

CRAY



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Cray X1 Storage Management and SAN Directions

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Overview

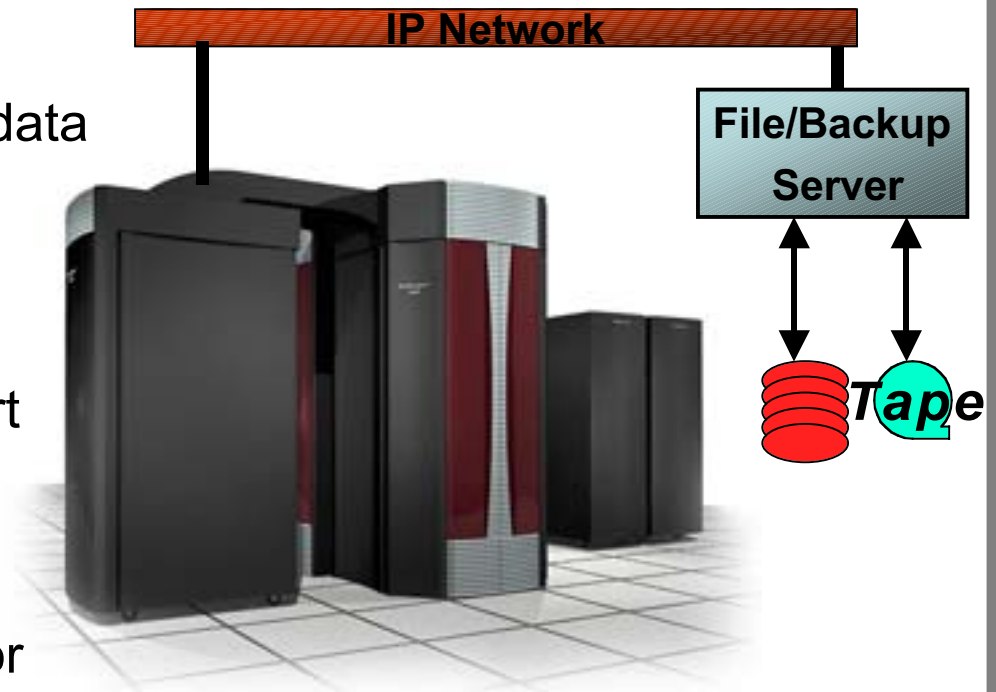


- Previous CUG Feedback
- Industry Trends
- Cray Strategy
- Cray/ADIC Relationship
- Cray Status
- Cray Professional Services
- ADIC Overview
- StorNext Management Suite
- DMF Migration



Previous CUG

- Cray X1 Data Management Strategy
 - Utilize IP network to export data to a File Server
 - NFS, FTP, UDP
 - No DMF support
 - No direct attach tape support
- Customer Concerns
 - Performance
 - Desire richer environment for backup and archival capability
 - DMF migration





Industry Trends

- Increasing amounts of storage
 - Need to manage 100's of Tbytes and 10's of millions of files in a file system
- Increase in size of heterogeneous datacenters
- Desire to consolidate and centralize storage and storage management functions
- Standards
- Share access to data between systems
- Increased sophistication in storage management software

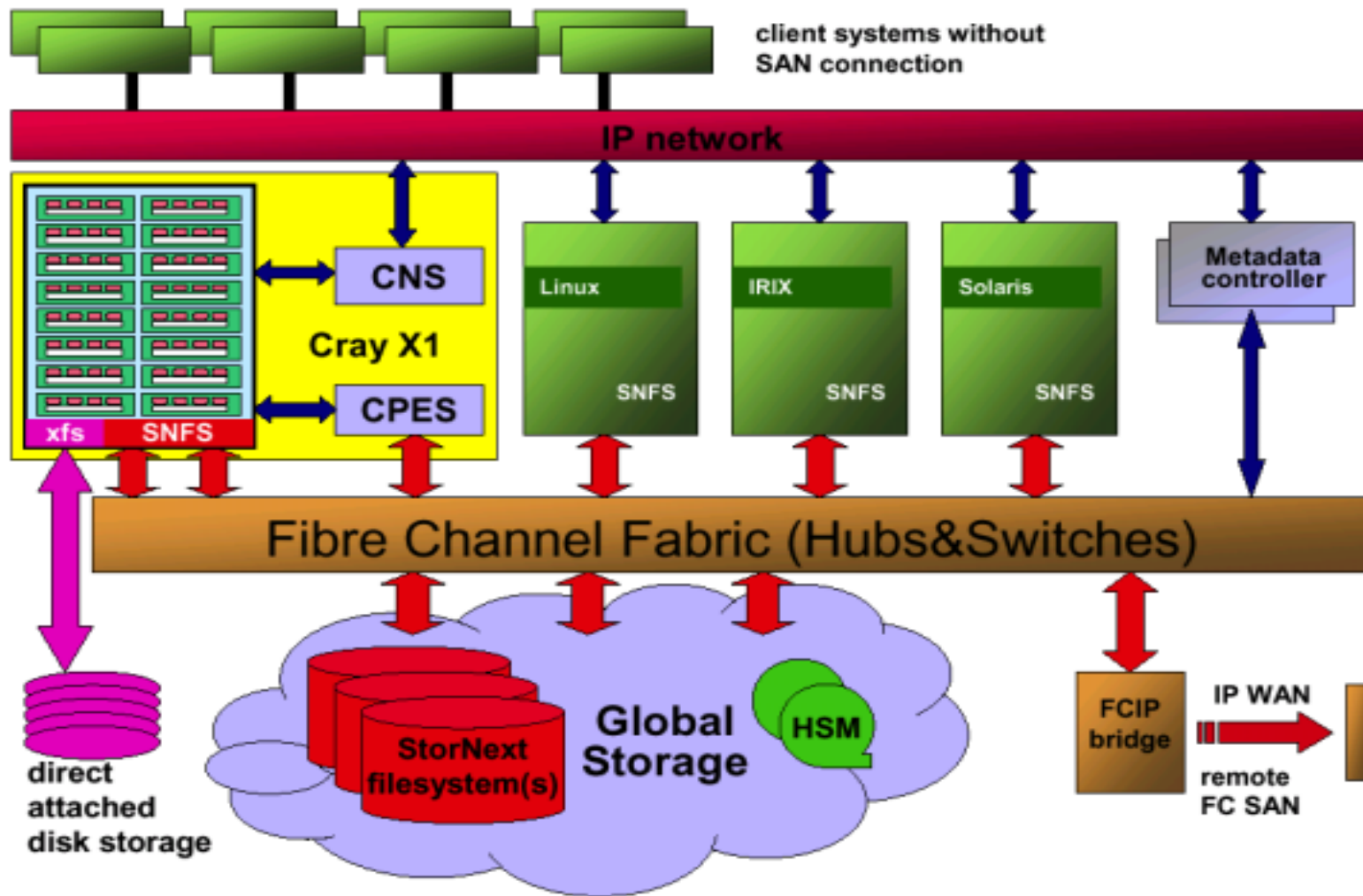


Cray Storage Management Strategy

- Pursue acquisition of technology and partnering to allow sharing of files and data with network access to data
- Establish the infrastructure to support the Strategy
- Requirements
 - Minimize performance impact to X1 I/O
 - Support heterogeneous solutions
 - Flexibility in types of solutions
 - Proven technology and partner
 - Partner with compatible business interests and vision

