Deploying Public, Private, and Hybrid Storage Cloud Environments

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What is a Storage Cloud?

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- Public Storage Clouds: "Increase the efficiency of offering storage capacity through the use of multi-tenancy solutions – meaning multiple customers are services at once from the same shared storage infrastructure"
- Private Storage Clouds: "Typically exist behind an organization's firewall and are deployed for internal customers. Private storage clouds can be located in an enterprise data center, but can also be hosted at a collocation facility possibly owned by a third party like a service provider. Designed to take advantage of the elasticity and management simplicity of the cloud model, a private storage cloud implementation allows the customer to set up and manage their own environment"
- Hybrid Storage Clouds: "Uses a combination of both public and private storage clouds"

Source: "Managing Private and Hybrid Clouds for Data Storage" SNIA CSI whitepaper

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Why Storage Clouds?

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- Budgets and staffing are constrained
- Data is growing exponentially
- Mergers, acquisitions, divestitures make environments more complicated
- Regulatory, compliance, and legal requirements

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Is Your Environment:

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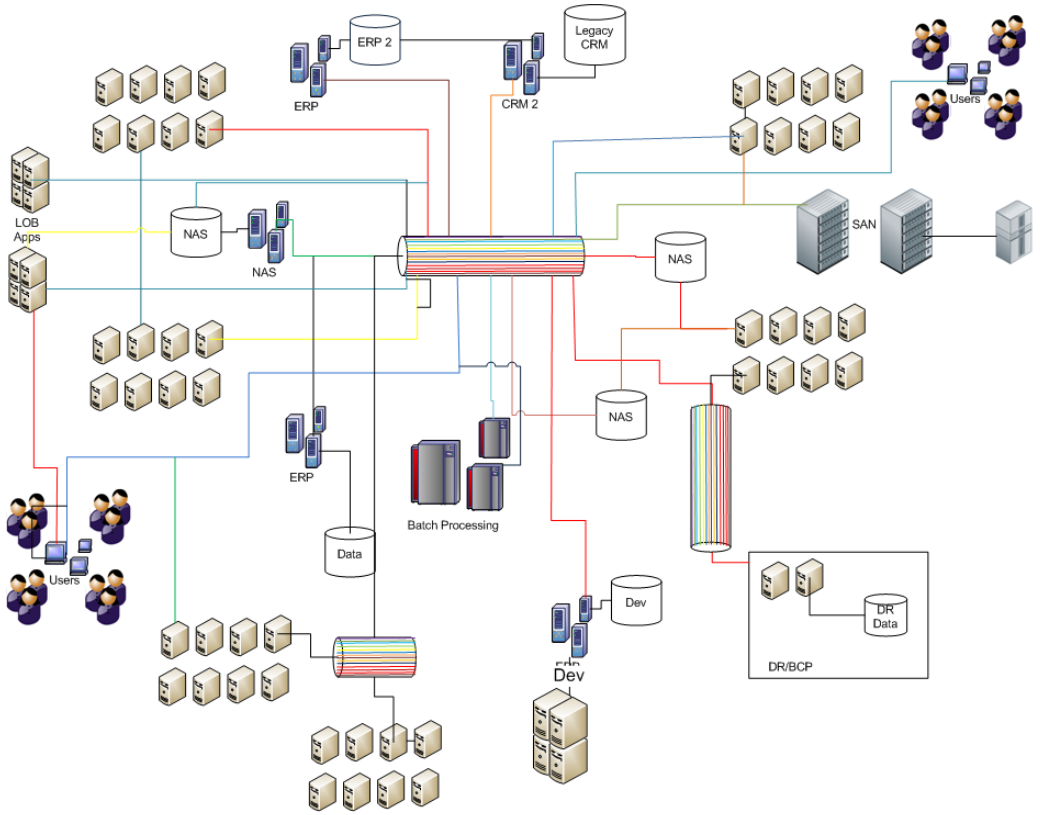
- More complicated now or 4 years ago?
- Becoming more heterogeneous?
- Getting harder to scale?
- Increasing in operational costs?
- Harder to support?
- Compliance challenged?



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How Storage Clouds Help

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- Lower TCO
- Faster Deployments
- Leverage service provider's skill sets
  - Is your operations staff being mandated to grow or shrink?
- Gives you the ability to re-deploy your environment at your own pace and with a thought-out architecture

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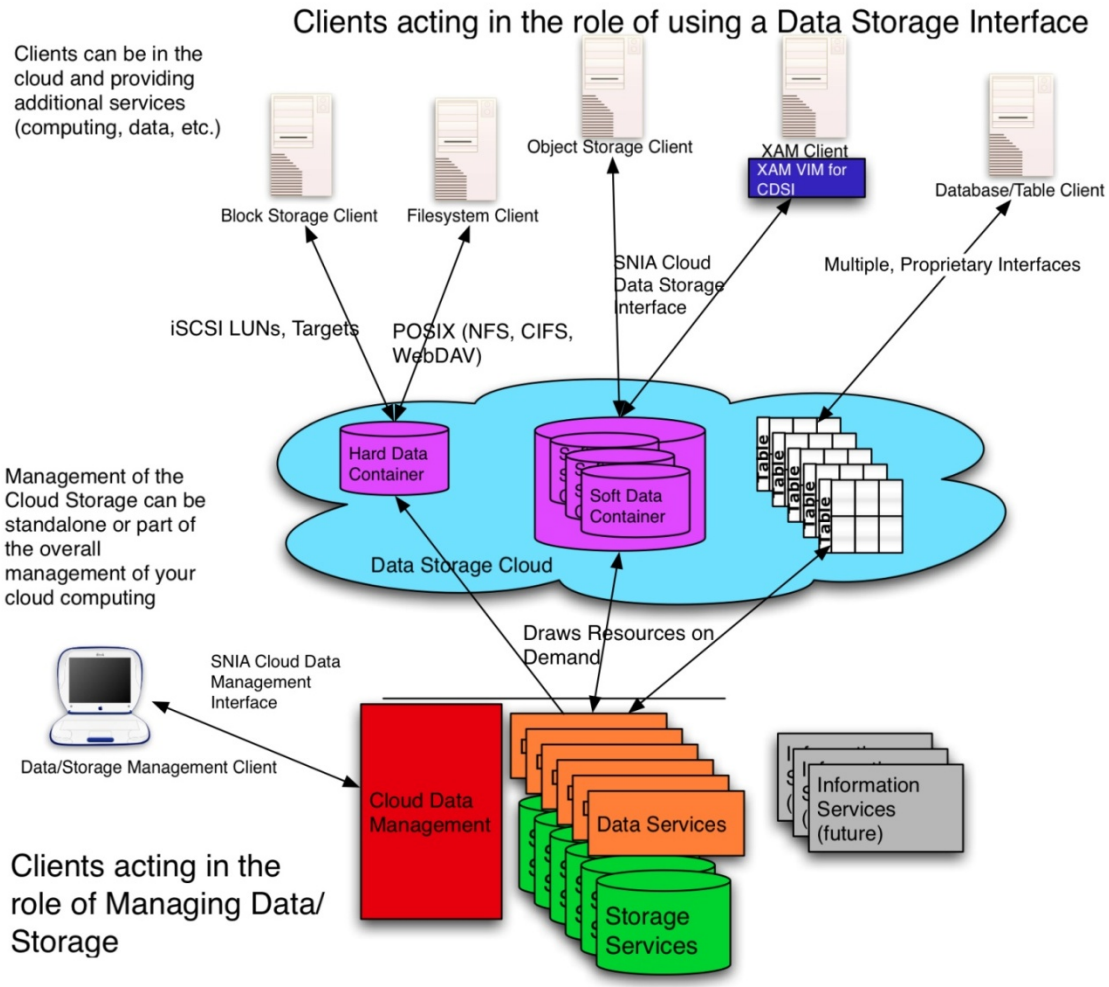
The Big Picture



