrum

# High Scalability and Availability for Web Mail



# Scaling Up

- Large, MP server
- Huge (multi-TB) file system
- Single IP address/mount point
- Consolidation
- Easy to manage

# Scaling Down

- SSP model
- I have many internal customers
- Each needs small pool of storage
- Each wants to manage its own “server”
- Each should have no visibility to the others
- I need to reapportion capacity and bandwidth often
- Bunch of separate servers can’t cut it

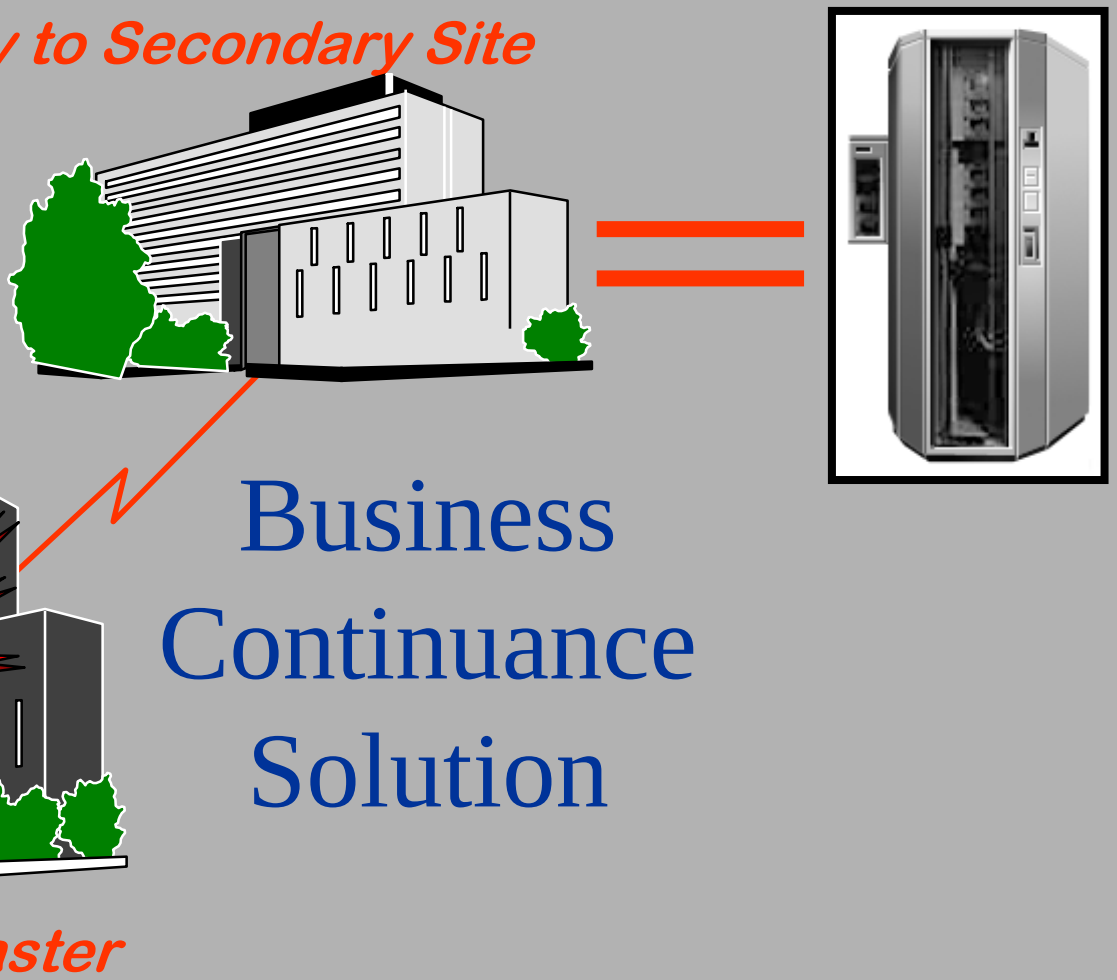
# NAS Virtualization

- Server is a cluster of nodes
- Each node has a set of virtual servers
- Each virtual server appears as separate netbios name with its own shares, etc.
- Each node can capable of serving all the data
- Can flexibly move data between nodes

