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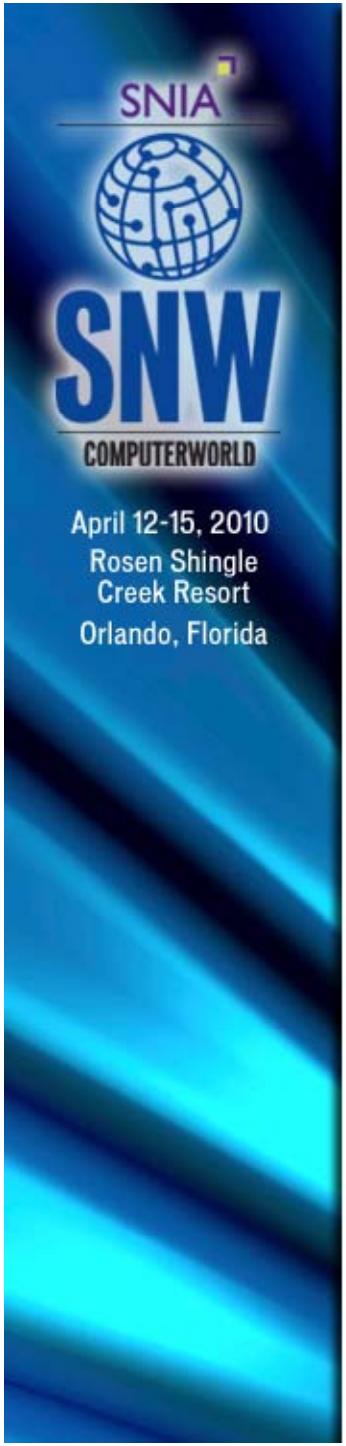

Cloud Storage:
Where Does It Fit Into Tomorrow's IT?

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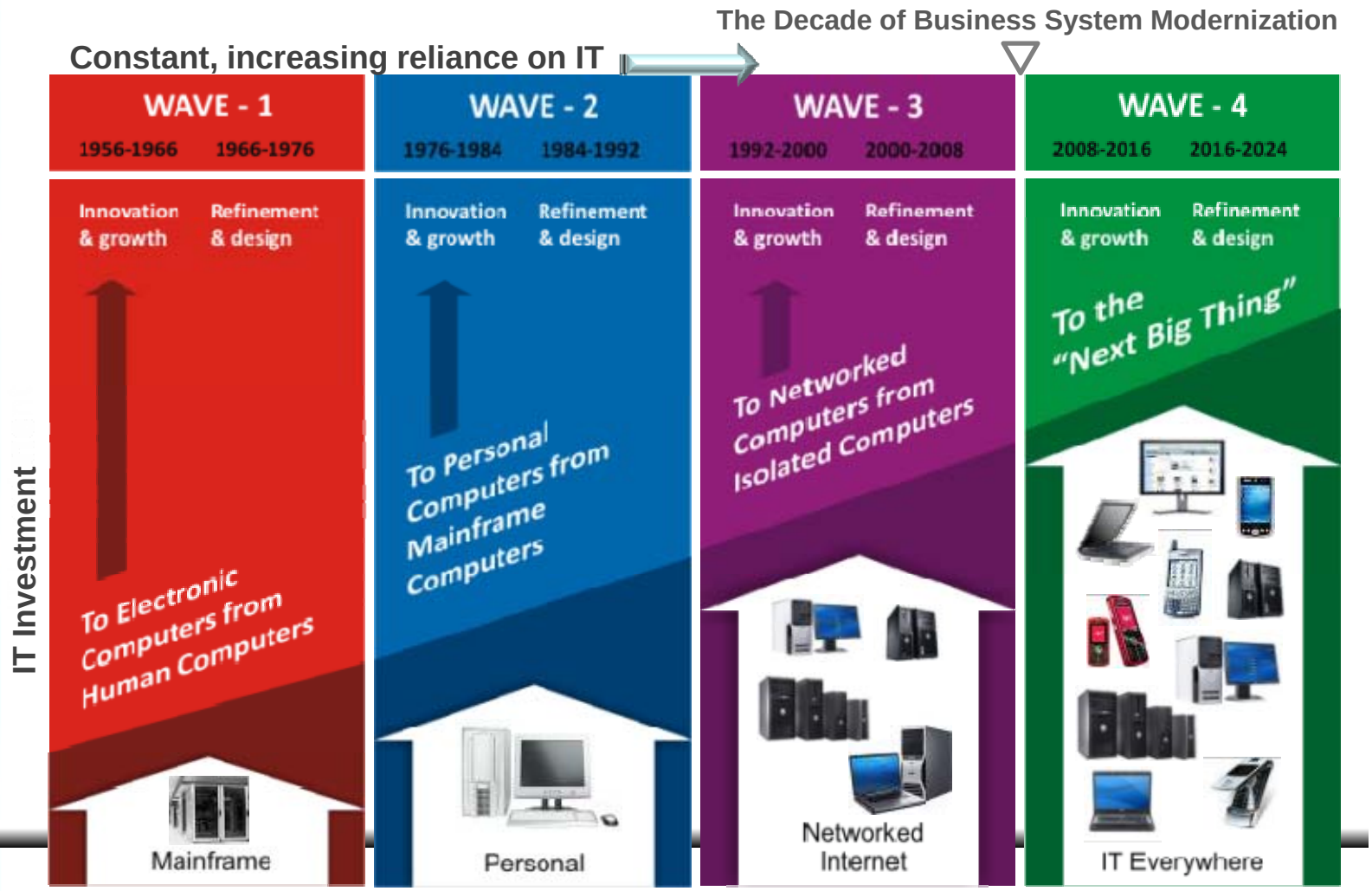
The Evolution of IT