Deployment Steps for Cloud Storage

- Determine your storage cloud use case
- Diagnose the potential bottlenecks for your deployment scenario
- Define Public, Private, or Hybrid deployment
- Document concerns with cloud deployment style
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Storage Cloud Use Cases

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- Determine your storage cloud use case:
  - Backup Cloud
    - Capacity and cost larger concerns than latency
  - Long Term Archive Cloud
    - Low cost and high capacity larger concerns than latency
  - Application Data Cloud
    - Low latency larger concern then high capacity or cost
- Largest separations across use cases are generally capacity, latency, or cost priorities

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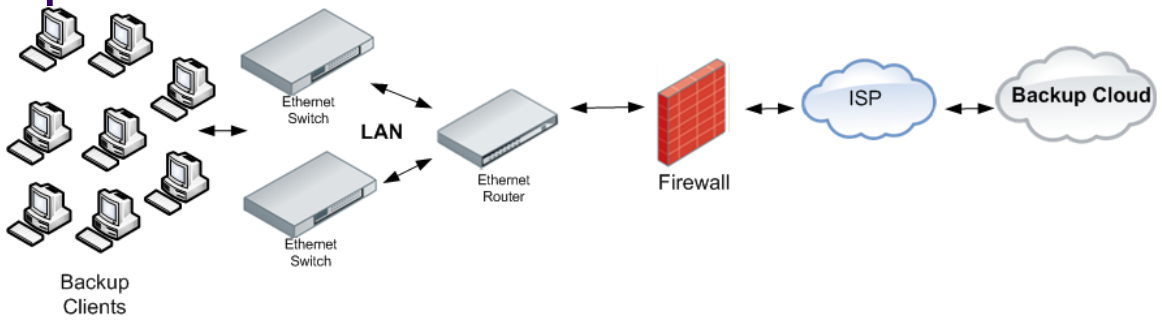
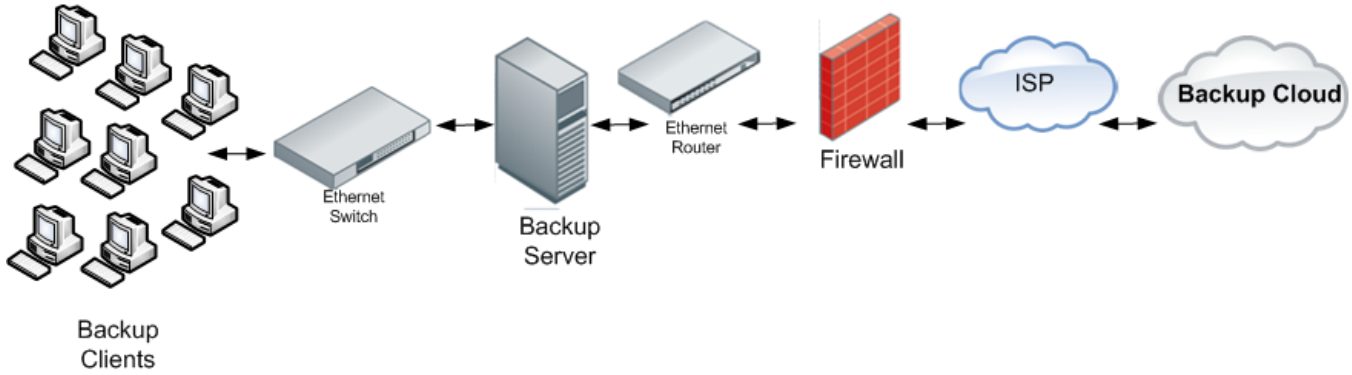
Backup Clouds