# Data Protection

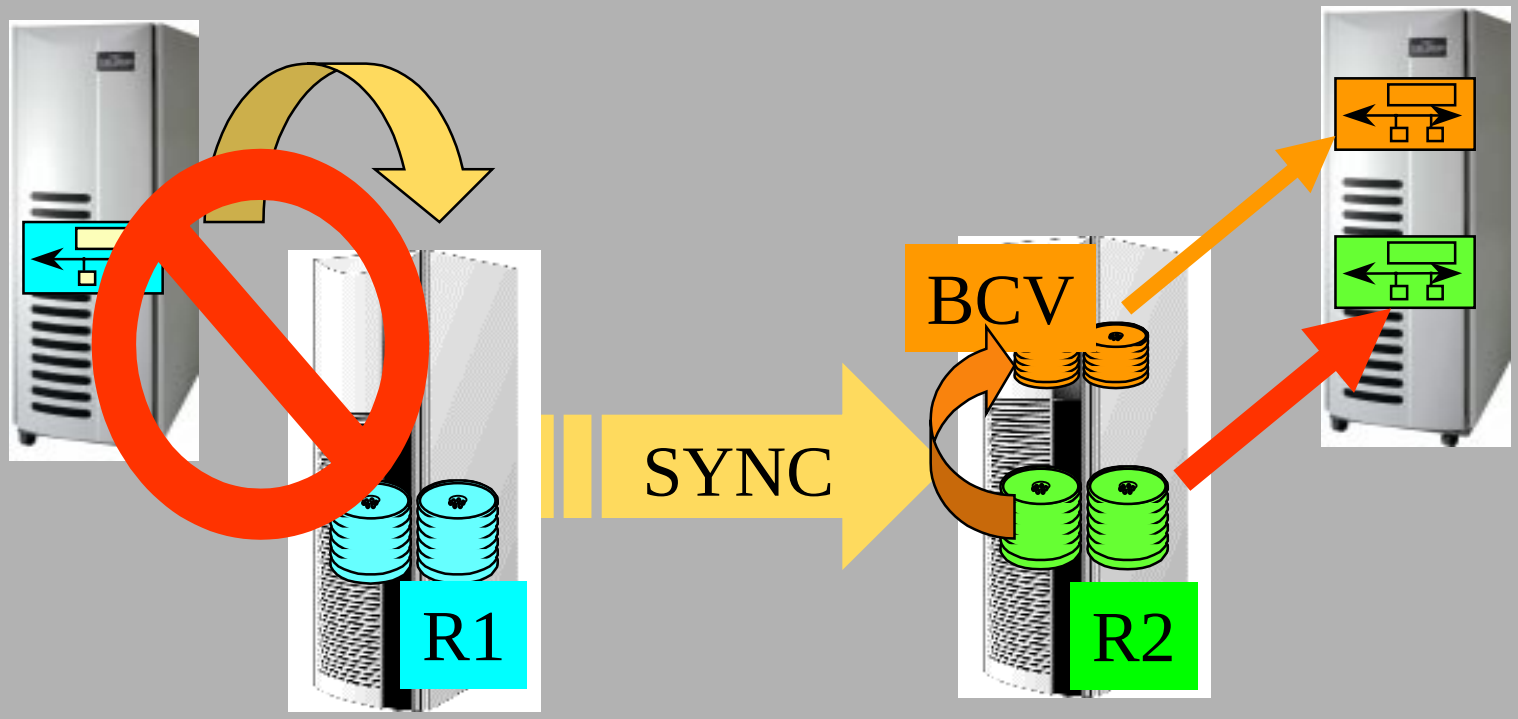
- TimeFinder/FS
- SnapSure
- Disaster Recovery