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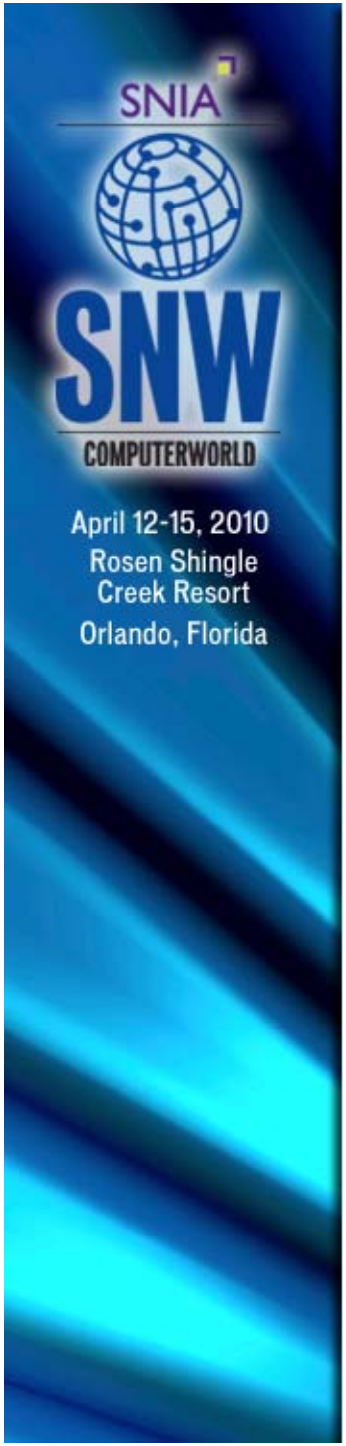
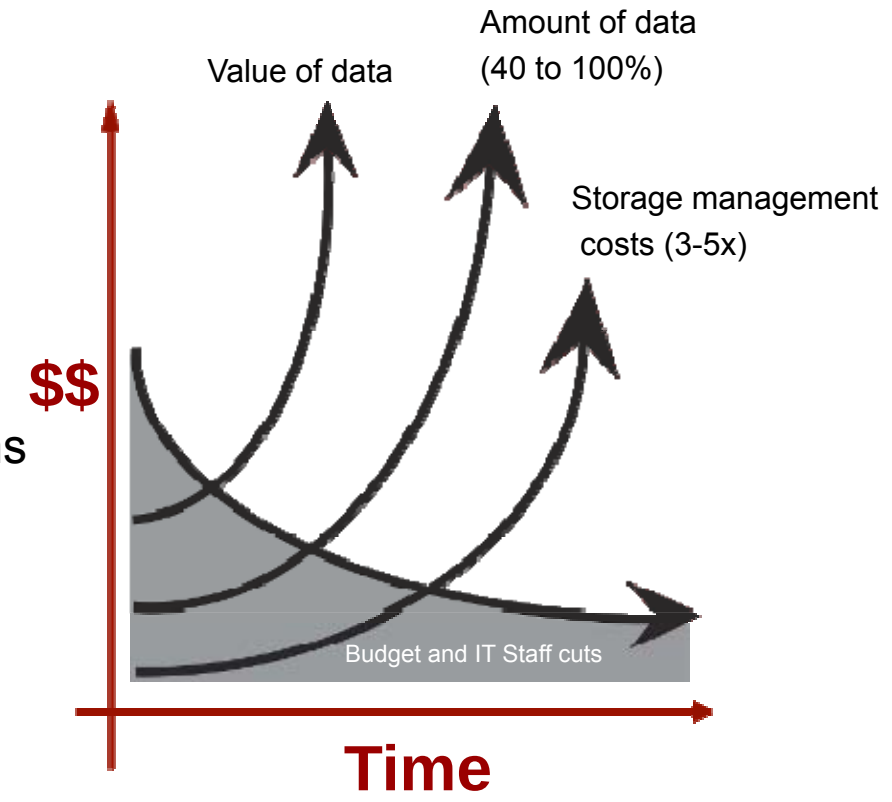
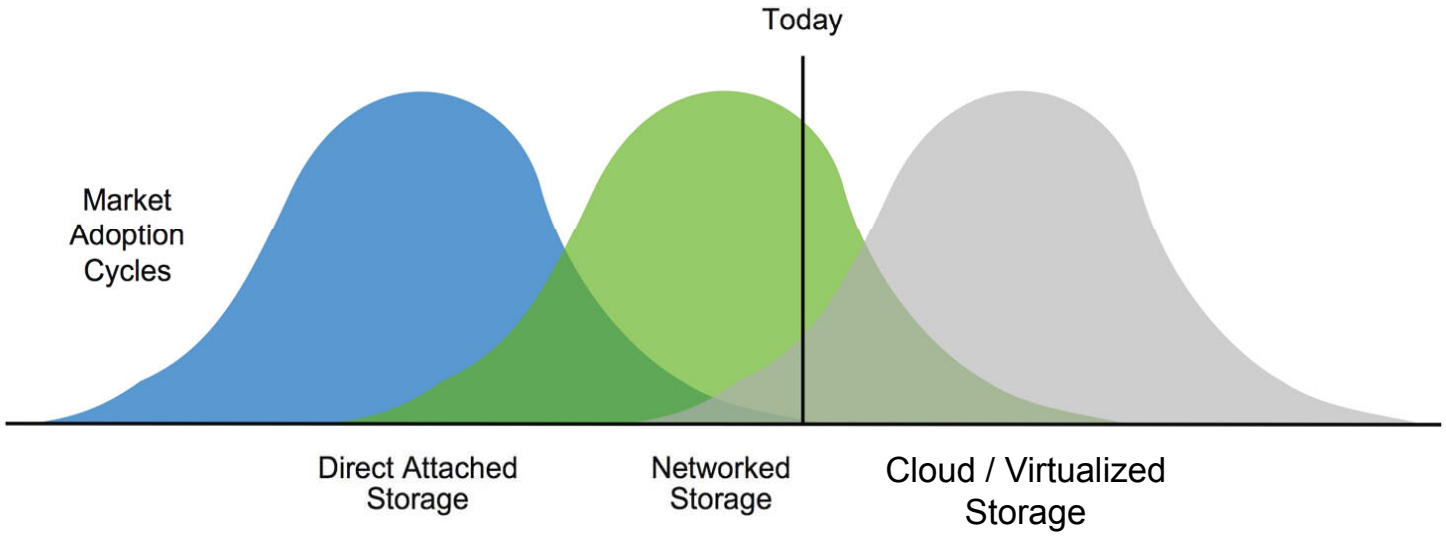