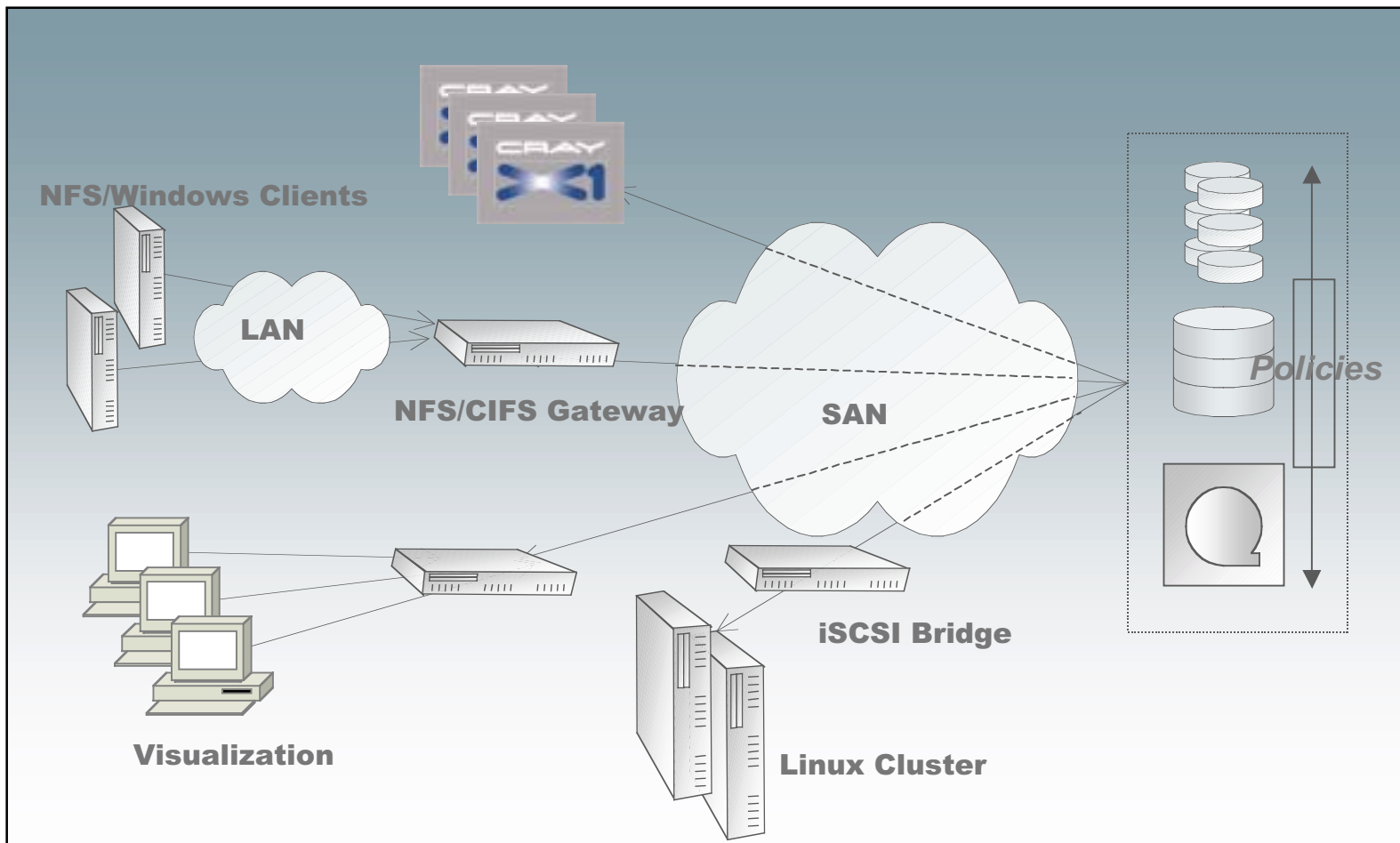


Cray Storage Management Direction





Cray Storage Management Direction





Cray X1 Data Management Strategy

- Cray Inc has entered into an agreement with ADIC (Advanced Digital Information Corp)
 - Source license agreement to port ADIC's StorNext File System to the Cray X1
 - Reseller and support agreement regarding ADIC's StorNext Management Suite and tape library products.
 - Cray Service and Professional Services support
- Create a shared storage environment leveraging 3rd party data management technology
 - Allows advanced data management capability for purposes of backup, data migration, archival in a heterogeneous environment.
- Expect to begin to deploy SAN solutions in the second half of 2003
 - All equipment in current Cray X1 configurations are SAN compatible



The Cray X1 StorNext Solution

- With StorNext the X1 Gets
 - Ability to Create High Performance X1 data management environments
 - Closest Possible Integration with Other Systems
 - Simplified Data Movement Architecture
 - Integrated Data Management
 - Data Protection - Disaster Recovery
 - Integration of High Performance and Low Cost Disk
 - HSM
 - Data Life Cycle Management
 - A Competitive Edge



Storage for Supercomputing

Cray's Mission Statement:

To deliver products and services that enable customers to solve their most challenging technical problems

- Overall approach is the same...
 - High-performance storage for supercomputing
 - High Bandwidth
 - High Capacity
 - High Reliability
 - Responsive service and support
- Only the details have changed
 - Storage is now SAN-capable
 - Supercomputing plus resource sharing, file sharing
 - More storage-related services

Solid Value



Cray X1 Data Management Status

- Initial StorNext File System port to Cray X1 is complete
 - Targeting UNICOS/mp release 2.3
- Fibre Channel Switch driver development underway
- Test bed established in Chippewa Falls
 - Multiple Cray X1 nodes
 - RS200 and RS100 storage
 - Linux, Solaris, IRIX servers and MDC
 - Qlogic switch
 - Tape systems to be added
- Test bed functions
 - Functionality testing
 - Interop testing
 - Performance optimization
 - Support Professional Services efforts
- Plan full SAN deployment in 4Q03



Migration from DMF Legacy Systems

- Defined Storage Service
- ADIC StorNext File System 2.2
 - Conversion utility for Unicos or IRIX
 - Scans DMF to build SNFS metadata
 - Copies Name Space to StorNext
 - All file access moves to SNFS overnight
 - Files appear in SNFS as migrated
 - File access through SNFS client (X1, Irix, Solaris, Linux)
 - Read triggers ftp from DMF system to client
 - Relay to target Cray system (X1, Strider etc.)
 - Background Processes copy all data
 - Related utilities for broadside one-time migration



Cray Professional Services

Flexible and customized solutions that:

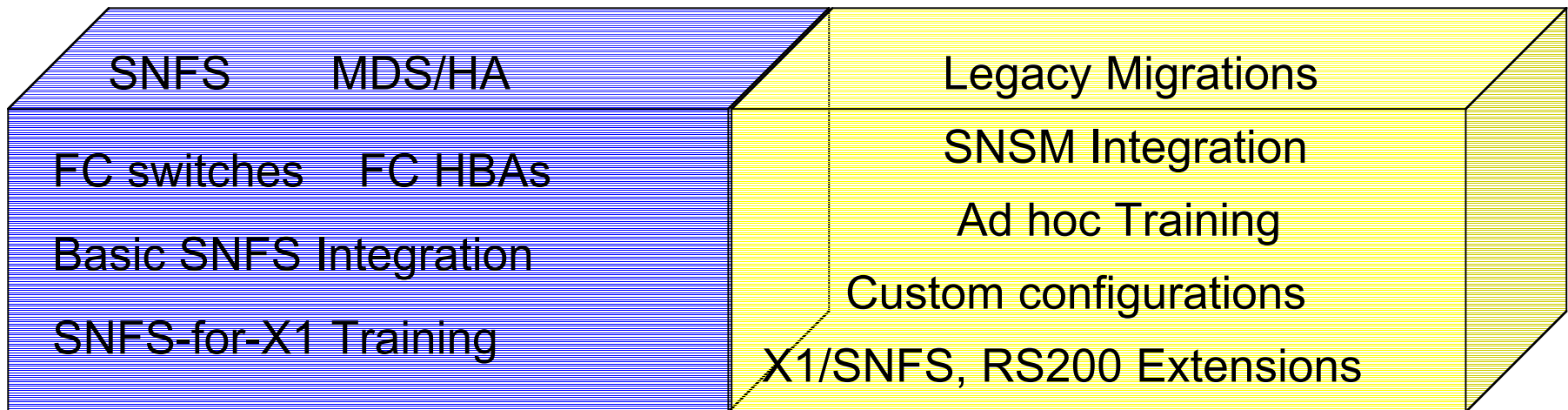
- **Storage**
 - Complement Cray standard *storage* product offerings
 - Leverage Cray intellectual property (IP) and HPC *storage* experience to provide new services
 - Creatively solve a wide range of customer HPC *storage* problems

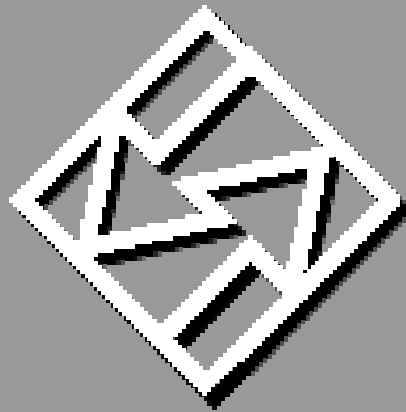


X1 Professional Services

Standard Product Suite

Professional Services





StorNext Management Suite



ADIC Capacity Products

Automated Tape Libraries





ADIC Product Line

Storage Management Software

***StorNext Management Suite
AMASS
FileServ***



Storage Networking Appliances

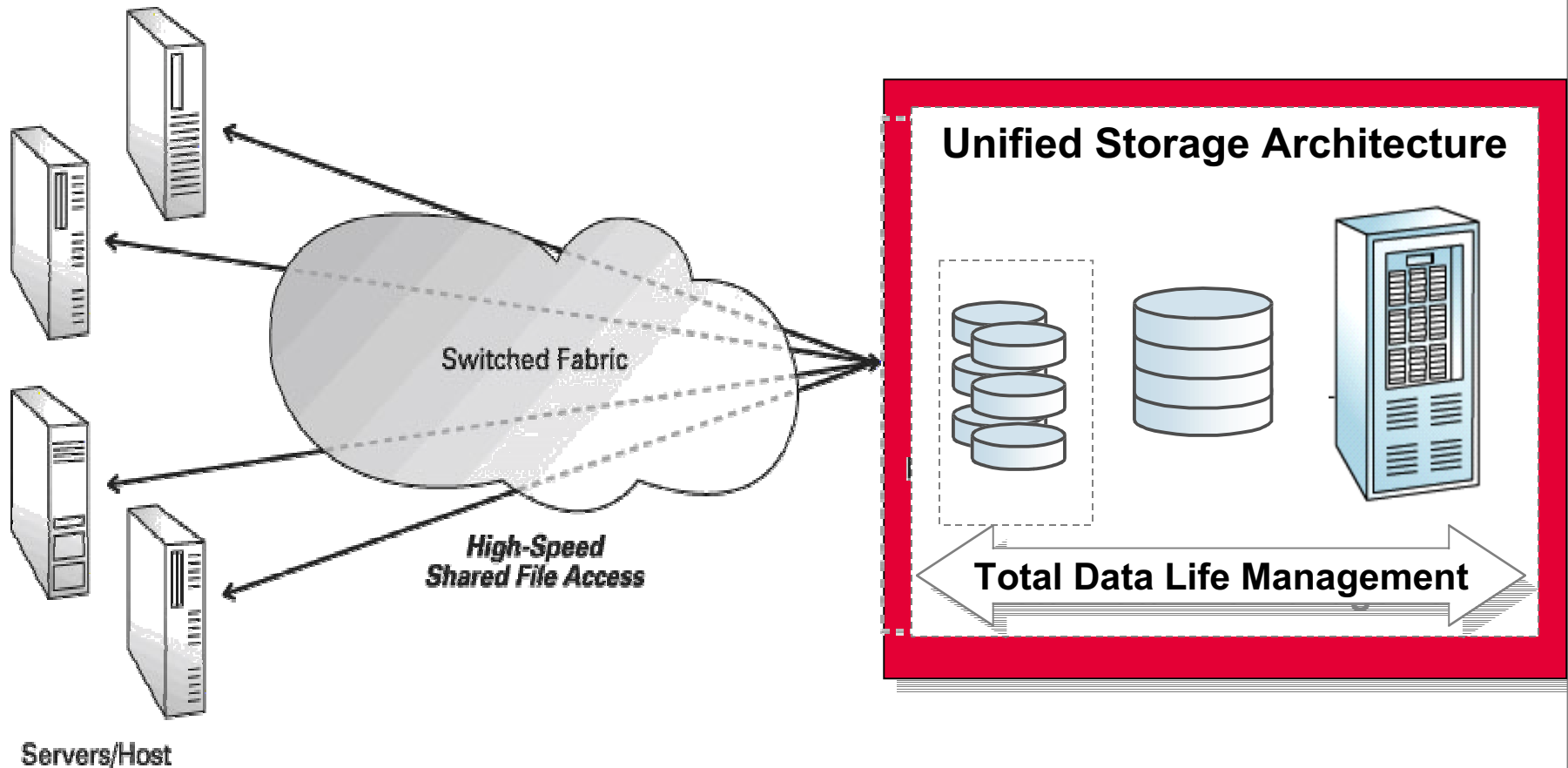
***Pathlight 5000
Gateway 3000***





StorNext Management Suite

Automated Placement and Protection of Data





Entertainment/Broadcast/VOD

- Internet/Intranet video streaming servers
- Broadcast editing and processing
- Film and video creation, editing, special effects
- Analog to digital conversion of film and video
- Archiving of image or video sets



Recent Wins:

Henson, Warner Bros.

