Digital Data Archive and Preservation in the Cloud - What To Do and What Not To Do

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Abstract

Cloud Archive Challenges and Best Practices

- This session will appeal to Storage Vendors, Datacenter Managers, Developers, and those seeking a basic understanding of how best to implement a Cloud Storage Digital Data Archive and Cloud Storage Digital Data Preservation service. In addition, we will discuss how these approaches result in a “greener” implementation versus traditional in-house and on-premise implementations.

- This session will examine current challenges within the Public Cloud Storage Industry, delve into some specific services profiles, and address best practices for utilizing public cloud storage for archive and preservation needs.

Data Protection, Business Continuity, and Disaster Recovery - New Technologies
Agenda

What is the problem?

- Challenges of Private vs. Hybrid vs. Public Cloud Storage

Backup and Archive and Preservation

SNIA Cloud Archive and Preservation SIG

Solution – Services Profiles
Current Archiving Paradoxes

- Data continues to grow
  - Terabytes ➔ Petabytes ➔ Exabytes

- Data has a tendency to be lost
  - Dropbox, Amazon and iCloud breaches

- Migration does not scale

- Access & use models keep changing

- Cost overwhelms everything that complexity does not

- Ever-increasing and changing regulations
Additional Challenges

❖ Lack of uniform semantics and standard interfaces
❖ Interoperability between public cloud providers
❖ Managing data format changes over time
❖ Authenticity verification
❖ Compliance and Governance
  ❖ HIPPA
  ❖ Sarbanes Oxley
  ❖ J-SOX
  ❖ SAS 70
❖ Risk Management & Litigation
Backup (BU): A collection of data stored on (usually removable) non-volatile storage media for purposes of recovery in case the original copy of data is lost or becomes inaccessible.

Disaster Recovery (DR): The recovery of data, access to data and associated processing through a comprehensive process of setting up a redundant site (equipment and work space) with recovery of operational data to continue business operations after a loss of use of all or part of a data center.

Digital Archiving: A storage repository or service used to secure, retain, and protect digital information and data for periods of time less than that of long-term data retention.

Digital Long Term Preservation: [Long Term Retention] Ensuring continued access to, and usability of, digital information and records, especially over long periods of time.

Source: SNIA Dictionary
Definitions

Cloud Digital Archive Service:

- A cloud-base service providing a specialized online storage repository for the purposes of compliance, litigation support, and/or retention for extended periods of time, not including “long-term.”
  - Can be utilized as a component of a complete digital preservation service.
  - Does not necessarily provide adequate services to accomplish digital preservation.
Definitions (cont.)

Cloud Digital Preservation Service

- A cloud service providing digital preservation of information and data.

- A digital preservation service includes a comprehensive management and curation function that controls:
  - Supporting Infrastructure
  - Information
  - Data
  - Storage Services
Forms of Cloud Deployment

- **Private Cloud:**
  - [Services] Delivery of SaaS, PaaS, IaaS and/or DaaS to a restricted set of customers, usually within a single organization (and under its complete control).

- **Public Cloud:**
  - [Services] Delivery of SaaS, PaaS, IaaS and/or DaaS to a relatively unrestricted set of customers.

- **Hybrid Cloud:**
  - A composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability.
Data Migration Today

Cloud A ???? Cloud B

Data over WAN via vendor specific API’s

Users

File System db Records Disc Blocks Tape Blocks
Corporation Legal, Records Management and Data Security policies require companies to keep data for long periods of time.

- HIPAA: Personal Medical Records - Lifetime + 2 years
- SOX: Audit correspondence - +4 years
- SEC 17a-4: Trading account records – Account Life +6 years
Why archive in the cloud?

- Operating costs are higher when using in-house
  - More capacity than data, multiple redundancies, backups, administration costs

- Cooling equipment consumes about 45% of power delivered to data center

- Storage consumes 13% of total data center power, with 15% for servers)
Cloud Storage is NOT Going Away

Archiving in the Cloud 2009-2015

IDC. Worldwide Storage in the Cloud 2011-2015 Forecast: The expanding role of Public Cloud Storage Services
Benefits

Cloud-based storage is 74% less expensive than in-house ("File Storage Costs Less in the Cloud Than In-House, Andrew Reichman, Forrester 2011")
Cloud Archive and Preservation SIG

Advance the use of public, private and hybrid clouds for archival services and long term retention

- CDMI
- Market Education
- Best Practices
- Services Profiles
- Standards Promotion
- Industry Liaison
- Interoperability Demonstrations/Certifications and Plugfests
- Implementation Reference Model

Participating companies:

Archive vs. Preservation

Digital Archive
- Specially designed system / repository to store digital data
  - Systems management
  - Physical security
  - Data security
  - Data backups
  - Disaster recovery
  - ISO 9001 certification
  - Manifest verification
  - Virus check
  - Format verification
  - Fixity check

Digital Preservation
- Process to ensure long-term data availability
  - Refresh
  - Migration
  - Replication
  - Emulation
  - Metadata Attachment
  - Sustainability
  - Timeless
What is already standardized?

