Sun Storage Overview and Archive & Information Management Trends

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Why is Archive So Important?

... because The History of Data Growth is Exponential!

24 Words - Pythagorean Theorem
67 Words - Archimedes Principal
179 Words - 10 Commandments
286 Words - Lincoln's Gettysburg Address
1300 Words - US Declaration of independence
26911 Words .......... EU REGULATION ON THE SALE OF CABBAGES
Archive can be difficult to define

Archive means different things to different organizations

Broad range of reasons to archive

Many archive options for implementation
Archive: the report advocates that IT practices adopt a more consistent usage of the term ‘archive’ with other departments within the organization. To the archival, preservation, and records management communities, an “archive” is a specialized repository with preservation services and attributes.

Preservation: managing information in today’s datacenter with requirements to safeguard information assets for eDiscovery, litigation evidence, security, and regulatory compliance requires that many classes of information be preserved from time of creation. **Preservation is a set of services that protect, provide availability, integrity and authenticity controls, include security and confidentiality safeguards, and include an audit log, control of metadata, and other practices for each preservation object.** The old IT practice of placing information into an archive when it becomes inactive or expired no longer works for compliance or litigation support, and only adds cost.

Authenticity: is defined in a digital retention and preservation context as a practice of verifying a digital object has not changed. **Authenticity attempts to identify that an object is currently the same genuine object that it was “originally” and verify that it has not changed over time unless that change is known and authorized.** Authenticity verification requires the use of metadata. The critical change for IT practices is that metadata is now very important and must be safeguarded with the same priorities the data is. IT practices

Source: [SNIA](http://www.snia.org/forums/dmf/knowledge/term_bridge/)
Today’s Archive

Index
Manage all digital resources for longevity and integrity
Create flexible Metadata that inter-relates content from multiple sources

Store
Multi-tier, multi-generational storage medium management

Search
Central search of content from multiple disciplines

Retrieve
Secure and controlled access to inter-related content

Storing Information is ONE Thing.... Retrieving Information is EVERYTHING
- Fred Moore
Demands of a New Archive Reality

Is the ratio for archiving solutions changing?

10 / 90

versus

2 / 18 / 80

• Next Generation Archives need to address a new dimension of the massive resting data – How do you search Petabytes of data from the edge?

• The new ratio has evolved into a Write / Read / Search relationship (2 / 18 / 80) – different demands on the infrastructure

• Business semantics need to drive data management not systematic schemas

• Virtualization and Search become critical to the presentation of the data, something new is needed...

• Compute and Store need to Converge
How do you build a Cost Efficient Archive, Sensitive to Access and Presentation where any Asset can be Requested at Any Time?
There Are Four Layers to Active Archive Solutions

1. Create and Share Information

2. Manage Archival Applications

3. Preserve Storage Preservation

4. Store Storage Devices

Digital Assets

Index - Search - Share

Database Server

ZFS, Solaris, Integrity, Protect, Longevity

Flash, Disk, Cloud, Tape

Here's where IAS and SAM-based storage solutions can play a role

SAM = Sun Archive Manager  IAS= Sun Infinite Archive Solution (based on SAM)
## Why Tape Continues to Make Good Sense

<table>
<thead>
<tr>
<th>Function</th>
<th>Tape</th>
<th>Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long span of media</td>
<td>15~30 years on all new media.</td>
<td>3~5 years for most HDDs</td>
</tr>
<tr>
<td>Portability</td>
<td>Media is completely removable and easily transported.</td>
<td>Disks are difficult to remove and safely transport.</td>
</tr>
<tr>
<td>Move data to remote location for DR with or without electricity</td>
<td>Data/Media can be move remotely with or without electricity.</td>
<td>Difficult to move disk data to remote location for DR without electricity.</td>
</tr>
<tr>
<td>Inactive data does not consume energy</td>
<td>Green storage</td>
<td>Very rarely, except with MAID (questionable ROI).</td>
</tr>
<tr>
<td>Encryption for highest security level</td>
<td>Encryption available on essentially all tape drives types.</td>
<td>Available on selected disk products.</td>
</tr>
</tbody>
</table>
Additional Advantages of Tape