Yahoo Japan, Cable & Wireless

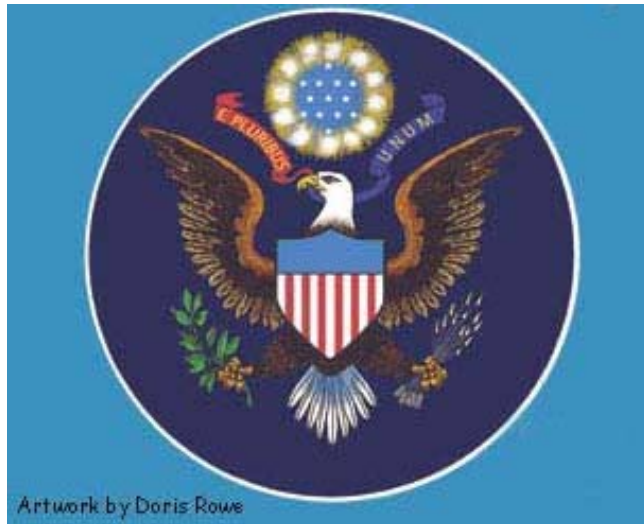


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Federal

- Imaging/surveillance – archive and processing
- Visualization
- High Performance Computing
- Weather forecasting

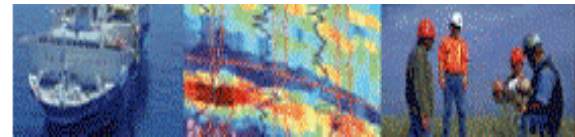


*Air Force Research Lab,
Raytheon, Air Force,
FBI, BAE, DOD, DOE, JWAC
NOAA, NASA,
Lockheed Martin*



Science & Engineering

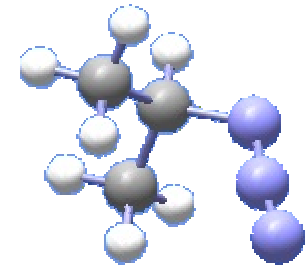
- High Performance Computing Clusters
- Very High Capacity File Servers
- Ground Station Processing
- Compute Farms
- High Performance Workflow Systems



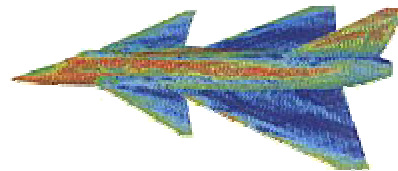
Los Alamos Labs



Northrop Grumman



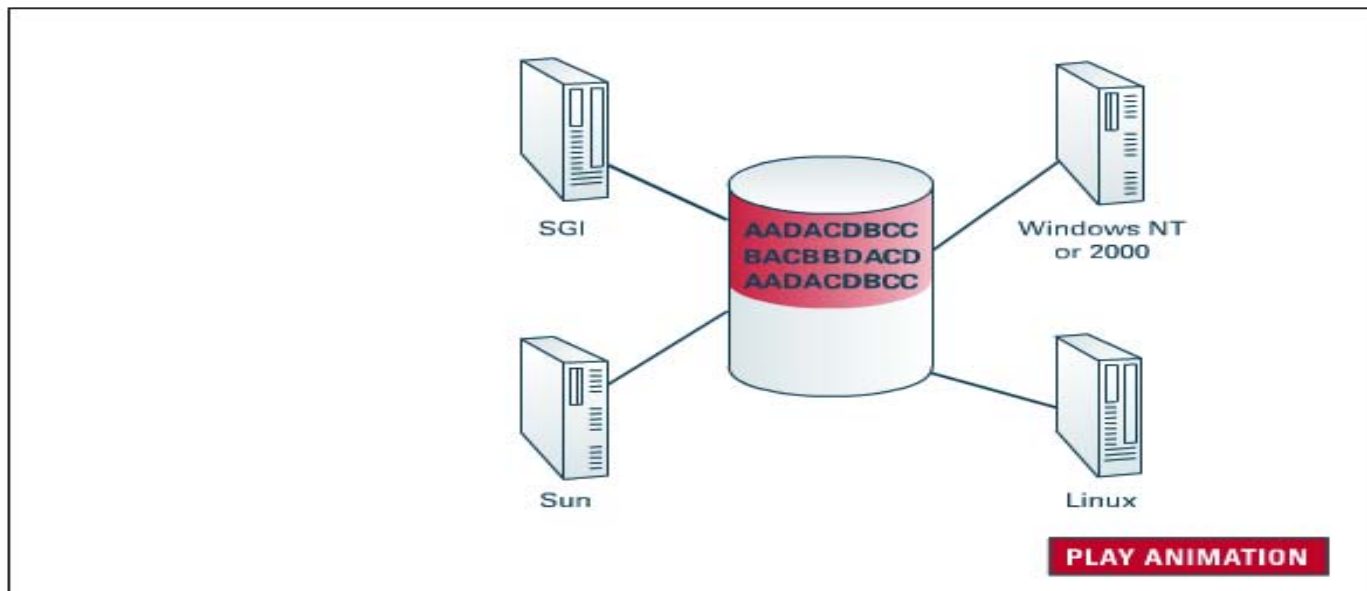
Vehma International





Data vs Storage Consolidation

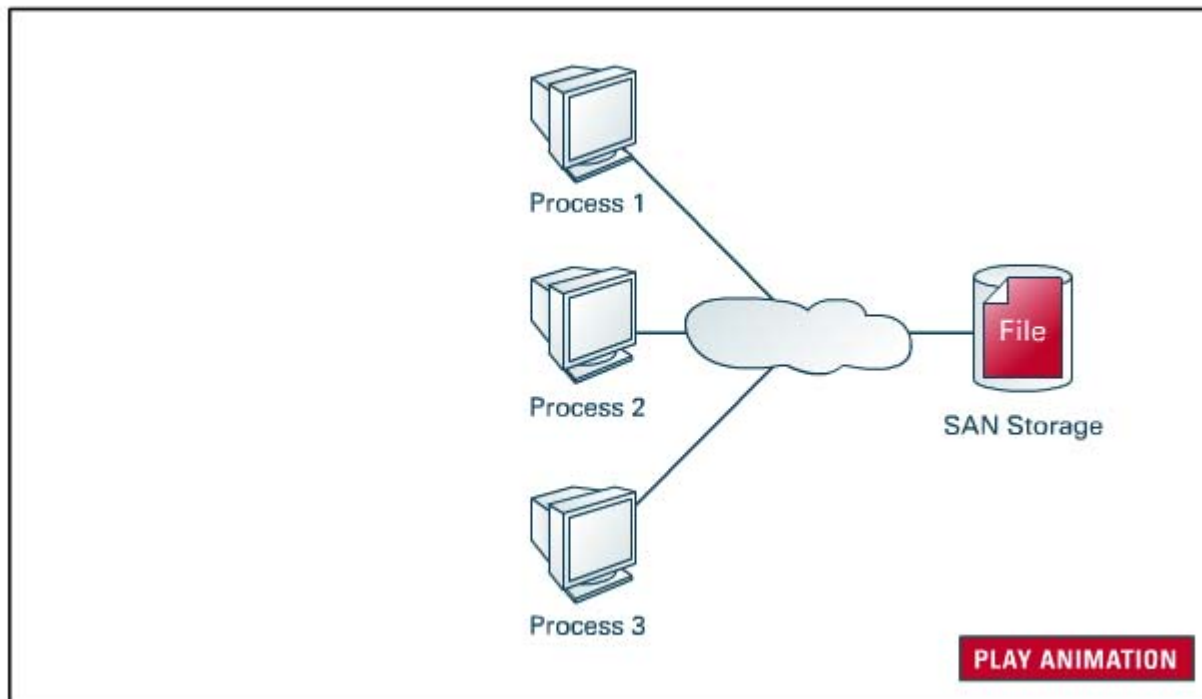
- SNMS benefits
 - Only one copy of the data is needed -- Windows, Linux and UNIX users share access





