Business Case for the Cloud

Alex McDonald
NetApp
The material contained in this tutorial is copyrighted by the SNIA unless otherwise noted.

Member companies and individual members may use this material in presentations and literature under the following conditions:
- Any slide or slides used must be reproduced in their entirety without modification
- The SNIA must be acknowledged as the source of any material used in the body of any document containing material from these presentations.

This presentation is a project of the SNIA Education Committee.

Neither the author nor the presenter is an attorney and nothing in this presentation is intended to be, or should be construed as legal advice or an opinion of counsel. If you need legal advice or a legal opinion please contact your attorney.

The information presented herein represents the author's personal opinion and current understanding of the relevant issues involved. The author, the presenter, and the SNIA do not assume any responsibility or liability for damages arising out of any reliance on or use of this information.

NO WARRANTIES, EXPRESS OR IMPLIED. USE AT YOUR OWN RISK.
Abstract

- **Building the Business Case for Clouds**
  - Moving Beyond Vanilla Use Cases
  - The fast emerging cloud services business arena is creating numerous new opportunities for both IT users and IT players beyond the traditional Enterprise IT ecosystem.
  - This presentation will cover popular use cases for cloud including storage clouds and enterprise or application specific clouds including multi-tenancy, private, and hybrid clouds while exploring why IT professionals are interested in each use case.
  - SNIA’s Cloud Storage Initiative (CSI) has created the Cloud Data Management Interface (CDMI) that can assist in cloud implementations and incorporation into your business case to prevent lock-in or solution obsolescence.
Agenda

✈ What is Cloud Storage?
   ✦ Is it separable from & does it differ from cloud services?
✈ The “Killer App”
   ✦ Where are your users putting their data?
✈ Legal Considerations
   ✦ Why and when you need a lawyer
✈ Deployment Types of Cloud Storage
   ✦ Private, Public and Hybrid
✈ Example Use Cases
   ✦ Backup & Archive
   ✦ Virtualization
✈ CDMI & Cloud Standardization
✈ Final Thoughtst
Cloud Storage

- 451 Group on cloud:
  - “Cloud is a way of using technology, not a technology in itself – it's a self-service, on-demand pay-per-use model. Consolidation, virtualization and automation strategies will be the catalysts behind cloud adoption.”

- Forrester Research on cloud:
  - “A pool of abstracted, highly scalable, and managed compute infrastructure capable of hosting end-customer applications and billed by consumption”

- SNIA: Data Storage as a Service (DaaS)
  - [Services] Delivery over a network of appropriately configured virtual storage and related data services, based on a request for a given service level.
  - Typically, DaaS hides limits to scalability, is either self-provisioned or provisionless and is billed based on consumption.

- Why Cloud Services:
  - Agile IT environments across coordinated layers
  - Reduce capital costs, optimize operational costs
  - Leverage expertise from all service dimensions
  - Pay for the IT you use, not just what is needed for peak times
    - On-going rightsizing
Where are your users putting their data?

- With corporate users bringing their own devices (BYOD), where are they putting files?
- Devices have limited storage capacity
- They are saving them in the storage cloud!
- Corporate data is already in the public cloud and unmanaged/protected

Source: Amazon

Source: Oxygen Cloud
Data Storage Interface Evolution

- New digital data is being generated by an ever diversifying set of devices
- 75% of data being generated by individuals (IDC)
  - Amount of Data doubling every two years
- 5 Billion Mobile Phones
  - Tablets on the rise
- Storage space on devices will always be limited (although this continues to grow exponentially)
- Device Apps are accessing content/storage via the Internet
  - Cloud Storage largely driven by device based use cases
- Traditional data storage interfaces (filesystems) are not up to this task!
Distilled Requirements

- Need a Global Namespace for data location
  - FILE handle -> URL + Unique Object ID globally
- Need support for Rich Metadata associated with the data
  - Plus Metadata Query and Index based Search
- Need HTTP access – browser support
- Data Services need to be transparent to the user, but extensible and powerful
  - Driven by Metadata
- Support for large objects, many small objects
- Support for active preservation operations
  - Driven by preservation Metadata
Legal Considerations