Today's IT Challenges "Do More with Less"

- Increasing Business Demands
- Explosion of new Data Requirements
- Growing Complexity
- Burden of Legacy Systems
- Staffing
- Low Utilization



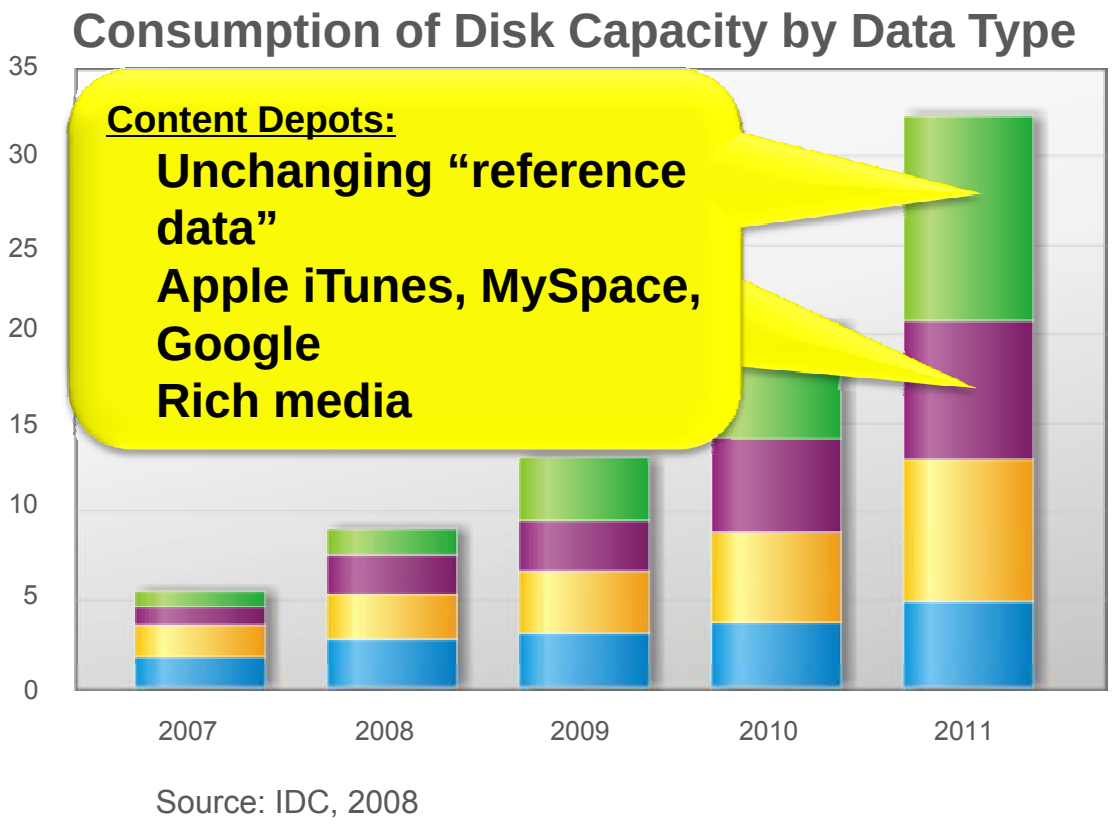
Paradigm Shifts: Storage 3.0



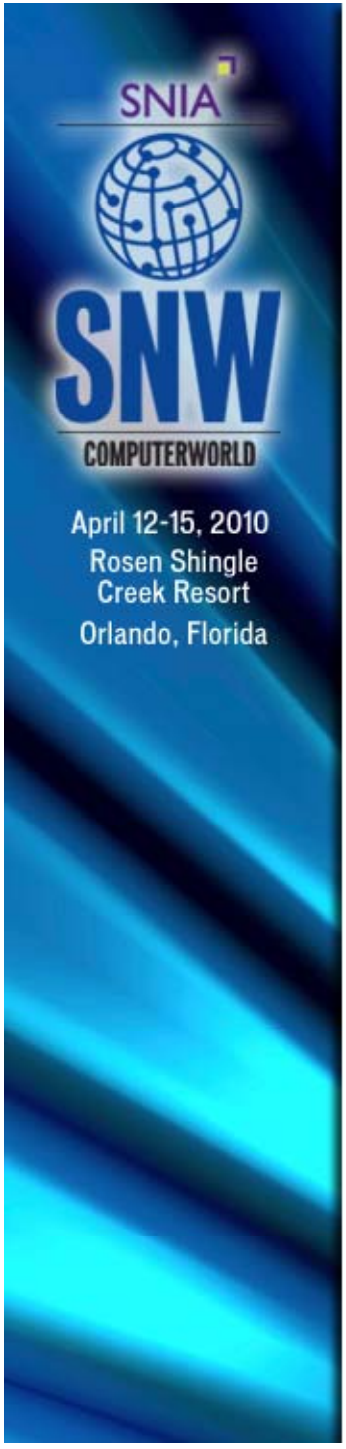
- **Networked Storage** (NAS/SAN) consolidates and virtualizes **disks** (capacity) for improved provisioning flexibility and efficiency
- **Cloud-based or Virtualized Storage** consolidates and virtualizes disks **and controllers** to scale capacity **and** performance, to provide enhanced resiliency, while reducing both CAPEX and OPEX for service providers and end-users

The Evolution of Data

Unstructured data and content depots are driving data growth



Source: IDC, 2008



Cloud Definitions

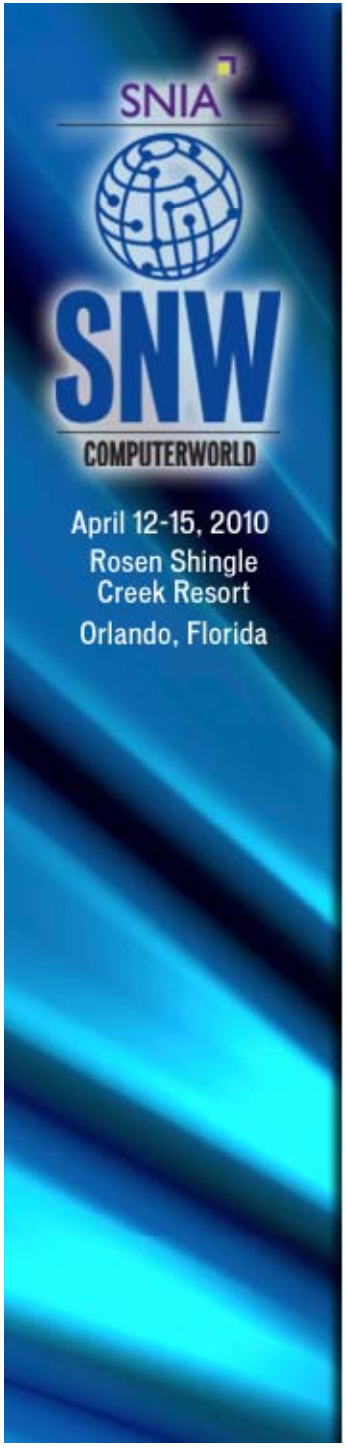
Cloud is a way of using technology, not a technology in itself – it's a self-service, on-demand pay-per-use model. Consolidation, virtualization and automation strategies will be the catalysts behind Cloud adoption."