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>2007</th>
<th>2009</th>
<th>2011</th>
<th>2017</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Inches</td>
<td>5.25 FH</td>
<td>5.25 FH</td>
<td>5.25 FH</td>
<td>5.25 HH</td>
<td>5.25 HH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5</td>
<td>5.25 HH</td>
<td>5.25 HH</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Volumetric Density</td>
<td>GB/in³</td>
<td>100</td>
<td>200</td>
<td>400</td>
<td>2000</td>
<td>10000</td>
</tr>
<tr>
<td>Cartridge Capacity (Native)</td>
<td>GB/TB</td>
<td>800 GB</td>
<td>1.2-1.6 TB</td>
<td>3.0-4.0 TB</td>
<td>12-16TB</td>
<td>48-64TB</td>
</tr>
<tr>
<td>Arial Density</td>
<td>GB/in²</td>
<td>1.2</td>
<td>2.0</td>
<td>3.0-3.5</td>
<td>10-14</td>
<td>20-40</td>
</tr>
<tr>
<td>Data Rate</td>
<td>MB/sec/Drive</td>
<td>120</td>
<td>160-180</td>
<td>200-280</td>
<td>400-800</td>
<td>800-1,600</td>
</tr>
<tr>
<td>Tape Speed for Data</td>
<td>Meters/sec.</td>
<td>6-8</td>
<td>8-10</td>
<td>10-12</td>
<td>12-15</td>
<td>12-15</td>
</tr>
</tbody>
</table>

Source: Bi-annual iNEMI Mass Storage Report for 2008

The Cost Ratio for a Terabyte Stored Long-Term on SATA Disk versus LTO-4 Tape is about 23:1
For energy cost, it is about 290:1

Clipper Notes-October, 2008
Key Concern

• Logical and physical migration do not scale cost-effectively
• Only operating standard today is to migrate information physically (to new media) every three to five years and logically (to new formats) before the applications and readers die and become obsolete (every 5-10 years)
• A never ending, costly cycle of migration
• Practitioners are struggling to keep up with migration requirements. Only 30% claimed to be doing physical migration correctly on disk & none on tape or optical. Only 20% claimed they were confident in their ability to logically migrate some of the data.
• Information is at risk long-term!
What is Sun Doing About All This?
Sun Open Archive Solutions Framework

Archive Application
- Industry Leading Archive Applications

Open standards based
Community supported
Storage Preservation
- Data protection
- Integrity checking
- Policy-based management

Industry-standard storage options
- Flash
- Disk
- Tape

Strong Partnerships & Collaboration
Sun, Versatile, DuraSpace, Drupal, Islandora & PASIG

The Best of Software and Hardware interlocking to create the Sun Open Archive Framework
Open Storage
&
Sun's Enabling Technologies
The Evolution of Data Storage:

- Application
- File System
- Storage

DAS

SAN

NAS

OSD

ISD
Open Storage/Open Archive Anatomy

NFS, CIFS, FCP, SAS, iSCSI, IB, VTL, OSD, CAS, XAM, Web DAV

Open Storage Appliances
- Sun Storage 7110
- Sun Storage 7210
- Sun Storage 7310
- Sun Storage 7410

Storage Servers
- SunFire X4240
- SunFire X4540
- SunFire x4250
- CMT Servers

Open Storage Arrays
- Storage J4200
- Storage J4400
- Storage J4500

Open Storage Flash
- F5100 - SSD

File-Systems
- ZFS, Lustre, SAM/QFS, pNFS

Replication
- Security
- Mirror/Snap
- Search
- Encryption
- De-duplication
- Migration
- Backup
- Compliance
Sun Storage Preservation Software

**ZFS**
- Keeps on-disk data self consistent and eliminate silent data corruption
- Copy-on-write
- Data is read and checked constantly
- End-to-end checksumming

**SAM-QFS**
- Data classification, centralize metadata management
- Policy-based data placement, protection and multi-tier migration
- Continuous backup and fast recovery

**Solaris & OpenSolaris**
- Dtrace
- Telemetry data collection
- Device detection
- Error identification and recovery
Why Applications Don’t Perform
Waiting for DATA – HDDs can't keep up

Today’s Multi-Core, Multi-Socket application server design are increasingly held back by slow storage

When requesting data, the server spends most of it’s time waiting for storage

Application performance remains sluggish regardless of the Server CPU horsepower

The traditional remedy of adding more expensive DRAM may no longer suffice as data sets double every 2 years
The number of HDDs needed to keep up
What is ZFS?
A new way to manage data