# Remote TimeFinder/FS at Recovery Site

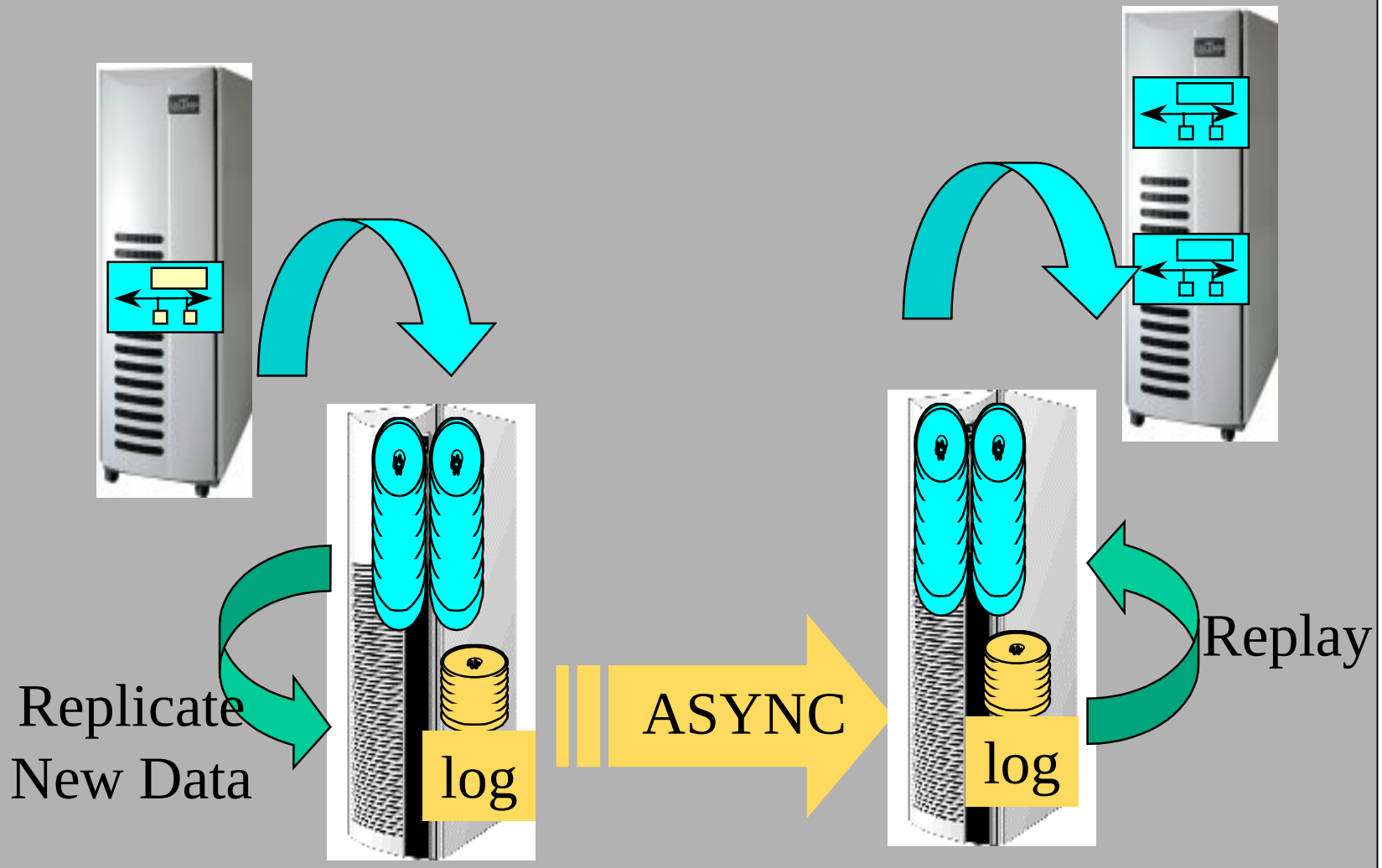


# Remote NearCopy

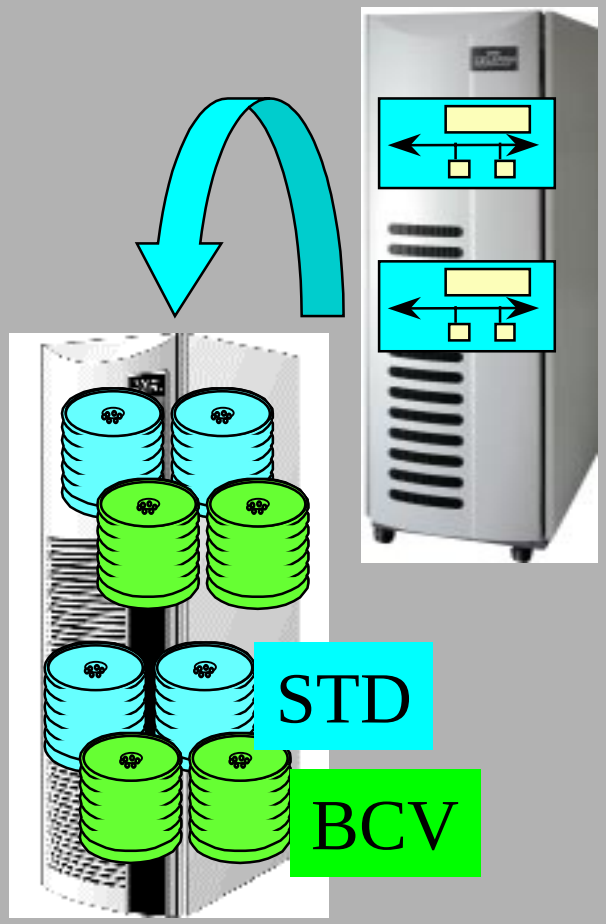
- TimeFinder/FS copy at Remote Site
  - Remote Site is for Disaster Recovery