Benefits of Industry standards:

- Allows storage vendors and developers to easily integrate with any cloud infrastructure.
- Allows Data Object Migration between heterogeneous systems:
  - End User site to Public Cloud
  - Public Cloud A to Public Cloud B
  - From Public Cloud back to the End User
- Standards already exist such as Self-contained Information Retention Format (SIRF) and CDMI (The Cloud Data Management Interface)

SNIA’s Cloud Data Management Standard (CDMI)

- ISO/IEC 17826:2012
- Standardized Data Path (Access) to the Cloud
- Standardized metadata to express the Archive requirement for the Data put in the cloud
- Immutability
What is already standardized?

Other de facto standards:

- Amazon S3 (Simple Storage Service)
- OpenStack SWIFT (Object storage)
- OpenStack Cinder (Block Storage)
How does this work in CDMI?

- Standarizes the access to data in the cloud
- Uses RESTful principles
- Can be implemented on top of the provider’s own interface.

Cloud Client needs to discover what archiving capabilities are provided by the cloud

- CDMI does this through *Capabilities* – a type of resource that acts like a service catalog for the functions that the cloud offers customers
- If the cloud offers the capability, the customer marks the data objects and containers with metadata (Data System Metadata) that specifies the requirements
- Lastly the Cloud provider has a way of expressing what is actually being provided also through metadata
Self-contained Info Retention Format

Being developed by Storage Networking Industry Association (SNIA), Long Term Retention (LTR), Technical Working Group (TWG)

An Analogy

- Standard physical archival box
  - Archivists gather together a group of related items and place them in a physical box container
  - The box is labeled with information about its content e.g., name and reference number, date, contents description, destroy date

- SIRF is the digital equivalent
  - Logical container for a set of (digital) preservation objects and a catalog
  - The SIRF catalog contains metadata related to the entire contents of the container as well as to the individual objects
  - SIRF standardizes the information in the catalog

[Photo courtesy Oregon State Archives]
SIRF and CDMI

- Cloud Data Management Interface (CDMI) specifies a standard API for clouds.
- CDMI API can be used to access the various preservation objects and the catalog object in a SIRF-compliant container.
- Example
  - Assume we have a cloud container named "PatientContainer" that is SIRF-compliant:
    - each encounter is a preservation object
    - each image is a preservation object
    - the container has a catalog object
  - We can read the various preservation objects and the catalog object via CDMI REST API as follows:
    - GET <root URI>/PatientContainer/encounterJan2001
    - GET <root URI>/PatientContainer/chestImage
    - GET <root URI>/PatientContainer/catalog
Cloud Digital Data Archive

**Storage Services**
- Snapshot – type
- Replication – type/class
- DeDuplication – type/class
- Data Integrity

**Data & Information Services**
- Retention Period
- Permanent Deletion
- Confidentiality/Encryption
- Security – Access, Audit logs
- Physical Migration
- Indexing/Searching
- Litigation Hold

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## CDMI Functional Services

### Cloud Digital Data Preservation

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Evaluating Tools and Providers

✧ Backup & DR
  - SLA and Performance is key
  - Insist on Proof of Concept
    › Validate in your environment
    › Perform established backup routines in parallel
    › Perform different sizes of restores
    › RTO/RPO objectives

✧ Archiving & Long-Term Preservation
  - Management is key
    › Preservation of file attributes (metadata), ownership
    › File access with multiple search techniques
    › Content management
    › Security and auditing compliance
Digital Archive and Preservation Services are becoming more prevalent and a basic requirement for businesses beyond traditional libraries and content repositories.

Cloud-based digital archives and preservation services can offer significant advantages regarding: ease-of-use, power/cooling, datacenter footprint, security, and high-availability.

Companies can take advantage of “green” cloud technologies for their digital archive and preservation requirements in place of relying solely on their own internal infrastructure – achieving >70% savings.
Attribution & Feedback

The SNIA Education Committee thanks the following individuals for their contributions to this Tutorial.

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