– The 451 Group

Key characteristics of the Cloud are:

- The ability to scale and provision dynamically in a cost efficient way
- The ability to make the most of that power without having to manage the complexity of the underlying technology

The Cloud architecture can be private (hosted within an organization's firewall) or public (hosted on the internet), and hybrid use cases



NIST* Cloud Computing Attributes

On-demand self-service

- *A consumer can unilaterally provision computing capabilities as needed automatically without requiring human interaction with each service's provider.*

Broad network access

- *Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms.*

Resource Pooling

- *The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.*

Rapid Elasticity

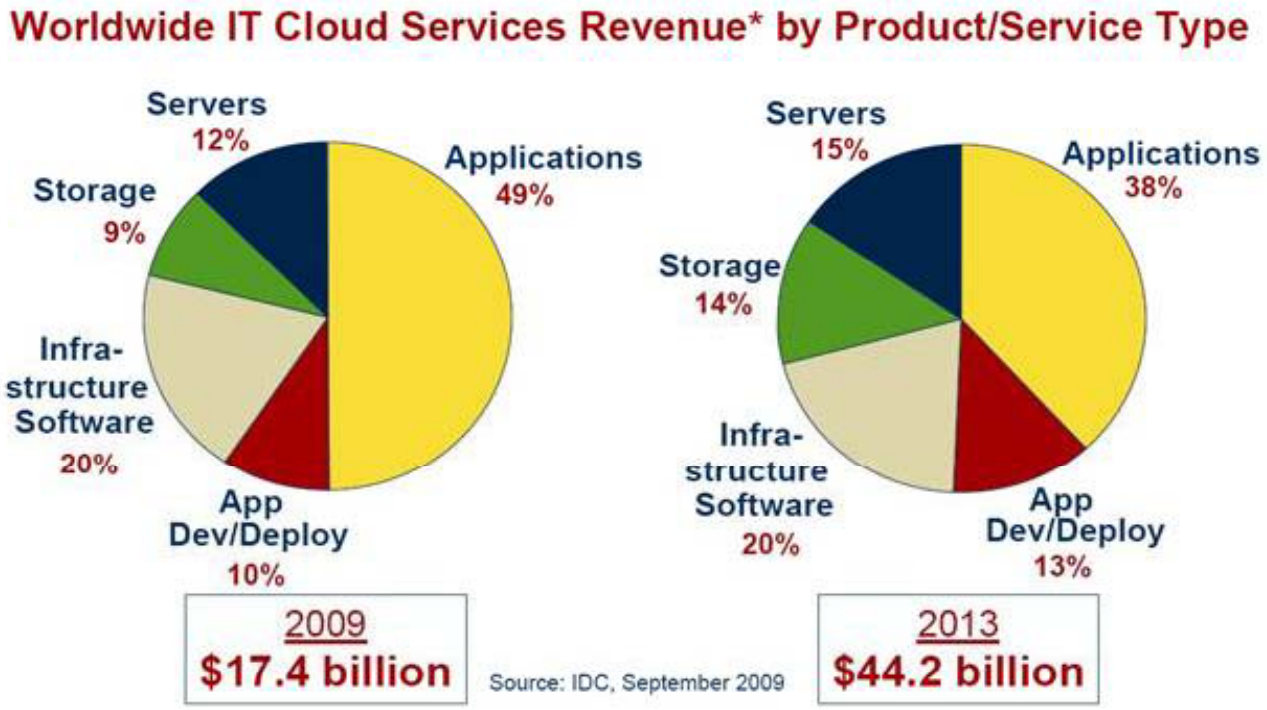
- *Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in.*