# File System Replication

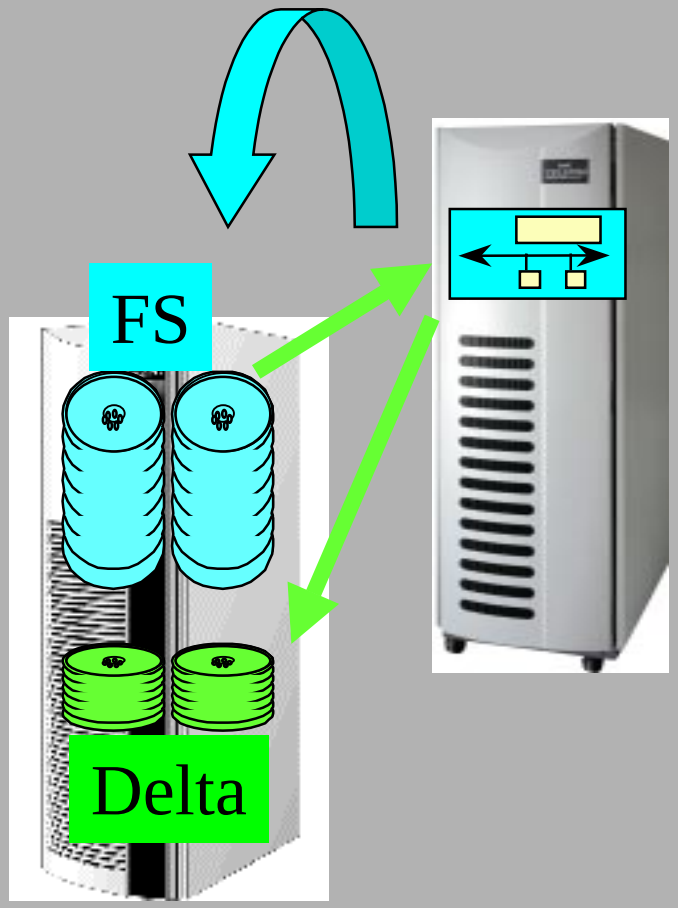


# TimeFinder/FS




- Complete detachable mirror of file system
- Can be made read-write
- Can be refreshed from original
- No server CPU overhead