Synchronous vs Serial Access

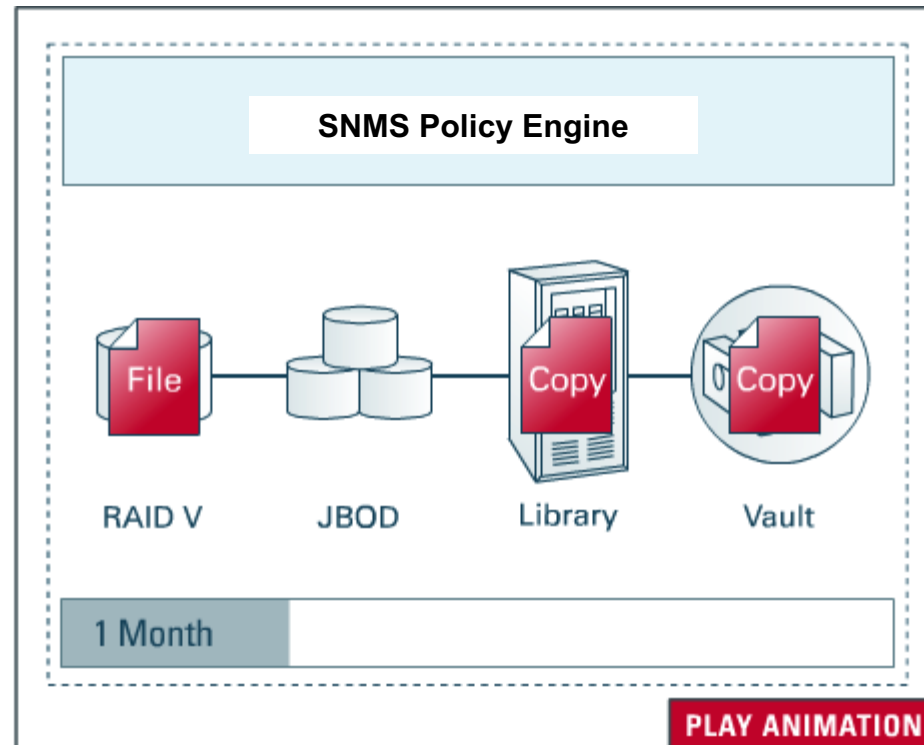
- SNMS benefits
 - Concurrent SAN file sharing improves productivity by reducing file movement over the LAN





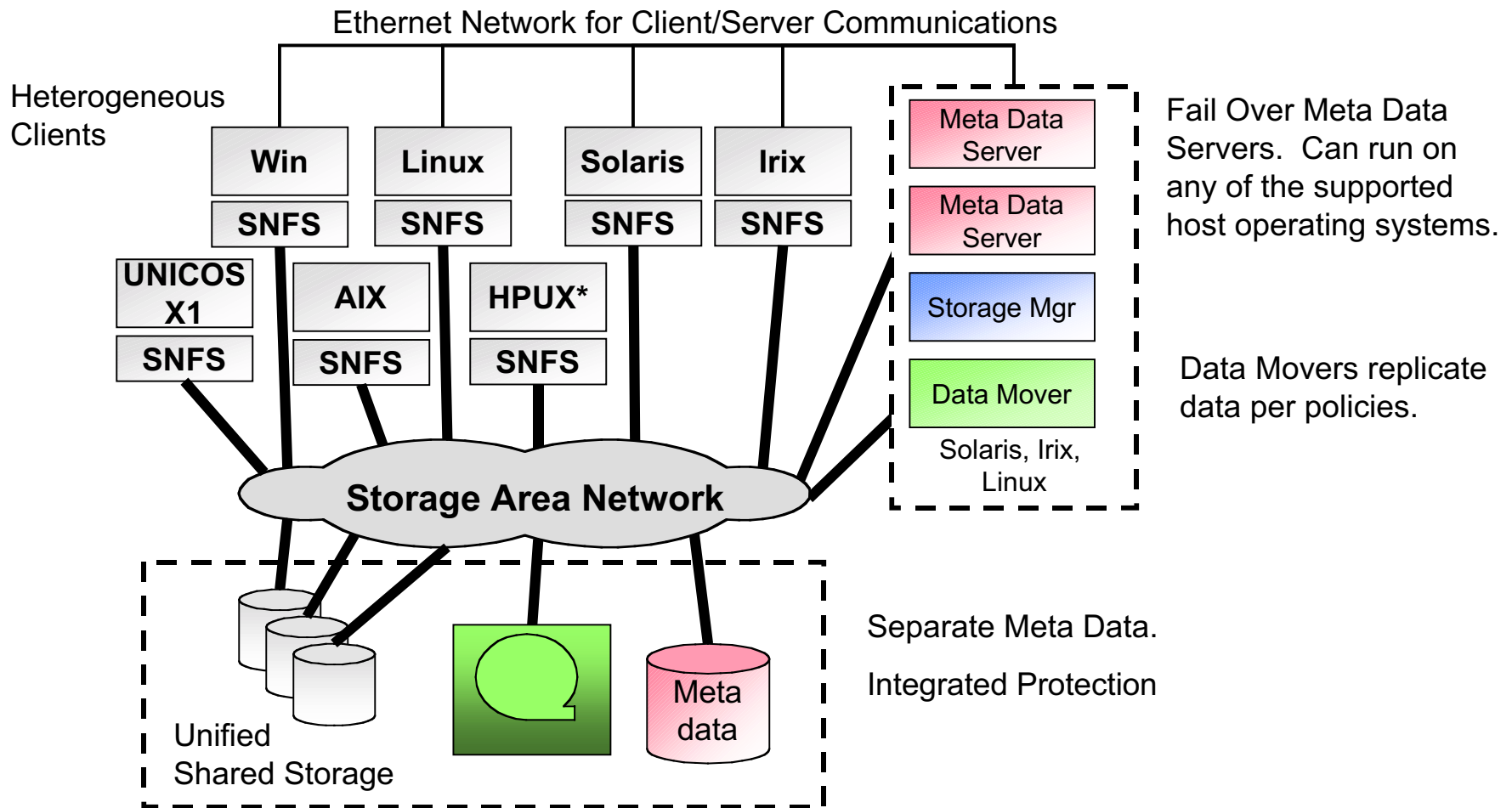
Space vs Data Management

- SNMS benefits
 - Policies leverage tape and disk storage to cost-effectively meet access & retention requirements