- Traditional backup software on local machines pointing to a Backup Cloud



- Central backup server pointing to a Backup Cloud



Long Term Archive Cloud

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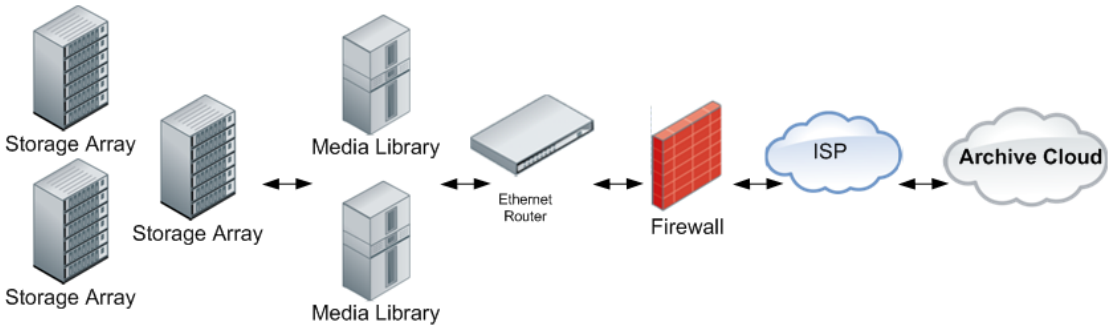
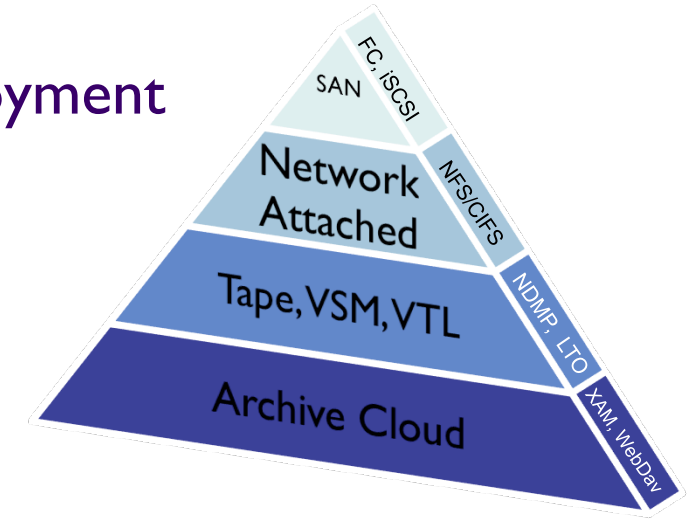
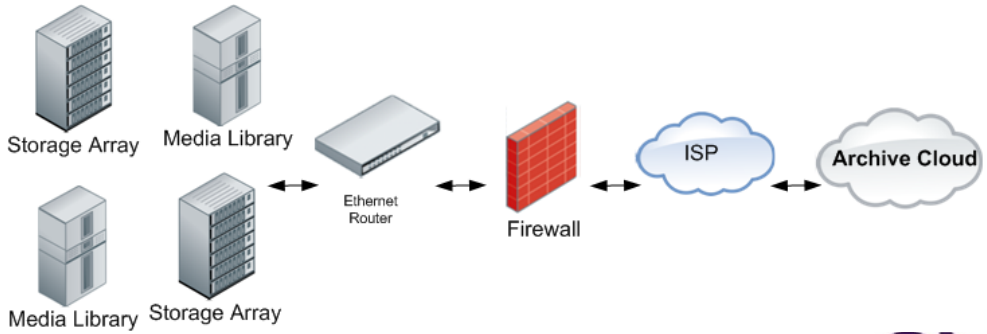
- Archive Cloud as Last Tier in ILM deployment





- Direct Archive Cloud



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Application Data Cloud

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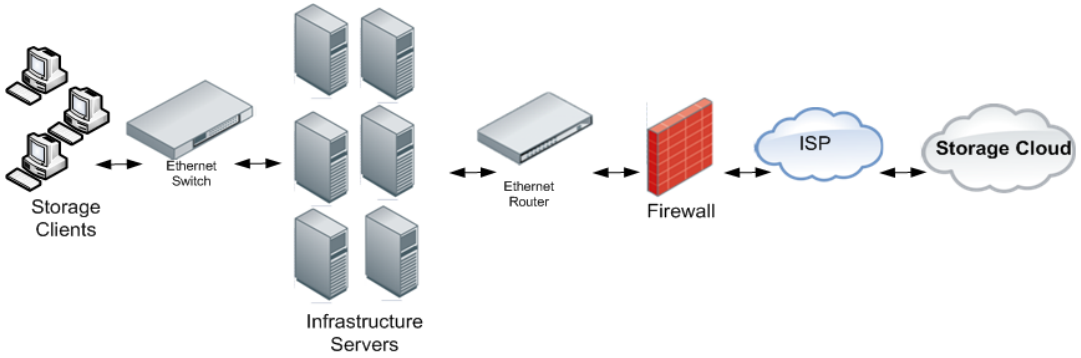
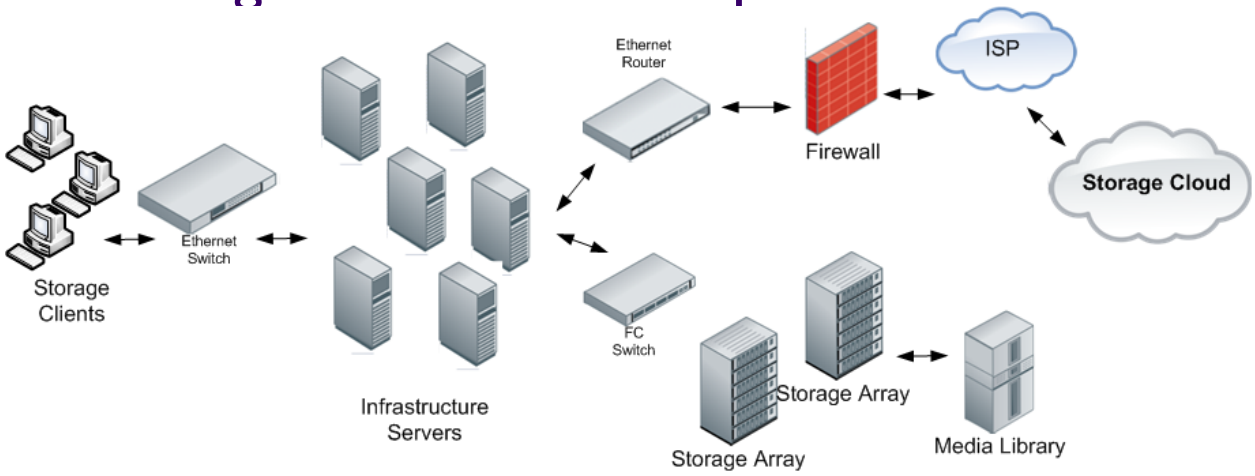
- Storage Cloud as Backend Storage



- Storage Cloud as a Compliment Environment



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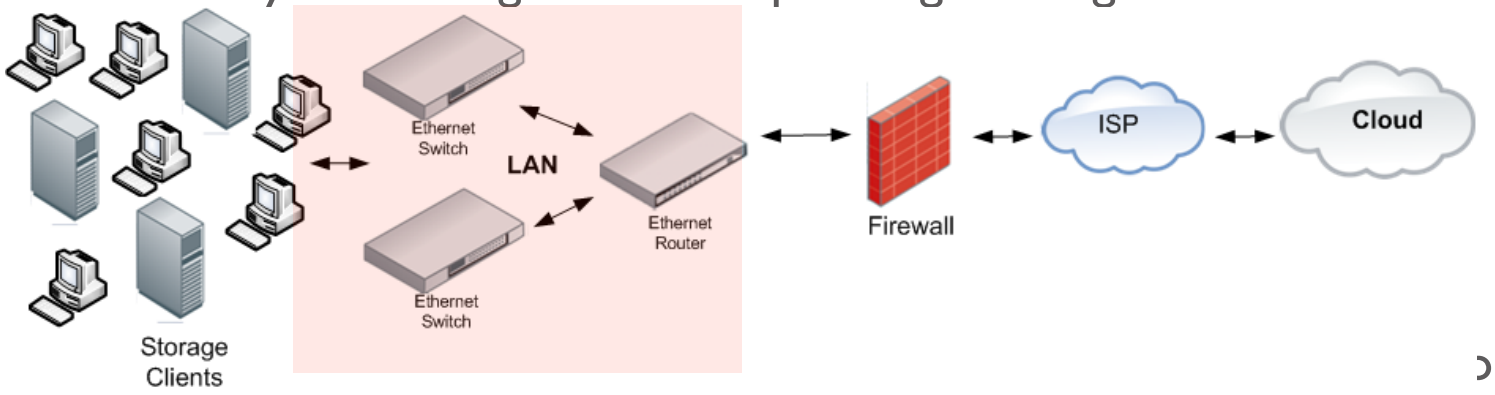
Diagnose Potential Bottlenecks