Measured Service

- *Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service.*

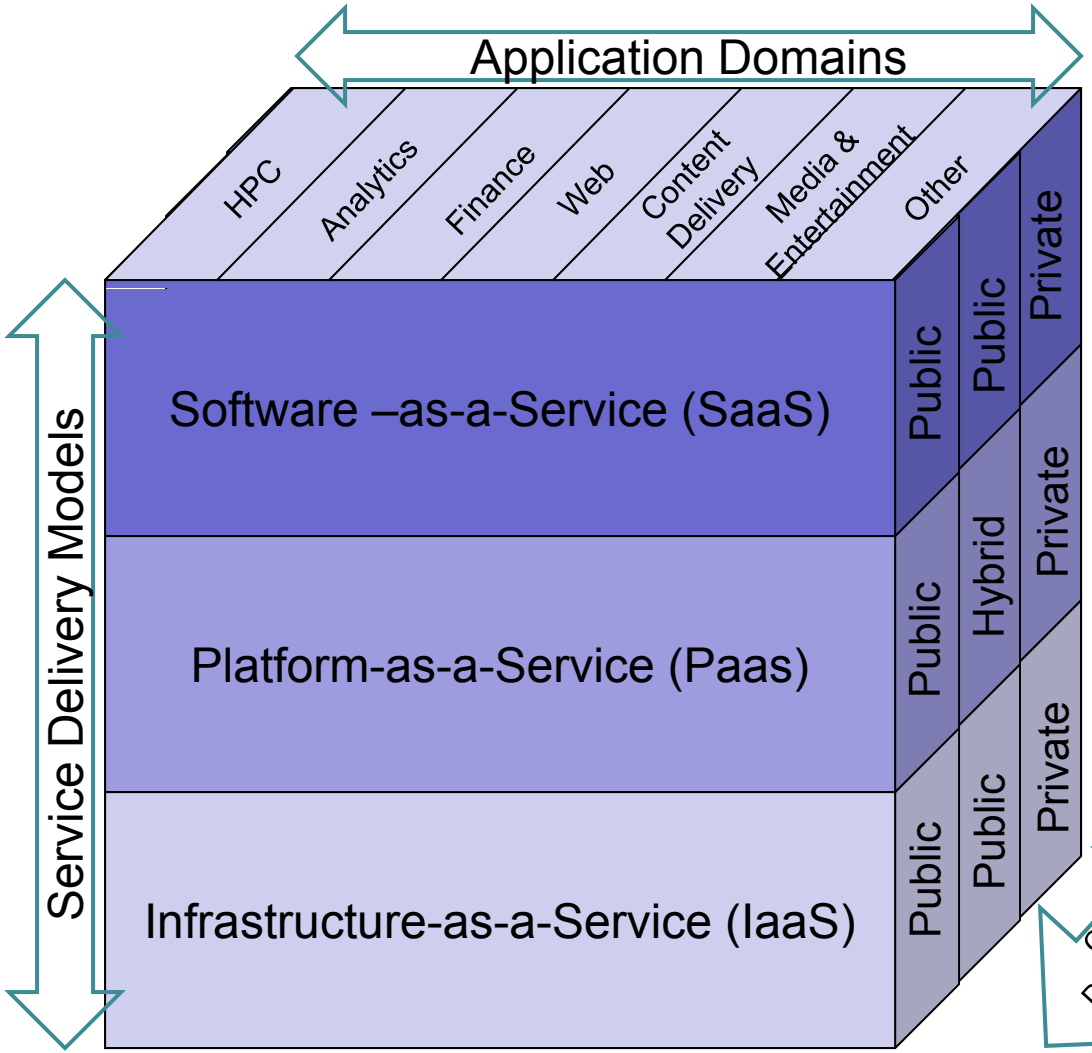
* National Institute of Standards and Technologies – nist.gov

Cloud Storage Spending



- **Storage will outgrow all other types of Cloud IT spend**
- Important to choose the right storage vendor
  - Quality, longevity
  - Features and functionality
  - Price/performance, cost per terabyte, price granularity

