SAM-FS - Advanced Storage Management Solutions for High Performance Computing Environments

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Advanced Storage Management Solutions

from

LSC, Inc.

"Software should NOT be the Limiting Factor in Storage Management!"

SAM-FS - Advanced Storage Management Solutions for High Performance Computing Environments

LSC, Inc. - Our Mission:

To provide Enterprise-wide Storage Management Software Solutions with:

- Highest Performance
- Highest Capacity
- Most Data Security
- Virtually Unlimited Scalability

for Effective Management and Safeguarding of Data.

Data Storage in HPC Environments: Challenge or Opportunity?

- ✓ ~~Extremely High Data Bandwidth Requirements~~
- ✓ ~~Explosive Data Growth~~
  - PetaBytes of data will quickly approach ExaBytes
- ✓ HPC Users are Leading Edge Customers
  - Keep pushing the boundaries
  - Willing to work on application to get better performance
- ✓ Data Servers Must Have Low CPU Usage
  - To conserve CPU cycles for the HPC applications
- ✓ Prefer a Commercial “Off the Shelf” Product

The File System:
Critical, Central Component for Storage Management

- ✓ File System Features Desired by HPC Users:
  - Meta-data and File-data can Reside on Separate Devices
    - No head seek conflict on reads and writes of short and long data
  - Support for Disk Striping AND Round-Robin Configurations
    - Additional Support for “Striped Groups”
    - Do not want to use a separate Volume Manager
  - Excellent Scalability by Adding Devices or Logical Units (LUNs)
    - Greater then 99% scalability factor

The File System: Critical, Central Component for Storage Management

- ✓ File System Features Desired by HPC Users (cont.):
  - Capability of using "direct I/O" and "no write lock" feature
  - Disk Allocation Unit (DAU) Size Must be Freely Settable
    - Adjustment of DAUs must be settable and can be based on disk data alignment
  - Pre-allocation of Disk Blocks to Assure Sequential Writes and Reads
  - Option to Lock I/O Buffers (mlock)

The File System:
Critical, Central Component for Storage Management

- ✓ File System Features Desired by HPC Users (cont.):
  - Write to Disks at Device Speeds Through the File System
  - Support single machine write, multiple machine read
    - Access to the same file system on multi-ported RAID subsystems
  - Provide Fastest Performance on Open Systems
    - "Off the Shelf" systems like SUN Ultra to E10000
    - Hardware configuration is the only limiting factor

Scalability and Performance: The Limit Should Always be The Hardware!

- Threaded, Parallel Functionality for all Data Access and Features
  - Migrating, Retrieving, Releasing, Recycling, etc.
- Sustain Data Transfer to Tape Drives at Physical Device Speeds
  - To multiple devices at the same time
- Support for Full 64bit (18.4EB) Addressing
- Performance Must Scale with Hardware
- Support Virtually Unlimited Capacities
  - On Media
  - Number of File Systems
  - Number of Files
- Equal Data Access Rates for Small and Large Files

Flexible Migration and Archive Policies: "Must Have" Features for Advanced Data Management

- ✓ Migration Must be Based on Flexible Policies and Options
  - Instantly make multiple copies
    - Time-based archiving to best protect your data
    - Make copies at any time to any media
  - Archive by group, user, directory, file, minsize, maxsize, wildcard, etc.
  - Optionally or Automatically Specify Pools of Media for Archiving
  - Automatically Assign new Migration Rules During Operation

Flexible Migration and Archive Policies: "Must Have" Features for Advanced Data Management

- Associative Archiving and Staging
  - Automatically control where your data goes and how it comes back
- Directly Access Data from Media with Random Tape Access
  - Fast positioning without having to bring data back to the disk cache
- Partial Release Options to Leave File Stubs on the Disk
  - Optionally specify when the data should stage back automatically
- Directly write and read data in custom formats to media
  - At device speeds through the file system inode
- Automatically Control Disk Cache Usage