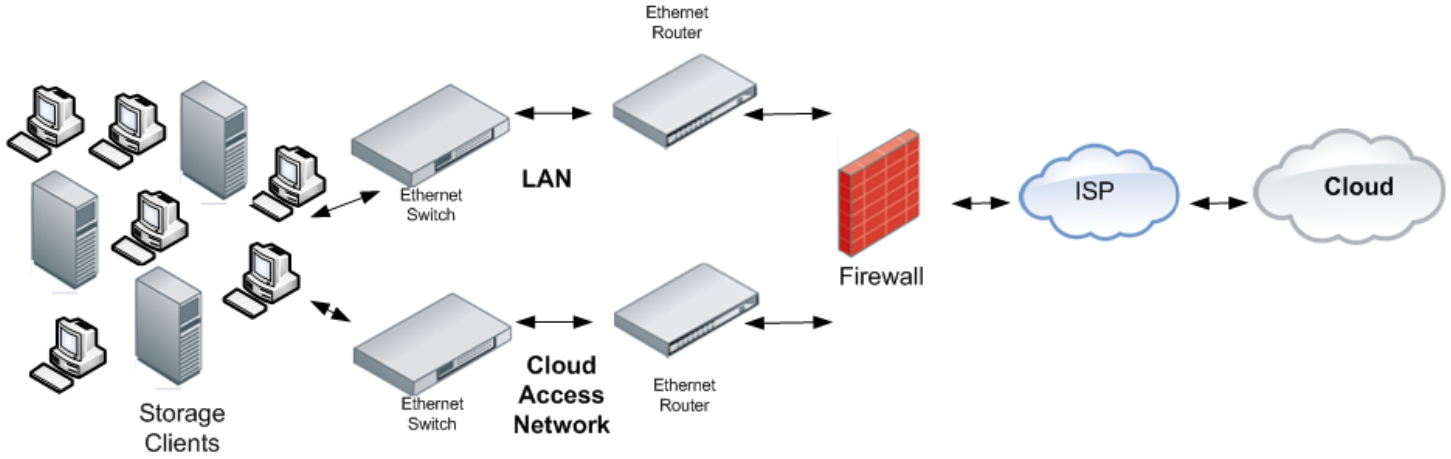
- Diagnose potential bottlenecks for your deployment scenario
- Does your LAN have available capacity?
  - Do you have 1gb to desktop? Is 1gb enough?



or a reason

Architect Around Bottlenecks

- Should your cloud deployment look more like:



- Evaluate cost/performance trade-offs with:
  - Dedicated circuits / Internet QoS
  - Caching/Accelerators

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Define Public, Private, or Hybrid

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- After defining your cloud storage use case evaluate your organizations needs for:
  - Cloud Storage Capacity
    - High Importance
    - Low Importance
    - Not Important
  - Cloud Storage Latency
    - High Importance
    - Low Importance
    - Not Important
  - Cloud Storage Cost
    - High Importance
    - Low Importance
    - Not Important

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Define If Shared Tenancy Is a Fit

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- 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

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Secure Multi-Tenancy in Cloud Storage

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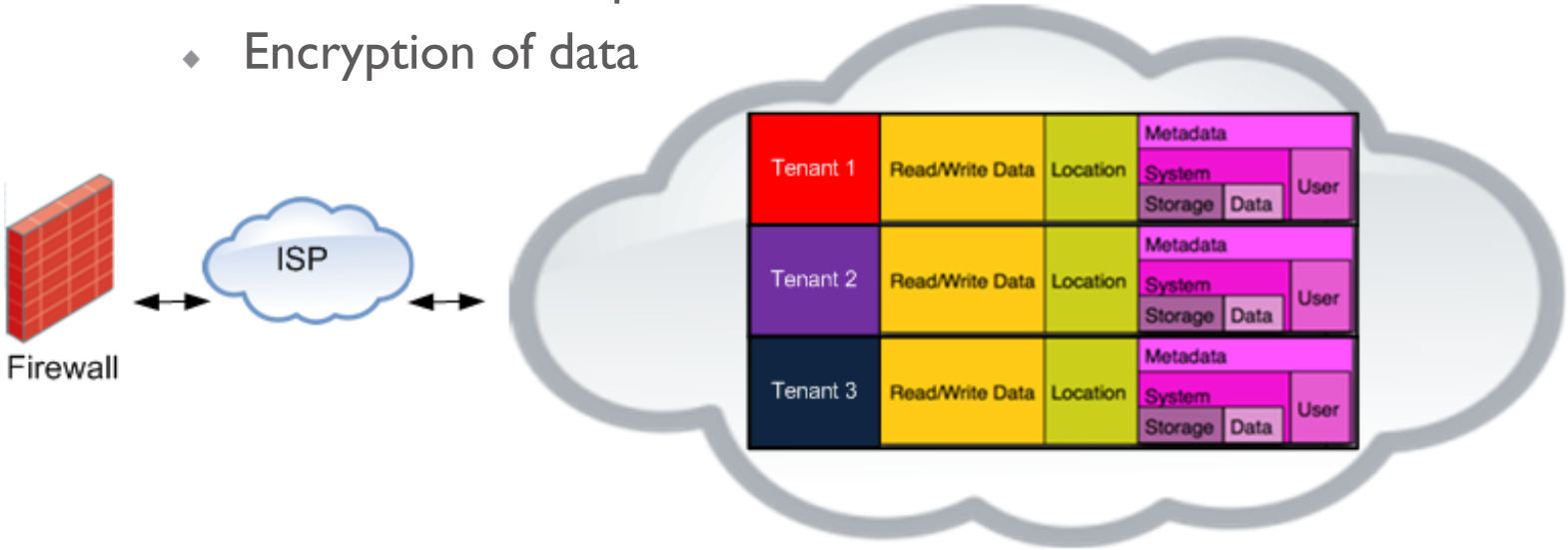
- Isolation/Security/Defense In-Depth:
  - Firewall/Edge network security
  - Tunneling across network/internet connections
  - HTTPs SSL/TLS
  - Private volumes, partitions, LUNs, or datastores
  - Encryption of data