SPI* Service Model

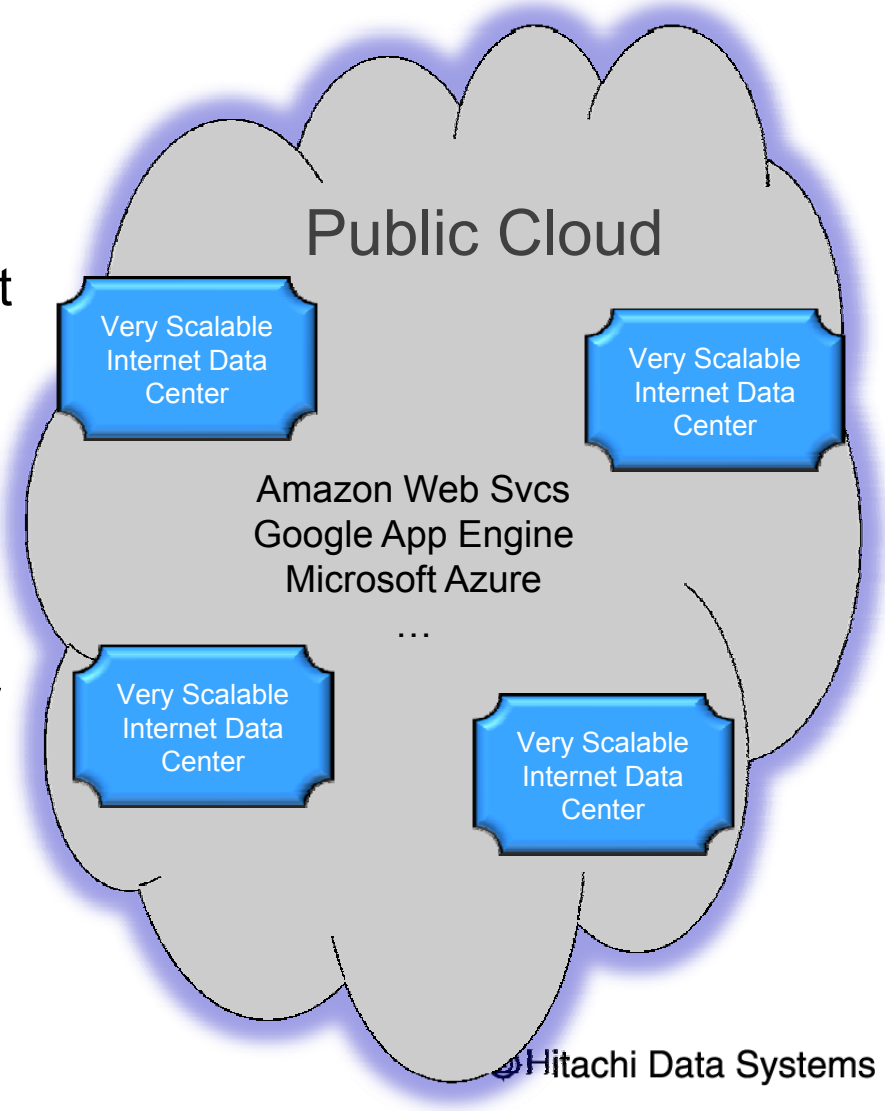


SOURCE:
Cloud Security and Privacy,
Mather, Kumaraswamy, Latif, 2009, O'Reilly,
ISBN: 978-0-596-80276-9.