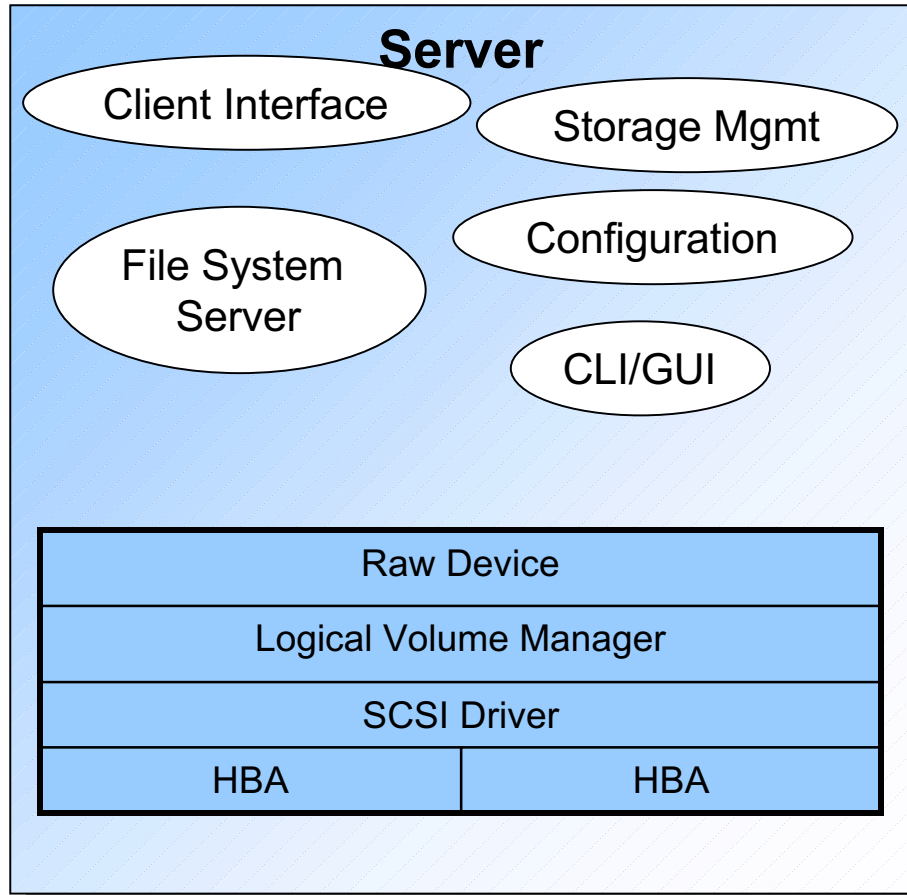
File System Architecture



* HPUX will be available in future releases



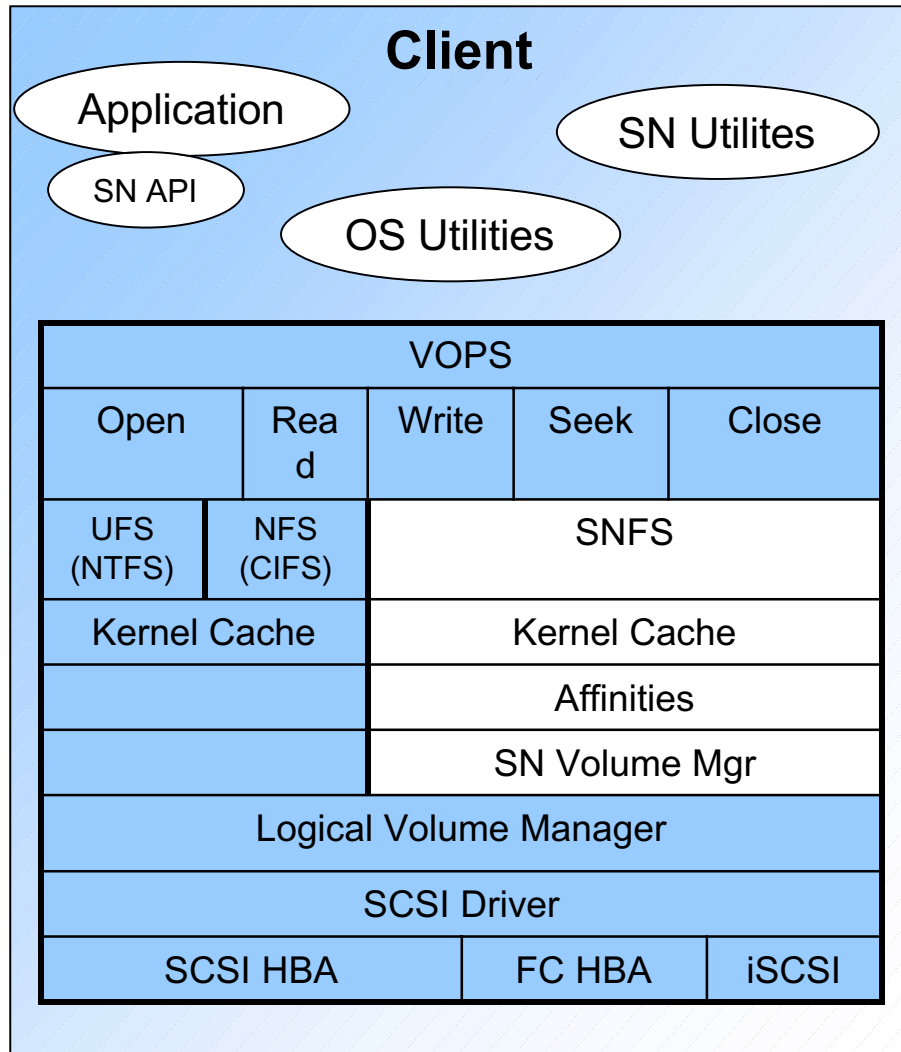
Server Features



Features		
B-Tree		
Multiple File Systems		
Synchronization		
Tickets	Call Backs	
Allocation		
Allocation Schemes	Online Expansion	Pre-Allocate
Space	Bandwidth	
Configuration		
Server Fail Over		
Concurrent Maintenance		
Integrated Storage Mgmt		