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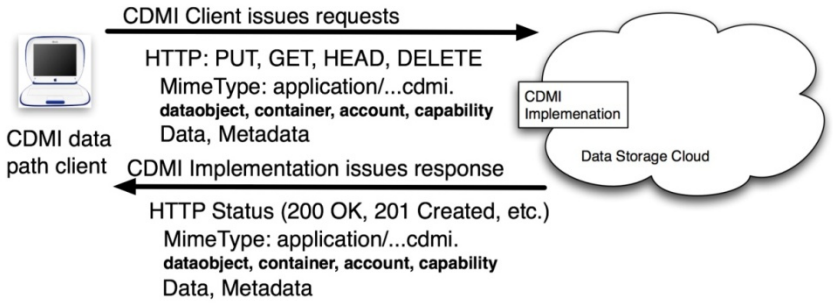
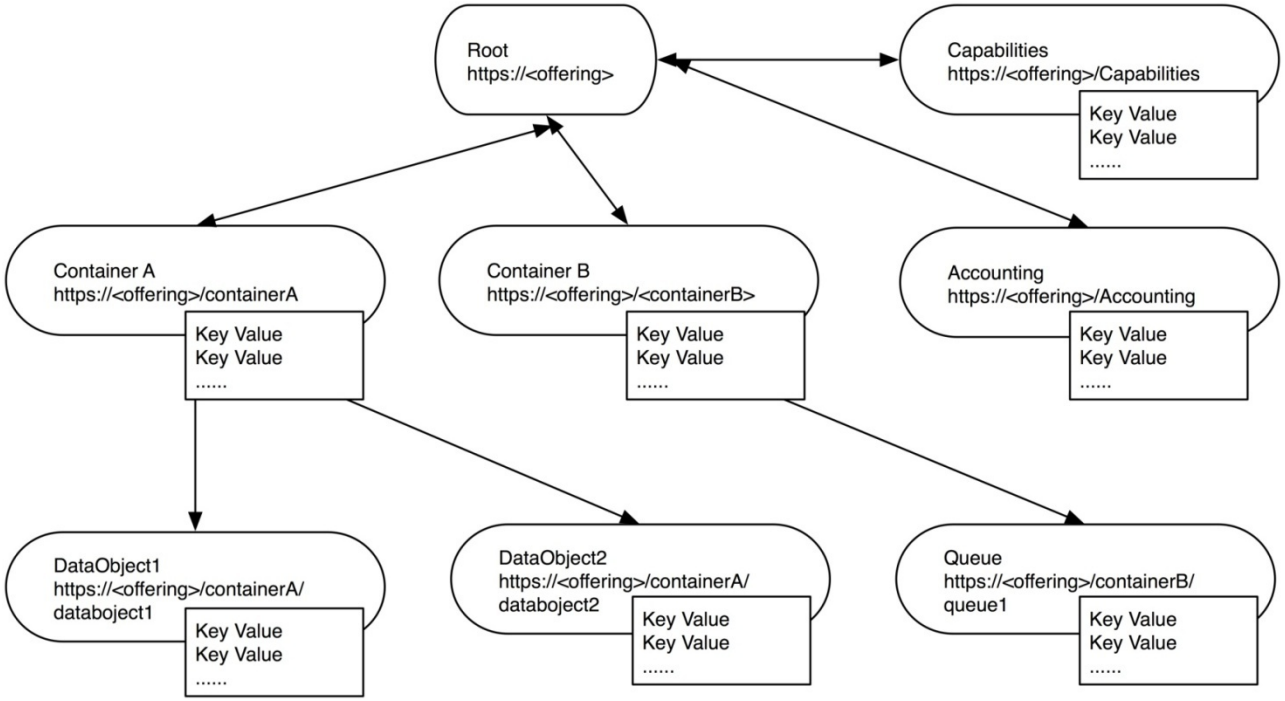
Document Concerns



- Security
  - Who audits?
  - Who ensures compliance/privacy?
- Vendor Lock-In
  - Can you easily migrate data from one cloud storage provider to another?
    - CDMI can help
- Standards
  - Does your potential cloud storage provider utilize open standards or proprietary ones?
    - CDMI can help

Cloud Data Management Interface (CDMI)



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CDMI in Cloud Computing

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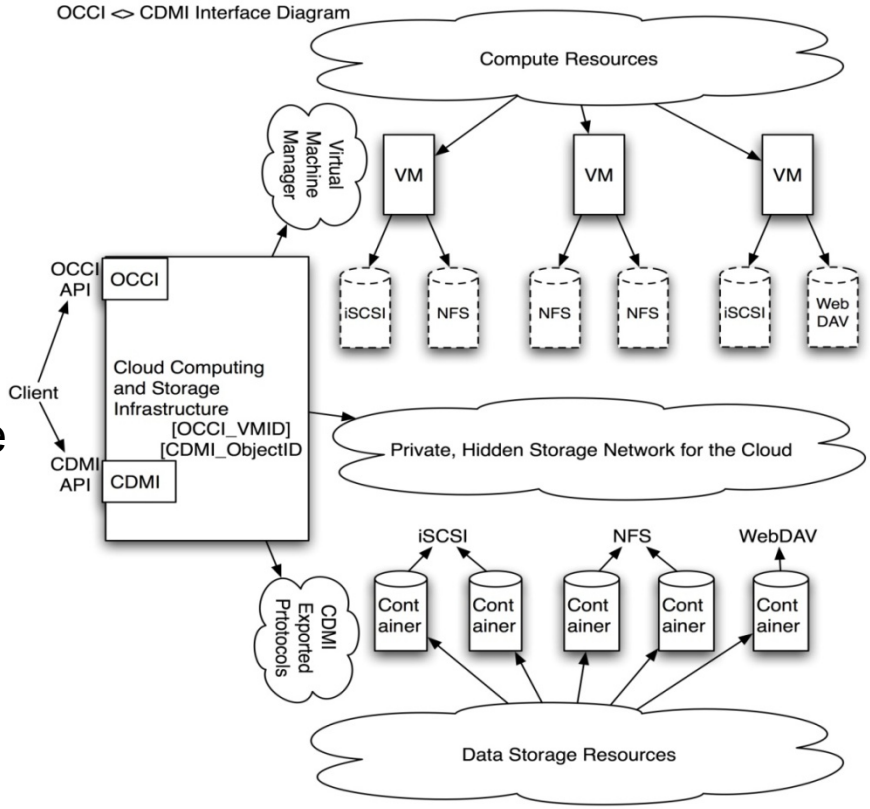
Get whitepaper at snia.org/cloud