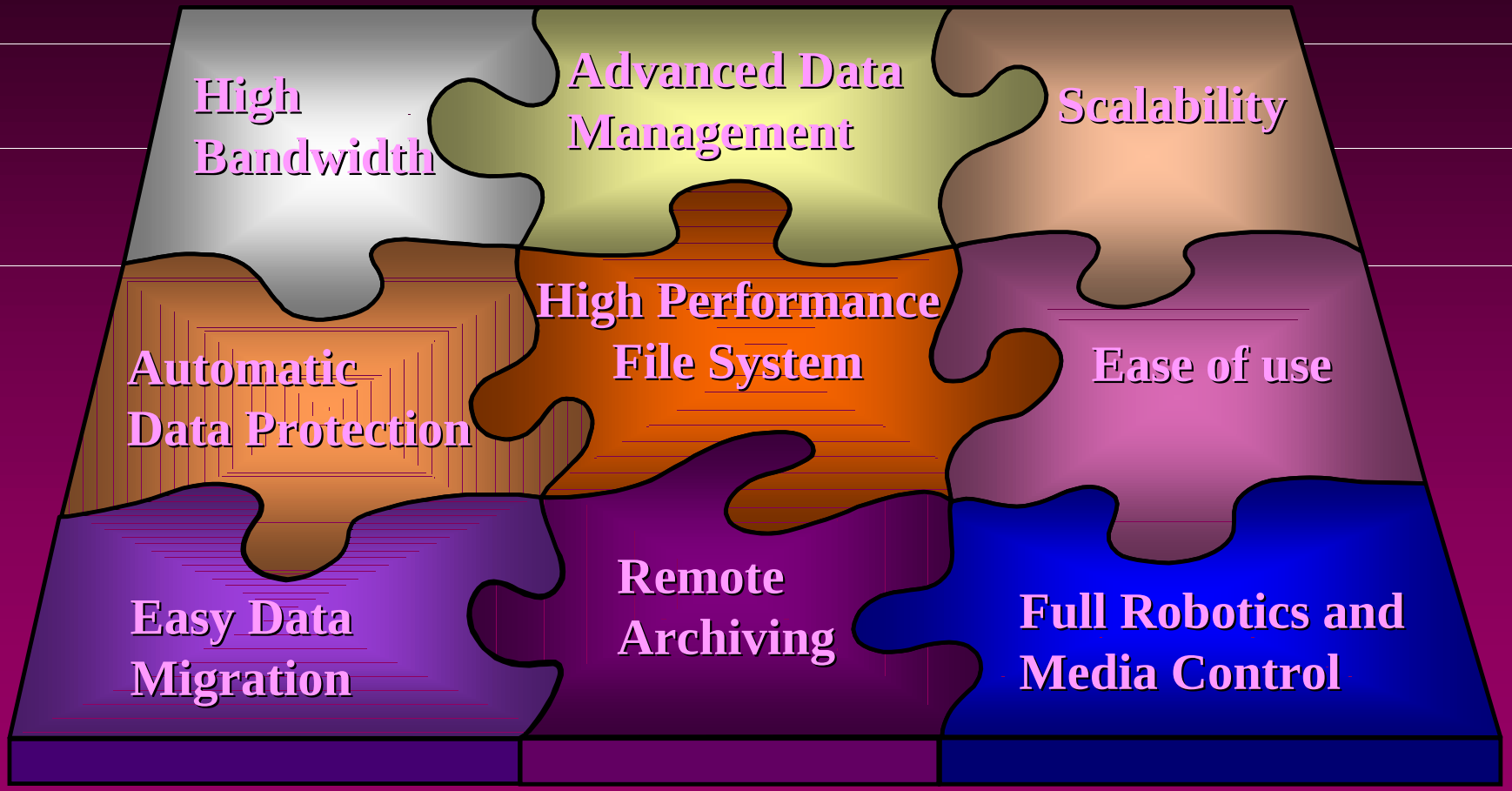
Data Protection and Disaster Recovery: Should be As Easy As Possible!

- ✓ Automatically Protect the Data
  - Instantly Make Multiple Copies
    - Time based archiving to best protect your data
  - Copies Must Live in Different Locations
  - Support for Remote Vaulting and Shelved Media
  - Fast Recovery after Disaster
  - Data on Media in “Industry Standard” Format
    - Capability of retrieving Data without application

Ease of use:
As Transparent As Possible!

- ✓ Transparent Interface to Users and Applications
  - Minimal user training
  - No application modification required
- ✓ Transparent to Storage Technology In Use
- ✓ No Downtime Required for Maintenance
- ✓ Availability of GUIs and Tools
  - for easy Administrator access and control

Advanced Storage Management Software from LSC, Inc. Provides the Pieces for your Total Storage Solution Needs!



Advanced Storage Management Solutions from LSC, Inc.

LSC's Products Are Available For You Today:

- SAM-FS - THE Standard in High Performance Data Management
  - Fully Developed
  - Feature Rich
  - Well Received by Our Customer Base
- SAM-HPFS - The NEW High Performance File System
  - Best Performance and Most Scalable File System in the Industry
- SAM-Remote - Remote Data and Robot Control
  - Control Distributed Data Throughout your Enterprise
- SAM-Migration Toolkit - Read "foreign" data
  - Access "Foreign" Data Directly Through the SAM-FS File System