Why and when you need a lawyer

Transborder Data Flow
- May generate legal obligations (sometimes conflicting) in multiple jurisdictions
- “The Right To Be Forgotten”; many jurisdictions have such laws
- Exporting data may be illegal
  - EU Data Protection Directive; does NOT permit transferring personal information to countries that do not provide EU protection levels; the USA is one such country

Expectation of "Reasonable Security"
- Security breaches leading to potential liability
- Only as strong as weakest link

Electronic evidence & e-discovery
- What constitutes evidence?
- Multiple copies, digital signing, data fragmentation
- Retrieval of data often complicated

Existing non-Cloud contracts insufficient
- License agreement vs service agreement
- Ownership vs use of content

Mobile Devices
- The law applies where you are, and where your data is stored

Get Legal Involved
- Early and often; laws change
Storage Cloud Flavors

- A Storage Cloud can be deployed as public, private or hybrid
  - Public – secure multi-tenant externally hosted
  - Private – secure single or multi-tenant usually hosted in-side the firewall or by a 3rd party
  - Hybrid – combination of public and private cloud infrastructures and services
  - Storage Cloud may be mixed with other Cloud services
Multi-Tenancy in Storage Cloud

What is multi-tenancy:
- “the terms multi-tenant and multi-tenancy are not new; both have been used to describe application architectures designed to support multiple users, resource owners or “tenants” for many years. With the advent of cloud computing, this terminology has simply been extended to include any cloud architecture”

Secure multi-tenancy:
- Application layer
- Server layer
- Network Layer
- Storage Layer

- Source: “Storage Multi-Tenancy for Cloud Computing” Whitepaper, Paul Feresten, SNIA CSI Member
Private Storage Cloud

- **Multiple Tenancy Models**
  - **Multi-Tenants**
    - Each Enterprise business unit (e.g. Division, Dept.) has its own dedicated cloud services space
    - Monitoring, Billing is handled separately for each BU
  - **Single-Tenant**
    - All Enterprise BUs are regrouped under the same cloud services space
    - Service monitoring and billing is jointly organized and internally processed

- **Private Cloud Infrastructures are usually deployed behind the firewall**
  - In line with the Enterprise security guidelines
  - Geographical dispersion possible

- **Private Cloud may be hosted by a trusted 3rd party (xSP).**
  - IT resources are dedicated to a single customer with metering and billing matching requested model.
  - Its integration behind the firewall will depend on cloud service uses
  - Segregation of IT resource will be determined by SLA
Hybrid Storage Cloud

- **Combination of public and private storage clouds**
  - Different clouds maybe access to different type of services
    - E.g. Storage Tiering – both internal and external services
    - E.g. B/R to the cloud – internal services
    - E.g. Archiving to the cloud - external services
    - E.g. cloud storage for computing – will depend on compute resource location

- **Services may be tied to applications layers & services**
  - SaaS/PaaS with storage resource dependencies
    - E.g. B/R, DR services

- **Usual misconception about hybrid cloud**
  - Accessing external cloud services from a traditional data center does not make it a hybrid cloud
Use Cases

- Elastic demand for web based media (video, eBooks, audio)
- Backup to the cloud
  - Restore, Recovery, “Seed” the backup with hard drive
- Sync of files to the cloud and multiple devices
  - Internet “Drive” secondary storage
- Archive/Preservation in the cloud
  - Including Compliance, Retention and eDiscovery
- Storage for Cloud Computing
  - Support for legacy storage interfaces key
  - Self Service Storage Administration
Backup & Restore

⇒ Business Problem:
  - Business critical data needs to be point-in-time restorable within defined operational constraints

⇒ Traditional Approach
  - Backup software/agents on file servers or desktops backing up to dedicated data systems (disk or tape), usually on premises

⇒ Cloud Approach
  - Backup software/agents backing up to a dedicated dynamic service platform with high capacity and moderate latency backup storage to meet backup window and recovery time objectives
Cloud BUR Requirements

- **Cost**
  - Lower cost BUR solution than traditional tape or disk based solutions

- **Capacity**
  - Adequate capacity to handle your daily, weekly, monthly backup capacity plus growth