# SnapSure

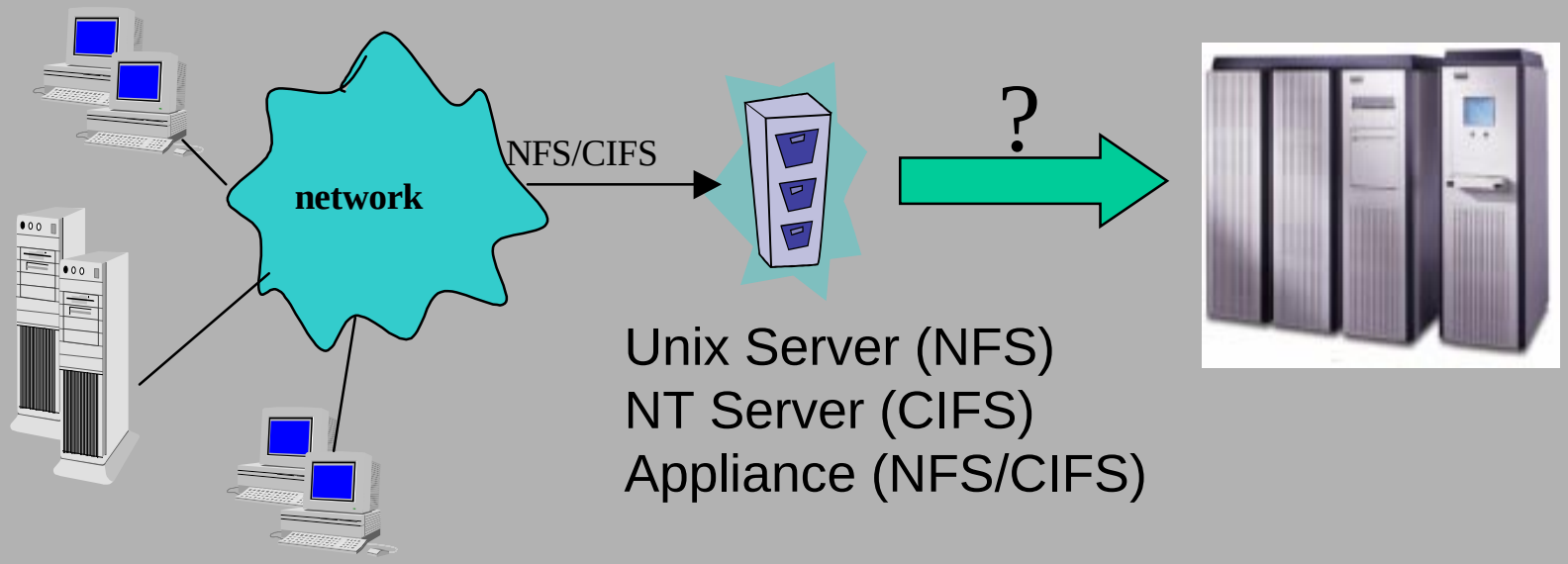



- Logical point-in-time copy of file system
- Uses much less space
- Read only
- Poor man's TimeFinder/FS

# Data Mobility

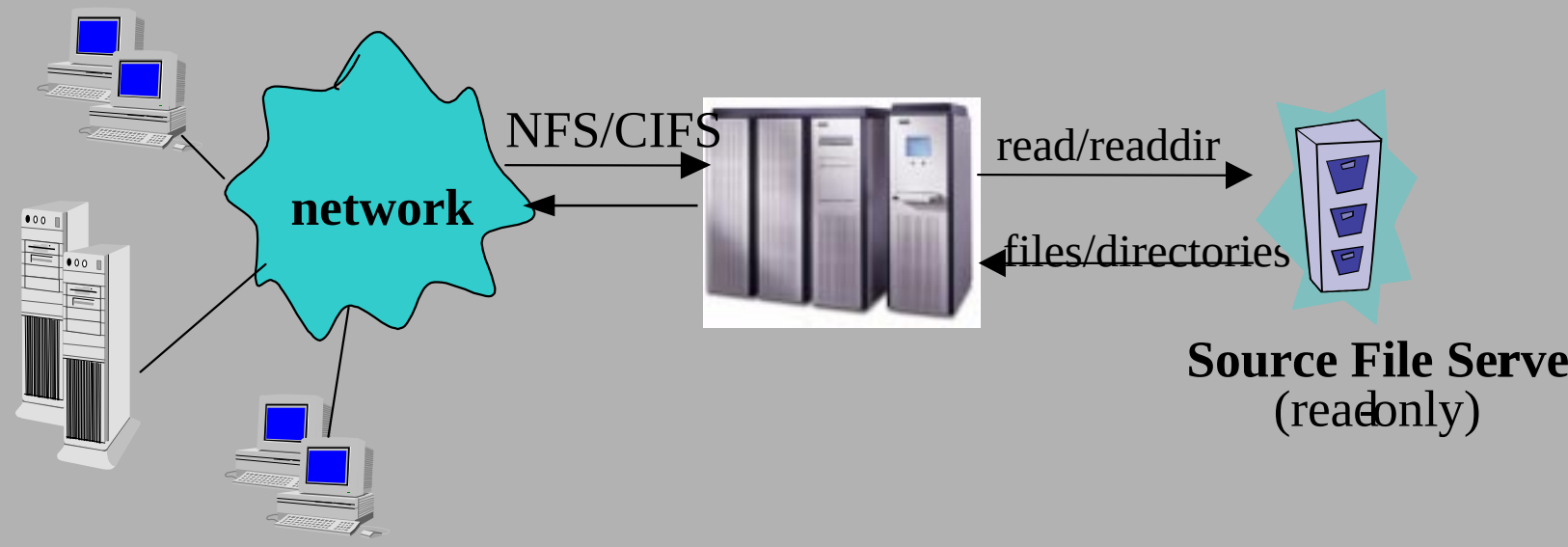
- Move file systems from one node to another
- Migrate data from other servers
- Remote replication