A single cloud computing infrastructure can implement both the OCCI and CDMI interfaces

The infrastructure abstracts the configuration of the networking and virtual machine details and uses the standard interface merely to define connectivity

A cloud computing client can then utilize the interfaces to both specify the data requirements and then use that data for guests



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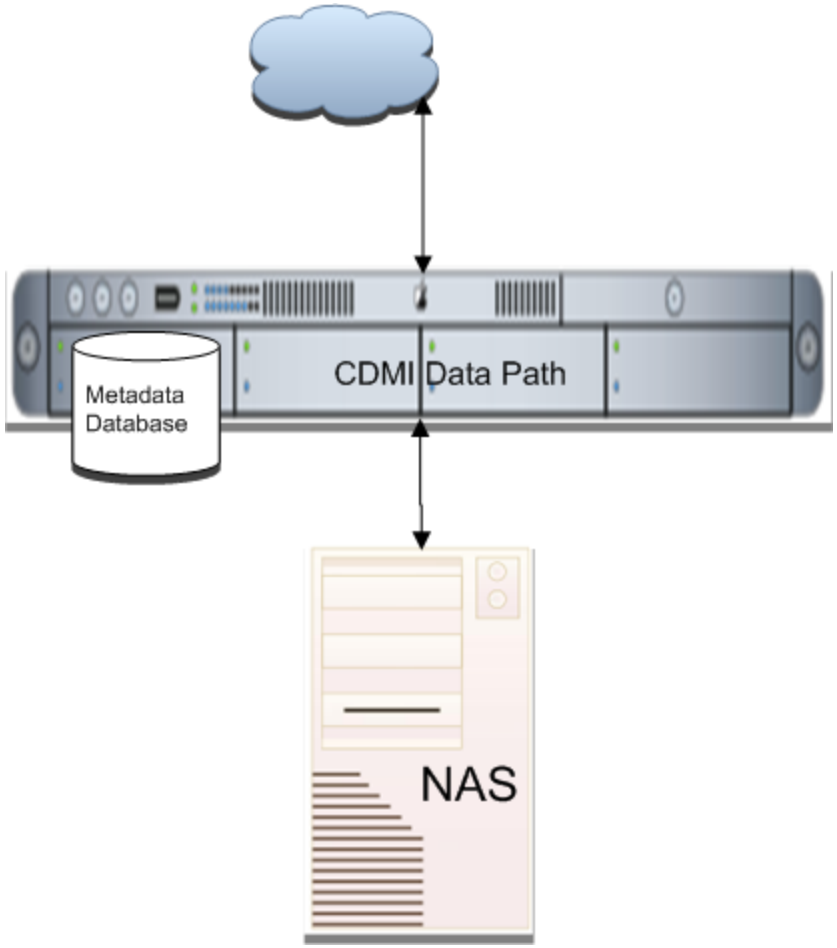
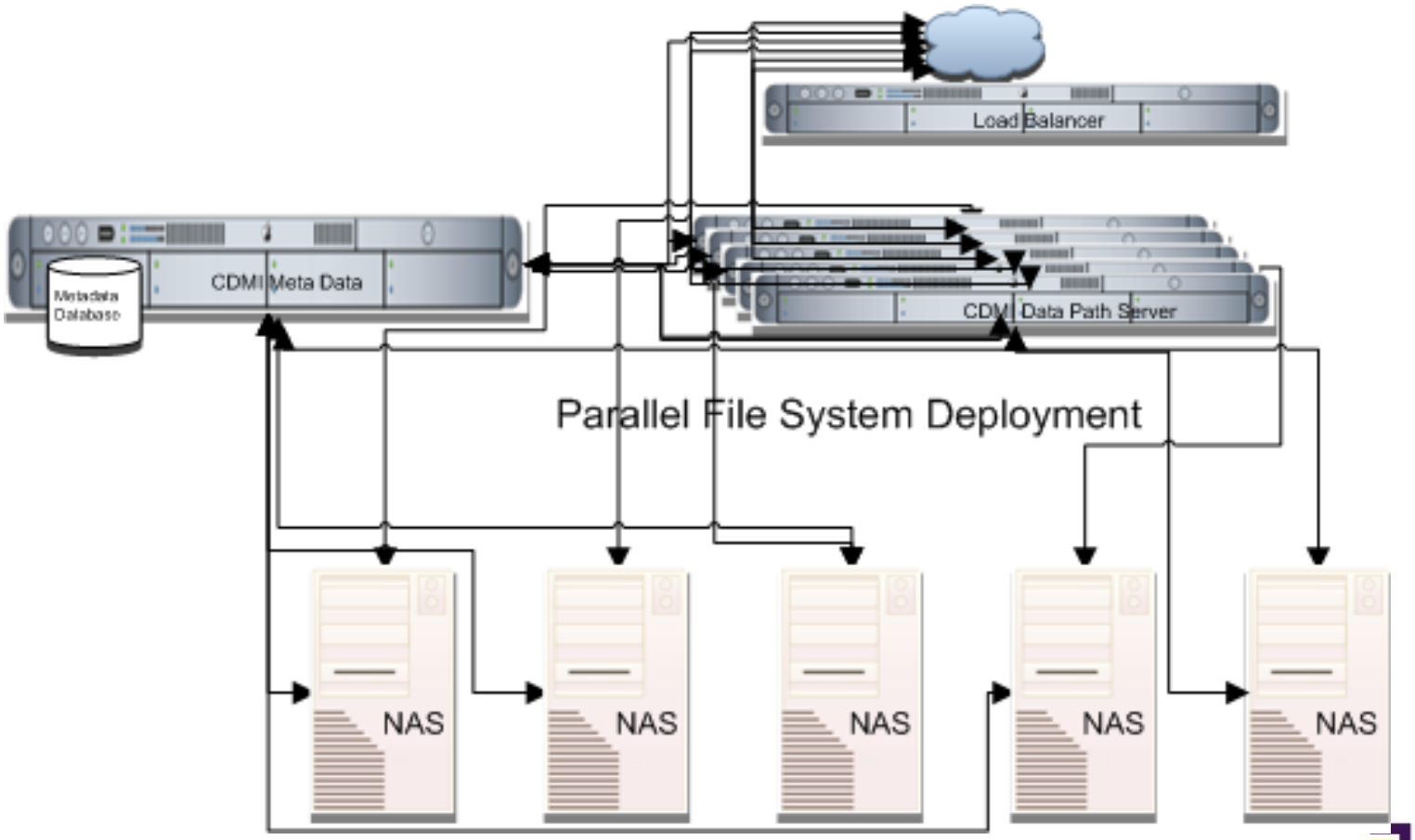
CDMI in Simple Archive Cloud