- **Latency**
  - Latency needs to be low enough to meet backup AND recovery objectives but not too expensive to make cost prohibitive
  - Complementary shuttle services may be need especially for restoring large data sets

- **Manageability**
  - Management tools of the BUR service platform need to allow to meet SLA/SLO as well as to fit within Enterprise guidelines
    - E.g. Asset management, security…
Cloud BUR Advantages

- **Lower costs**
  - Benefit from the economies of scale from the service provider
  - Cost of recovery ought to be included

- **Charge-back to business units**
  - Focus on more granular/specific requirements vs. bulk-park numbers

- **Option to shift burden of meeting SLAs to a service provider**
  - An important transition when going cloud

- **Traditional backup environments require your capital investment – scale and efficiencies are experienced by the largest customers**
  - Do you over buy capacity or risk running out of capacity and risk paying a higher price?
  - Are you prepared to cover the cost of technology refresh

- **Cloud BUR service platform can include capacity optimization**
  - Deduplication, compression…
Deployment Style

公共备份云:
- 将资本支出转化为运营支出
- 简化 BUR 解决方案的部署

私有备份云:
- 重新组织 BUR 作为内部服务
- 潜力可以利用专用备份云在异地

混合备份云:
- 第三方服务的优化按应用、数据类型...
- 管理备份到公共或私有云，具有不同的成本、可用性、延迟或安全性
Business Problem

- Business criticality or regulatory compliance require data to be retained for very long periods of time (up to 100 years).

Traditional Approach

- Data is archived to external storage media and stored offsite in a managed archives location (internal or external to the Enterprise)

Cloud Approach

- Data is sent to an archiving service platform providing (very) low cost and high capacity archive storage

Check out SNIA Tutorial: Cloud Archive and Long Term Preservation Challenges and Best Practices (Backup & Archiving Track, ????)
Application Data

» Business Problem:
  » Business critical applications and supporting applications require temporary and permanent data with various statuses and lifecycles
  » BYOD (Bring Your Own Device)

» Traditional Approach
  » Local disk, DAS, NAS, or SAN(FC/IP)
  » Network: SAN/LAN/MAN/WAN
  » Committed data center server pools
  » No non-company approved devices

» Cloud Approach
  » Storage cloud providing adequate data services capabilities
    » Size, protection, location, access, distribution
  » Cloud based virtualized servers
  » “Dropbox” type services
Build Your Own Cloud

- Corporations already offer their own email (instant messaging, etc.) services to their employees
- Cloud Storage is the next type of service offering for employee devices
  - Enterprise “Dropbox” implementations
- Essentially a “private” cloud with access over the Internet from corporate and other applications
- Data is retained “in house”, protected, available, secured and compliant
Application Data Implementation

- Develop or acquire a Drop Box client for supported devices (iDevice, Android, etc.)
- Connect back to the mother ship (internal enterprise storage) with a standard protocol (CDMI)
- Provide robust, available, protected and compliant storage services to those clients
- Manage the data stored via the enterprise “dropbox” usage
- Implement data retention and expiration policies on the data
Post-Filesystem Data Storage

- The SNIA has produced the Cloud Data Management Interface (CDMI) standard for post-Filesystem Data Storage
  - i.e. Public and Private/Hybrid Storage Clouds
- Specifically designed to meet the requirements (for the foreseeable future) of contemporary data usage and management
  - Superset of features currently being offered, but “shrink to fit”
- Innovative use of Metadata to express “Data Requirements”
  - Requirements are then met by the implemented Data Services
- CDMI can be (and is being) extended compatibly
  - To accommodate new types of data requirements, use cases
CDMI Overview

- **Data Portability Standard**
  - Move Data (and most importantly – Metadata) from cloud to cloud

- **Advanced Cloud Services**
  - Data System Metadata allows cloud vendors to up-sell!
  - Specialized storage clouds for specific use cases

- **Logging, Security, Audit Trails**

- **Extensible to accommodate rapid innovation in cloud market**
  - Proposed Extensions: CIMI/OVF, Versioning, Jobs

- **Shrink-to-fit**
  - Only implement what makes sense for your cloud
  - Profiles: Simple Storage (i.e. S3), Simple Storage Management (NAS)
Applicable to all three deployment models of Cloud Storage:

- **Cloud Storage for Cloud Computing**
  - Whitepaper at snia.org/cloud – the management interface for the lifecycle of storage in a compute cloud

- **Public Storage Cloud**
  - Whitepaper at snia.org/cloud – both a Data Path for the Cloud and a Management Path for the Cloud Data

- **Private Cloud Storage**
  - As well as hybrid clouds
  - An API for Storage Vendors selling into Cloud based solutions

**Semantics**

- Simple Containers and Data Objects with tagged Metadata
- Data System Metadata expresses the data requirements

**Protocol**

- RESTful HTTP as “core” interface style
- JSON (JavaScript Object Notation)– format of the representations are extensible
CDMI Benefits

- Adoption
- Interoperability
- Portability
- Compliance
- Security
- Simplicity
- Extensibility
- Coordinated
- Data Management
- International

- Commercial implementations, research infrastructures widely deploy CDMI
- Broad participation in plugfests
- CDMI standardizes moving the data (and metadata) between clouds (FedEx or Network)
- CDMI Retention, Hold, Query address requirements and eDiscovery
- Secure TLS, Encrypting Data at Rest, ACLs, audit logging, media sanitization all standardized
- CDMI Profiles: Simple Storage, Self Service Storage Management, Archive/Preservation
- CDMI Extensions: published publically and incorporated upon multiple implementations
- CDMI Cloud Storage for Cloud Computing working with OGF, DMTF, many others
- Replication, Archiving, Backup, Encryption, and even Tiering all standardized by CDMI
- CDMI is now ISO/IEC 17826:2012
Why not just adopt one of the existing interfaces?

- Despite the “open” licensing of several existing cloud storage interfaces, they all remain under the change control of a single vendor.
- No cloud vendor wants to have a competitor have change control over their interface.
  - Thus they release their own interface which they do have change control over.
- This leads to the propagation of multiple interfaces, each essentially locking developers/customers into that service.
- CDMI is under change control of a standards body, accommodates requirements from multiple vendors and can be extended for proprietary functions.
The Complete Picture

Clients acting in the role of using a Data Storage Interface

Clients can be in the cloud or enterprise and provide additional services (computing, data, etc.)

Block Storage Client
Exports to Cloud Computing
iSCSI, FC, FCoE LUNs, Targets
POSIX (NFS, CIFS, WebDAV)

Object Storage Client

SNIA Cloud Data Management Interface (CDMI)

XAM Client

XAM VM for CDMI

Database/Table Client

Multiple, Proprietary Interfaces

Management of the Cloud Storage can be standalone or part of the overall management of your cloud computing

Data/Storage Management Client

Clients acting in the role of Managing Data/Storage

Cloud Data Management

Data Services

Storage Services

Copyright © 2010 Storage Networking Industry Association

Business Case for the Cloud
© 2013 Storage Networking Industry Association. All Rights Reserved.
Final thoughts

- There are significant differences in how cloud services are delivered to the various categories of users. The integration of these services with traditional IT operations will remain an important success factor but also a challenge for IT managers.

- The Cloud industry is still in its infancy. We can expect many more developments for IaaS, PaaS and SaaS solutions across business segments and verticals. It will become increasingly important to understand how such services can be combined in a secure and cost-efficient fashion.

- Mobile & virtualised use of data well suited to cloud. Embracing it now will prevent data proliferation on unsuitable services.
For More information

- One Web Site to Remember: http://snia.org/cloud
- Large Cloud Storage Community
  - http://groups.google.com/group/snialcloud
  - http://twitter.com/SNIAcloud (@SNIAcloud)
- SNIA Cloud Blog Site:
  - http://sniacloud.com
The SNIA Education Committee thanks the following individuals for their contributions to this Tutorial.

**Authorship History**

Marty Stogsdill, Oracle

Updates:

- Alex McDonald
- Mark Carlson

**Additional Contributors**

- Marty Stogsdill
- Dean Nuemann
- Greg Kleiman
- Mark Carlson
- Vincent Franceschini

Please send any questions or comments regarding this SNIA Tutorial to tracktutorials@snia.org