# The Migration Problem

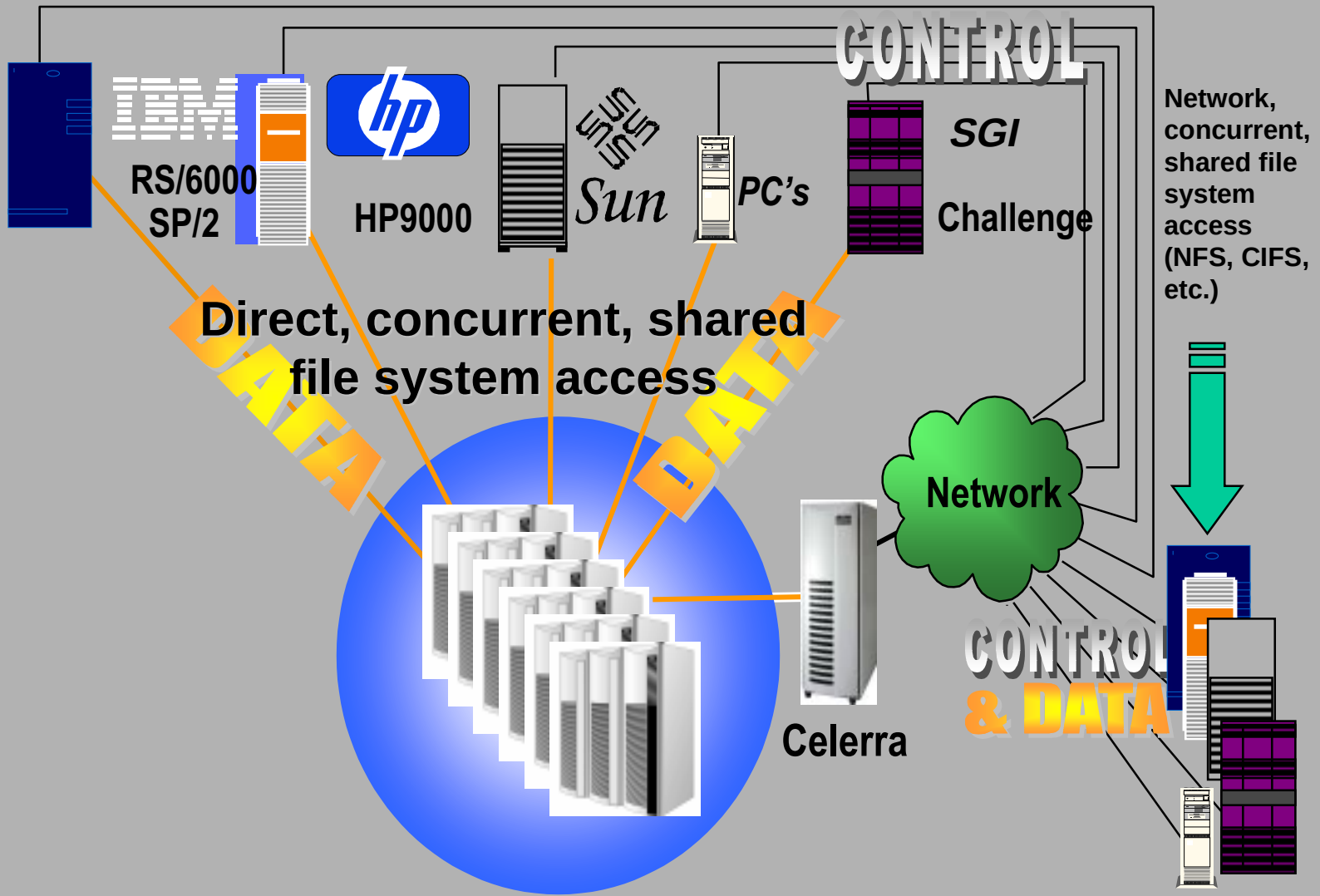



Unix Server (NFS)
NT Server (CIFS)
Appliance (NFS/CIFS)

# Celerra Data Migration Services (CDMS)



# EMC Celerra HighRoad



# HighRoad Bridges SAN and NAS

## Advantages versus NAS

- Higher Throughput over Ethernet LAN
  - Lower latency data delivery
  - Better bandwidth utilization for large files