CDMI Scale-Out



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CDMI Reference Deployment

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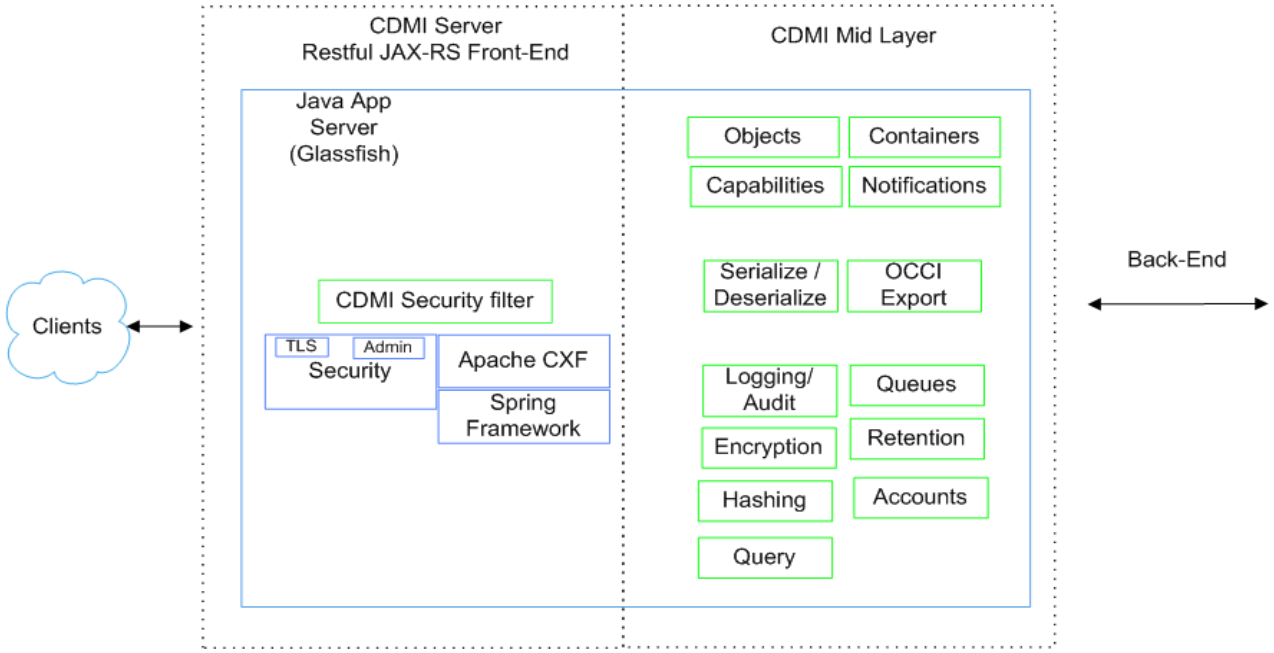
Front End and Middle



CDMI Reference Implementation Architectural Diagram
Green: SNIA Developed Code
Blue: 3rd Party Code

Date: July 20, 2010

Source: CDMI Reference Implementation Developers Guide

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CDMI Reference Deployment

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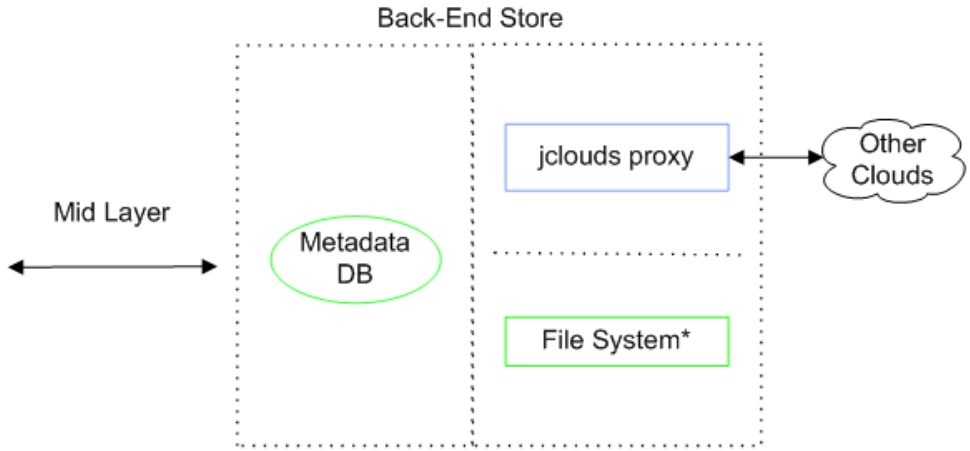
Back-End Reference Deployment



Source: CDMI Reference Implementation Developers Guide

* File System Naming:
Container Objects = Folders named with the container name
Data Objects = Files named with the object name, if one was given, else the Object ID
Metadata = Files named with the same name as the corresponding object with an additional "." in front

Examples:
Container: /mnt/cdmi server/MyContainer
Container Metadata: /mnt/cdmi server/.MyContainer

Data Object's Data: /mnt/cdmi server/MyContainer/MyDataObject.txt
Data Object's Metadata: /mnt/cdmi server/MyContainer/.MyDataObject.txt

Data Object's Data: /mnt/cdmi server/MyContainer/0000706D0010B84FAD185C425D8B537E
Data Object's Metadata: /mnt/cdmi server/MyContainer/. 0000706D0010B84FAD185C425D8B537E