End-to End Data Integrity
With check-summing and copy-on-write transactions

Immense Data Capacity
The world's first 128-bit file system

Easier Administration
A pooled storage model – no volume manager

Data Services
Snapshots Clones Replication
ZFS Turbo Charges Applications
The Hybrid Storage Pool Data Management

ZFS automatically:
- Writes new data to a very fast SSD pool (ZIL)
- Determines data access patterns and stores frequently accessed data in the L2ARC
- Bundles IO into sequential lazy writes for more efficient use of low cost mechanical disks

Now shipping in OpenSolaris and coming soon in Solaris 10
ZFS Hybrid Storage Pools
Faster, Cheaper, Less Power

100 Enterprise HDDs

Capacity: 30 Tbytes
Performance: 30K IOPS
Cap/Op -: $55,000 - 1.75kWhr

Hybrid Storage Pool

More IOPS
Lower $GB
Lower Power Consumption
Less Rack Space

1 SDDs

Capacity: 30 Tbytes
Performance: 30K IOPS
Cap/Op -: $6,040 - 0.392kWhr

For more on HSPs, see Adam Leventhal's article in the Communications ACM Magazine
http://mags.acm.org/communications/200807/
Introducing The Worlds 1st Open Storage Appliance
Sun Unified Storage 7000 Series

ENTRY-LEVEL STANDALONE
8 GB memory • 14×300GB SAS disks

HIGH-DENSITY SCALABLE
Up to 64GB memory, 142×1TB SATA disks
Up to 2×18 GB write-optimized SSDs

ENTRY-LEVEL CLUSTER-CAPABLE
Up to 64GB memory, 96×1TB SATA disks
Up to 6×100GB read/16×18GB write SSDs
Active-Active Clustering for H/A

SCALABLE CLUSTER-CAPABLE
Up to 128GB memory, 288×1TB SATA disks
Up to 6×100GB read/16×18GB write SSDs
Active-Active Clustering for H/A

STANDARD FEATURES (ALL MODELS)
All Data Protocols and Data Services Included
(Analytics, Snapshots, Replication, Compression, NFS, CIFS, iSCSI…)
Built-in 4×1 Gb Ethernet ports
Remote Console (Serial or Ethernet)
Lights-out Management

OPTIONAL NETWORKING & CONNECTIVITY (ALL MODELS)
2×10 Gb Ethernet (optical)
4×1 Gb Ethernet (copper) • 2×1Gb Ethernet (optical)
FC or SCSI HBA for tape backup
Open Storage & the Sun Storage 7000 Unified Storage Systems

*Converges Compute, Storage and the Network*

- Open Architecture
- Open data formats, Open protocols
- OpenSolaris and Appliance Kit platforms and communities
- Integrated products, reusable components
- Technical Innovation
- ZFS and Flash “Hybrid Storage Pool”
- DTrace Analytics
- Game Changing Economics
- ZFS+Flash+SATA yields best $/G, $/IOP, $/MB/s, W/IOP, W/MB/s
- Industry-standard architecture that leads volume price/performance
- No appliance software fees and license keys
Sun’s Infinite Archive System Approach
Factory integrated, solution tested, simple, scalable, and economical

Infinite Archive System (IAS)

Email
ERP
Transactional
Legal
Contracts
Web

Any Communications Protocol

Intelligent, Policy-Based Automated Archive
Storage Archive Manager
SAM-QFS

Tier 1 + Tier 2 Disk IAS Options
2500 series SAS
2500 series SATA

Scalable, Eco-Efficient Tape Tier Options
Libraries
Encryption
Access & Capacity Drives
IAS General Design & Application Data Flow

High Availability Application Infrastructure with Continuous Backup/Data Protection and Archive to shadow file system

Two (2) Sun Servers

Tier # 1
Active Data

Tier # 2
Disk Archive

Tier # 3
Tape Archive

Customer LAN or WAN

DATA IP Connections (GigE)

Standard IP, NFS and/or CIFS

UNIX

Linux

Windows

DATA IP Connections (GigE)
Sun Archive Components

Sun has provided archiving platforms for decades

- Encryption
- Networking
- Software
- Servers
- Disk
- Tape
- Cloud
- Solution Appliances

Continued investment in technologies that will provide the next generation storage platforms.
Thank You for Your Time and Attention

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