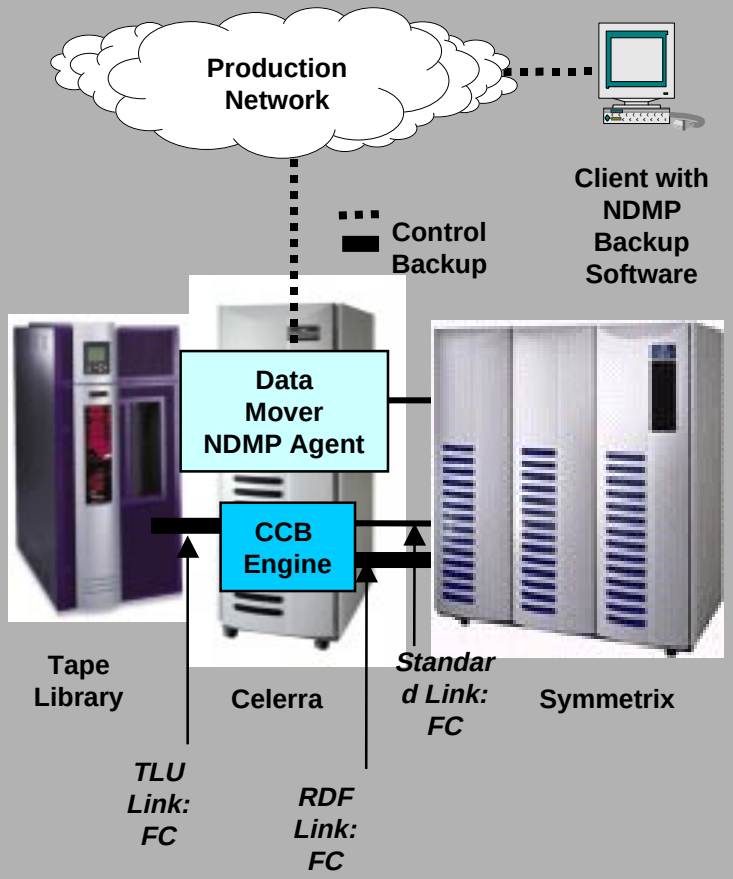
## Advantages versus SAN

- Adds file sharing to SANs
- Simpler storage resource management
  - Easier to scale/allocate/re-allocate space

# Enterprise Backup

- Eliminate backup windows
- No load on production file servers
- No load on network
- Back up multiple servers from one point