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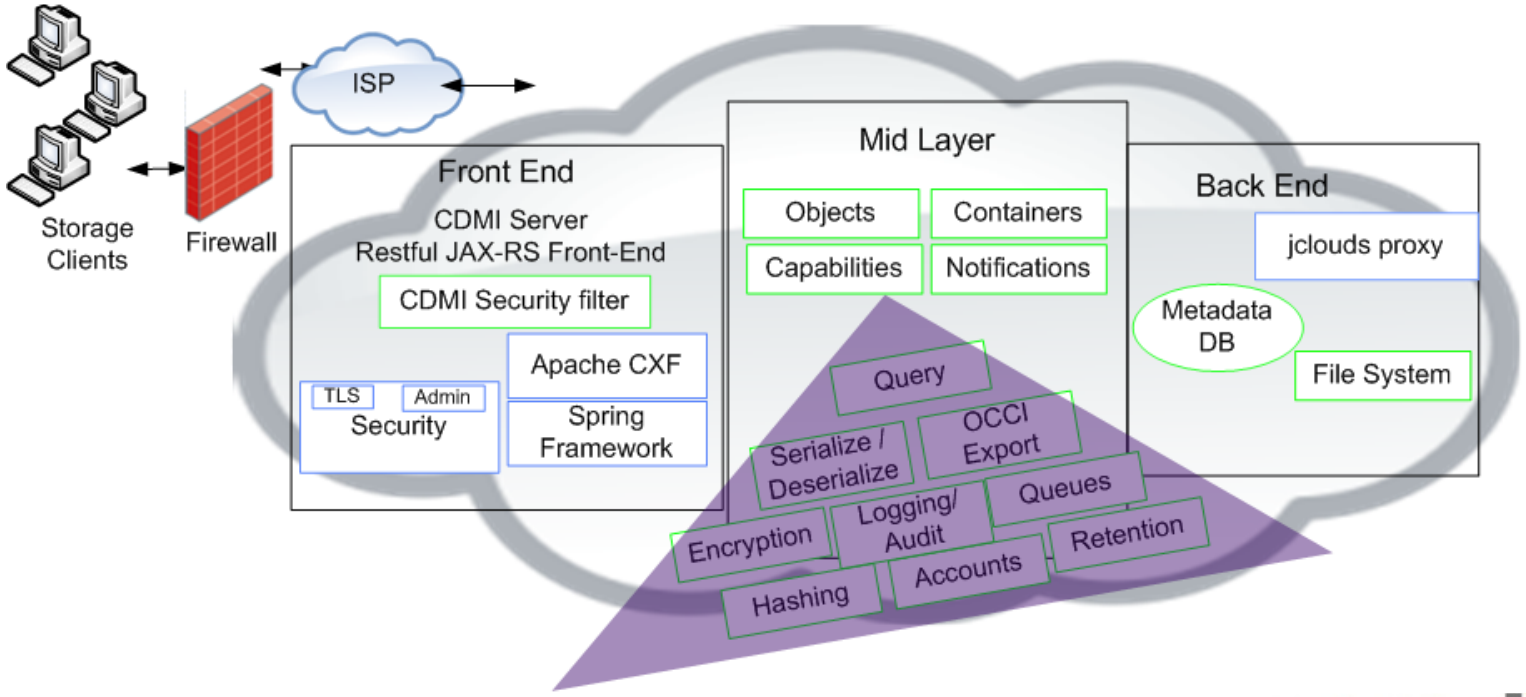
Cloud Storage Prototype

- Begin with bare-bones secured Cloud and phase in functionality:



Cloud Storage Production

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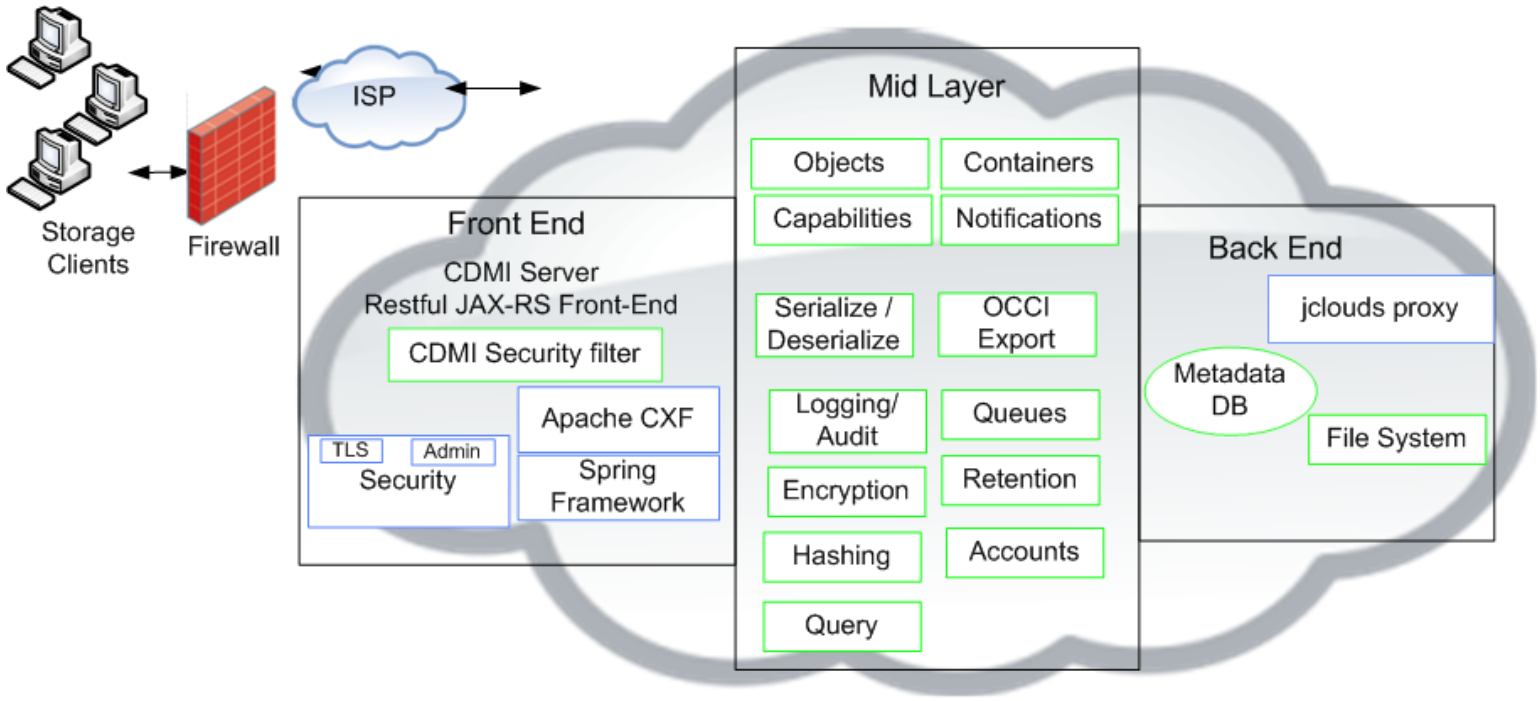
- Expand into a mature Cloud leveraging common framework/ standards:



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Q&A / Feedback

- Please send any questions or comments on this presentation to SNIA CSI: csi@snia.org

Many thanks to the following individuals for their contributions to this tutorial.

- SNIA CSI Education Committee

Marty Stogsdill
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