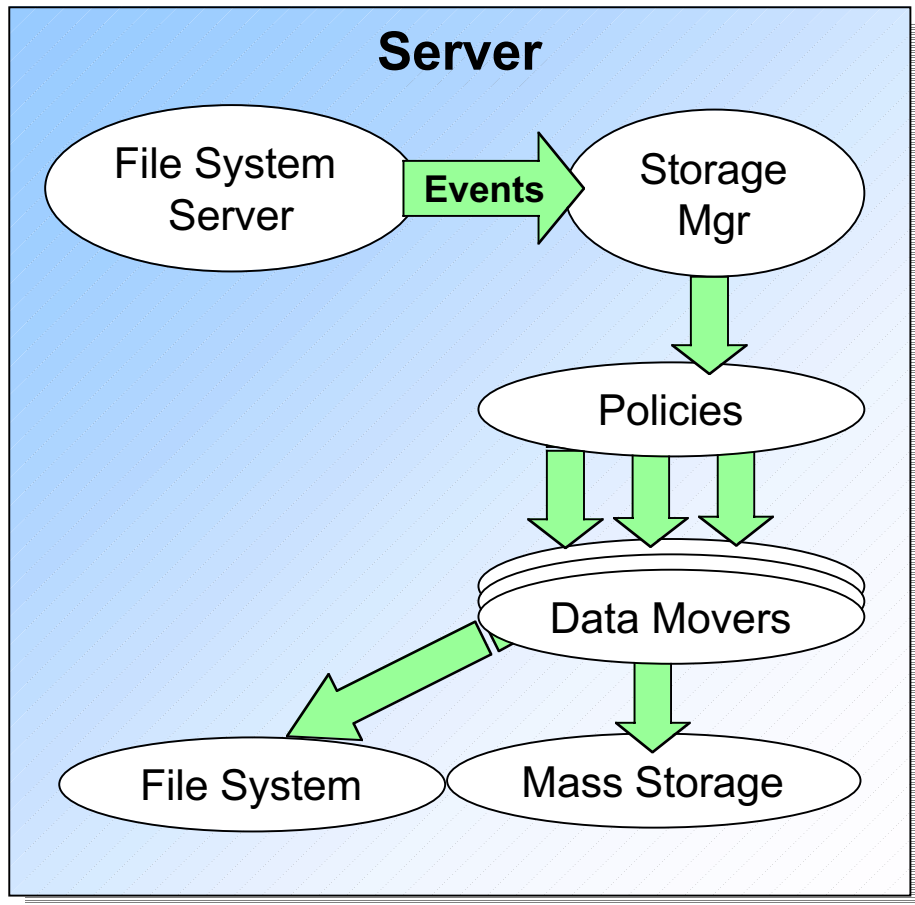
Client Features



Features
Multiple SNFS Mounts
Exportable
User Security (Domain/NIS)
Quotas
Tunable I/O
Quality of Service
RAID 0, Path Failover



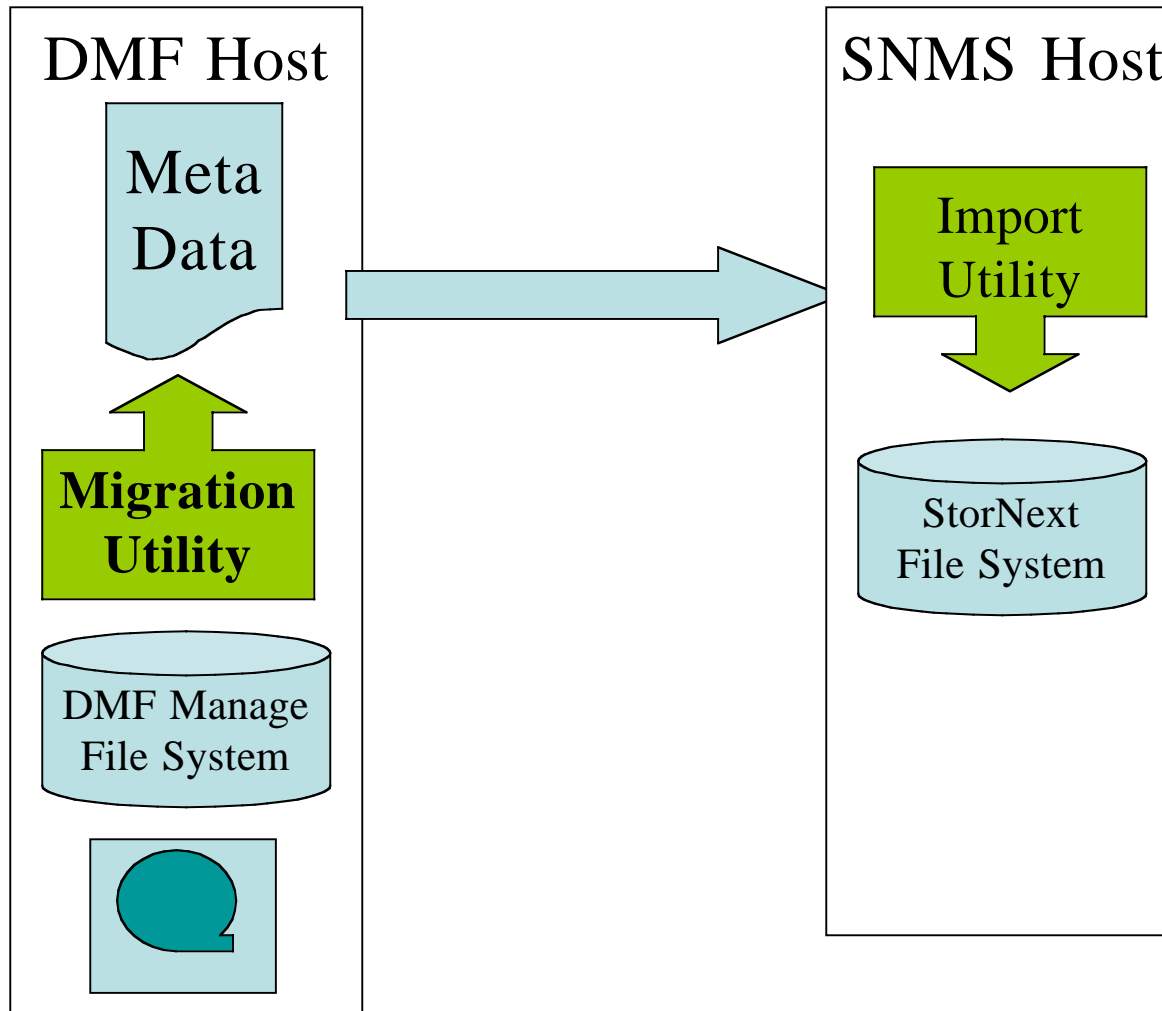
Storage Manager Architecture



Features			
Protection/Recovery			
File Replication	File Versioning	Meta Data Backup	
Trash Can			
Configuration			
Mass Storage Mgmt			
Libraries/Shelves		Tapes	