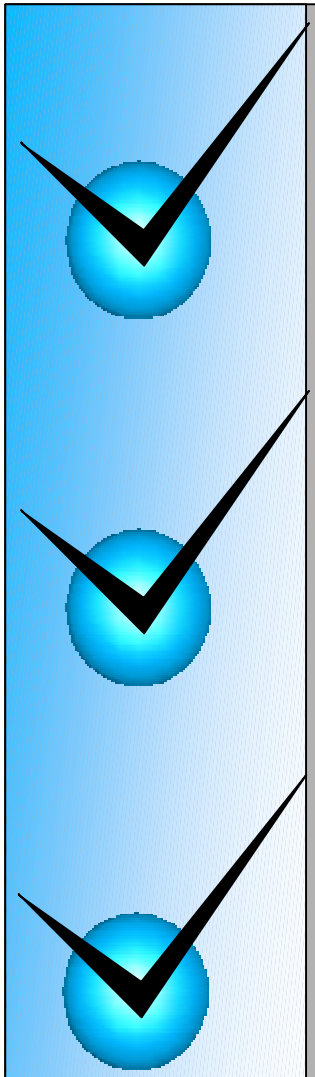
# High Performance Backup




- High Performance Backup/Restore
- Online backup.
- Industry Standard NDMP
- Supports both NFS and CIFS
- File Level Restore online
- Backs up multiple servers

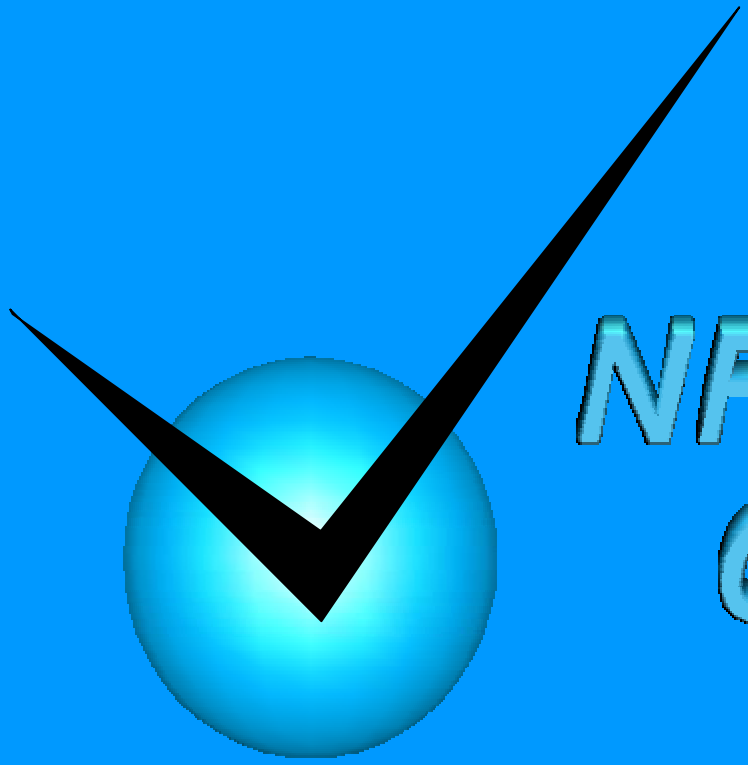
# NAS Service Provisioning Today's problem

- Provide disk quotations and size memory cache
- Exchange information with leasing company
- Order drives
- Follow up delivery chain
- Get a receiving paper from leasing company to start payment
- Installation and configuration of disk drives / memory cache
- Negotiate for each upgrade $/Mbyte cost
- Make an operational lease request every quarter
- Negotiate lease terms
- Be present during installation
- Paperwork follow-up
- Plan end of lease and move of data
- Follow up disk technology



# NAS Service Provisioning

- Make storage (NAS/DAS/SAN) and backup a commodity/service charged based on service level agreement (SLA) and a fixed $/Mbyte
- Let NAS vendor – or third party – manage the storage / backup / performance / accounting for a fixed $/Mbyte
- Customers get out of data path management and focus on the data path management
  - Optimize data flow: network design, NFS/CIFS path
  - Organize data: Clearcase / design file systems
  - Manage growth
  - Archiving



# NFS Vendors Conference