* Service Provider Interface

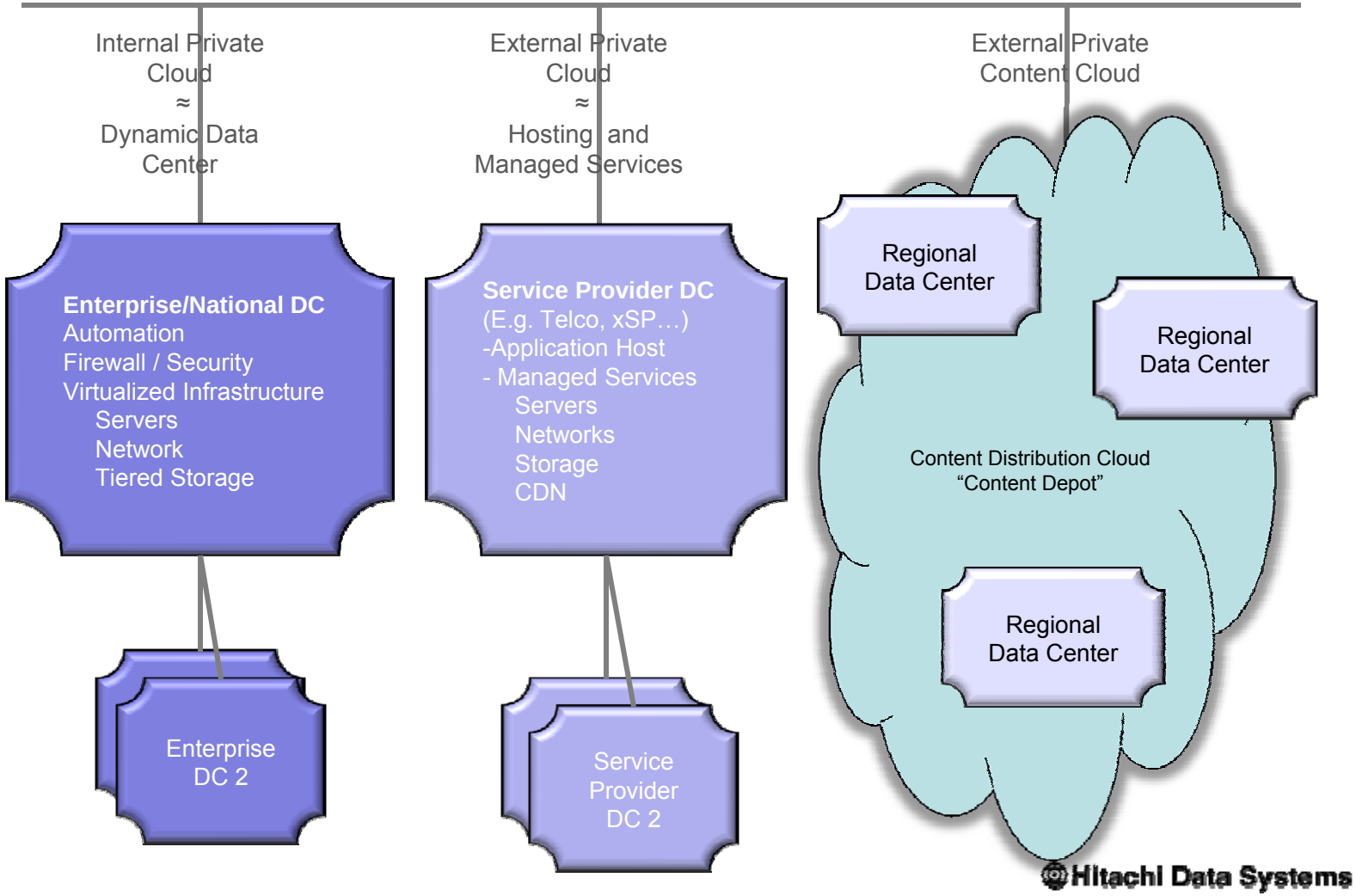
Characteristics of Public Cloud

- Illusion of infinite resources available on demand
- Elimination of an upfront commitment by cloud users