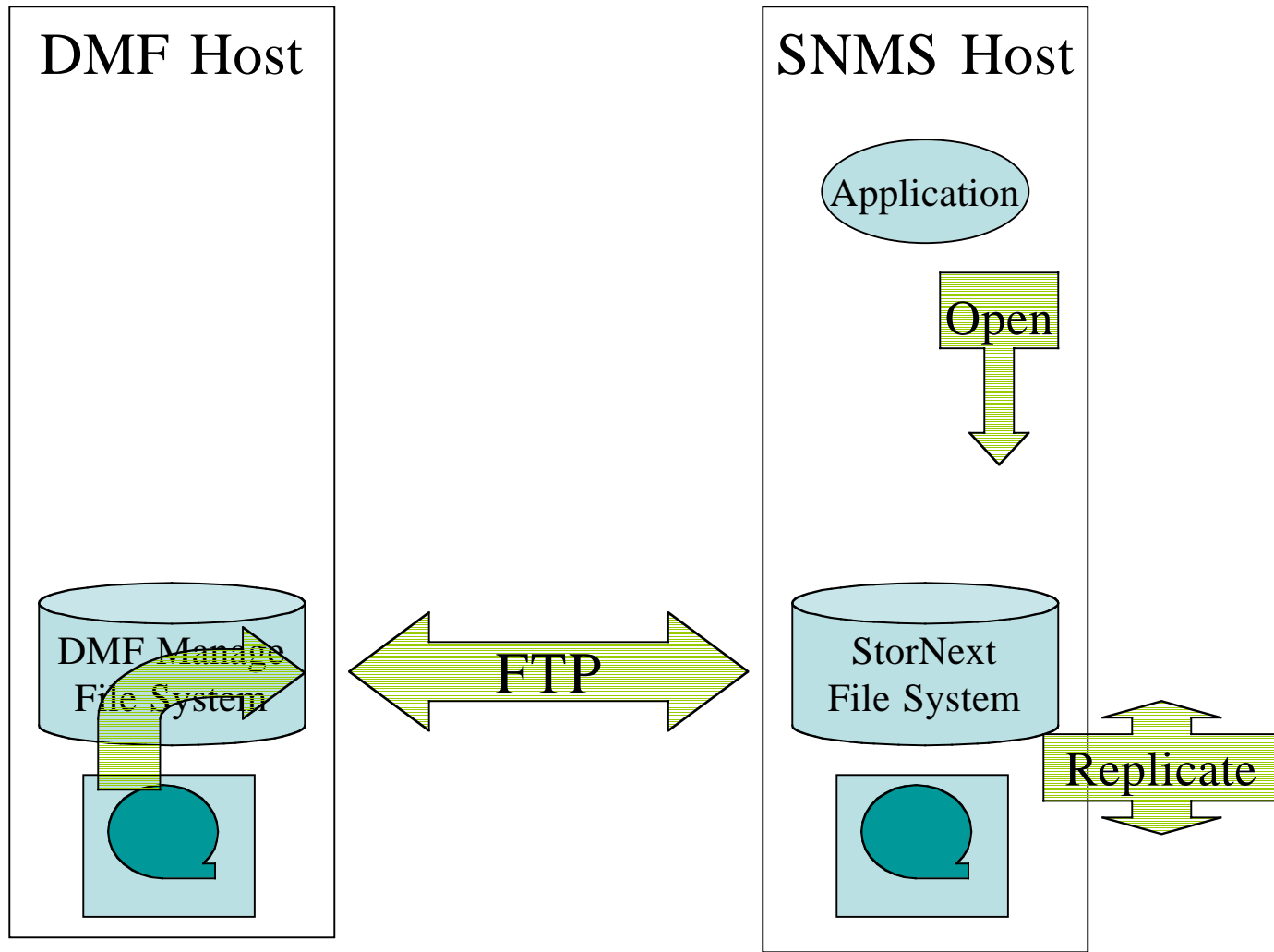


DMF Migration – Step 1



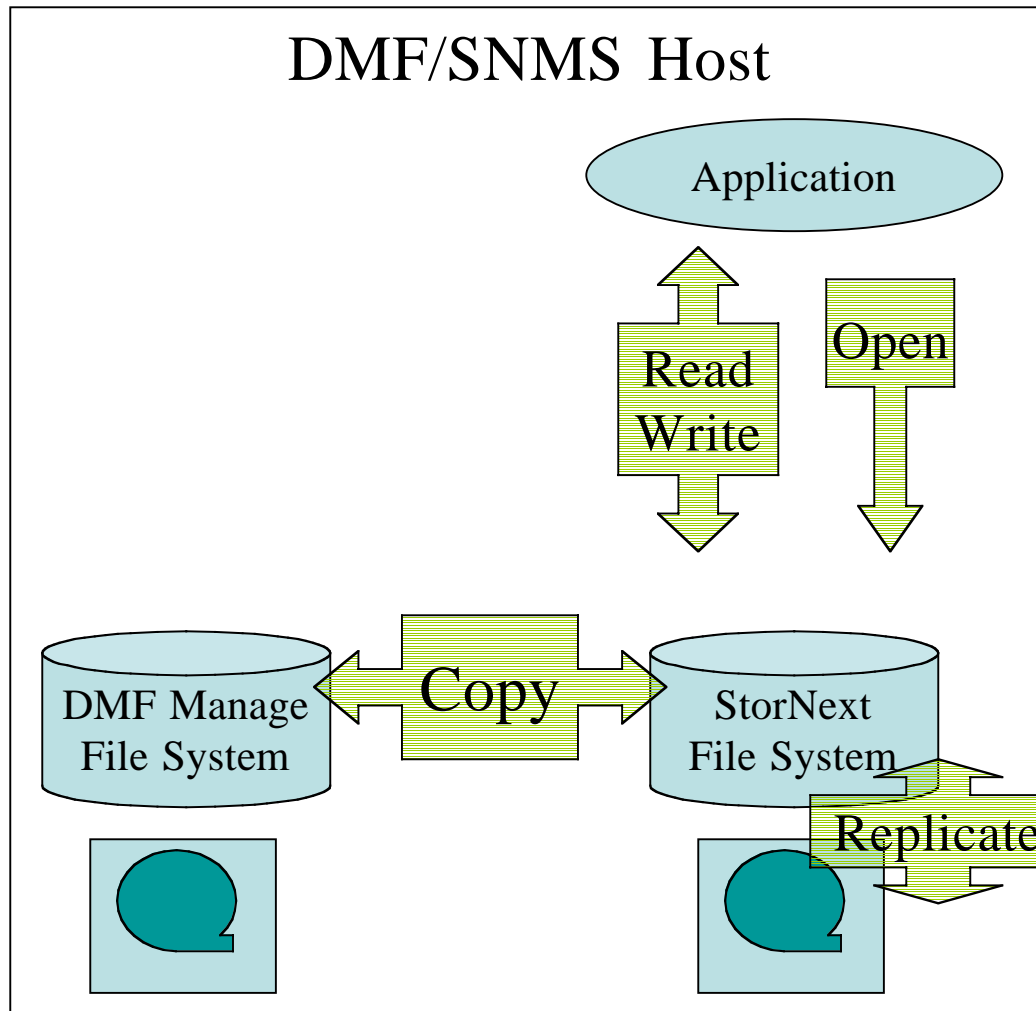


DMF Migration – Step 2





DMF Migration – Local



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EXTREME PERFORMANCE!
POWERED BY EXPERIENCE

6/2/03

CUG 2003 / Columbus, Ohio, USA