- Ability to pay for use on a short term basis as needed
- Services accessed over the Internet
- Service Level Agreement

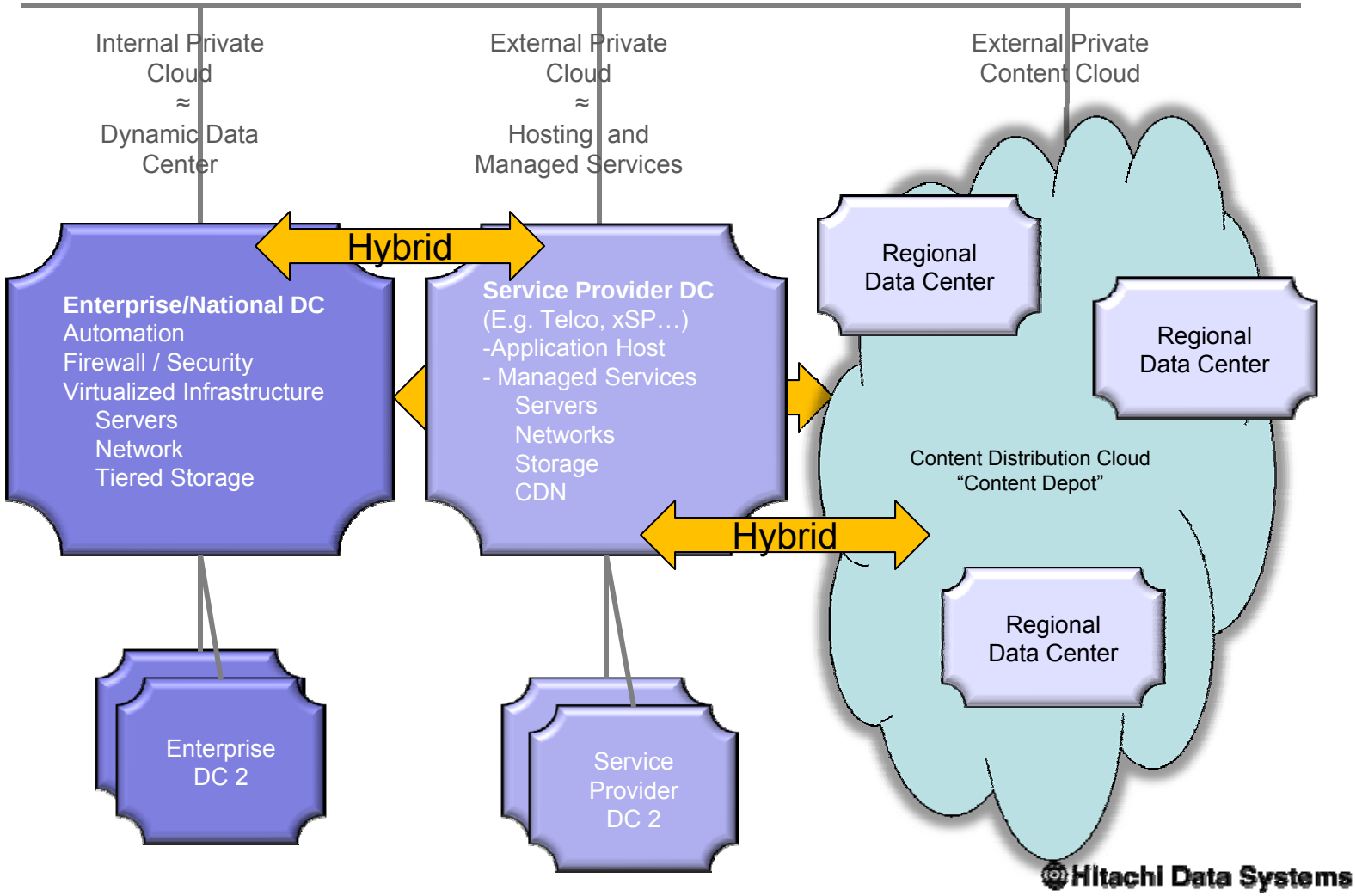


Characteristics of Private Cloud

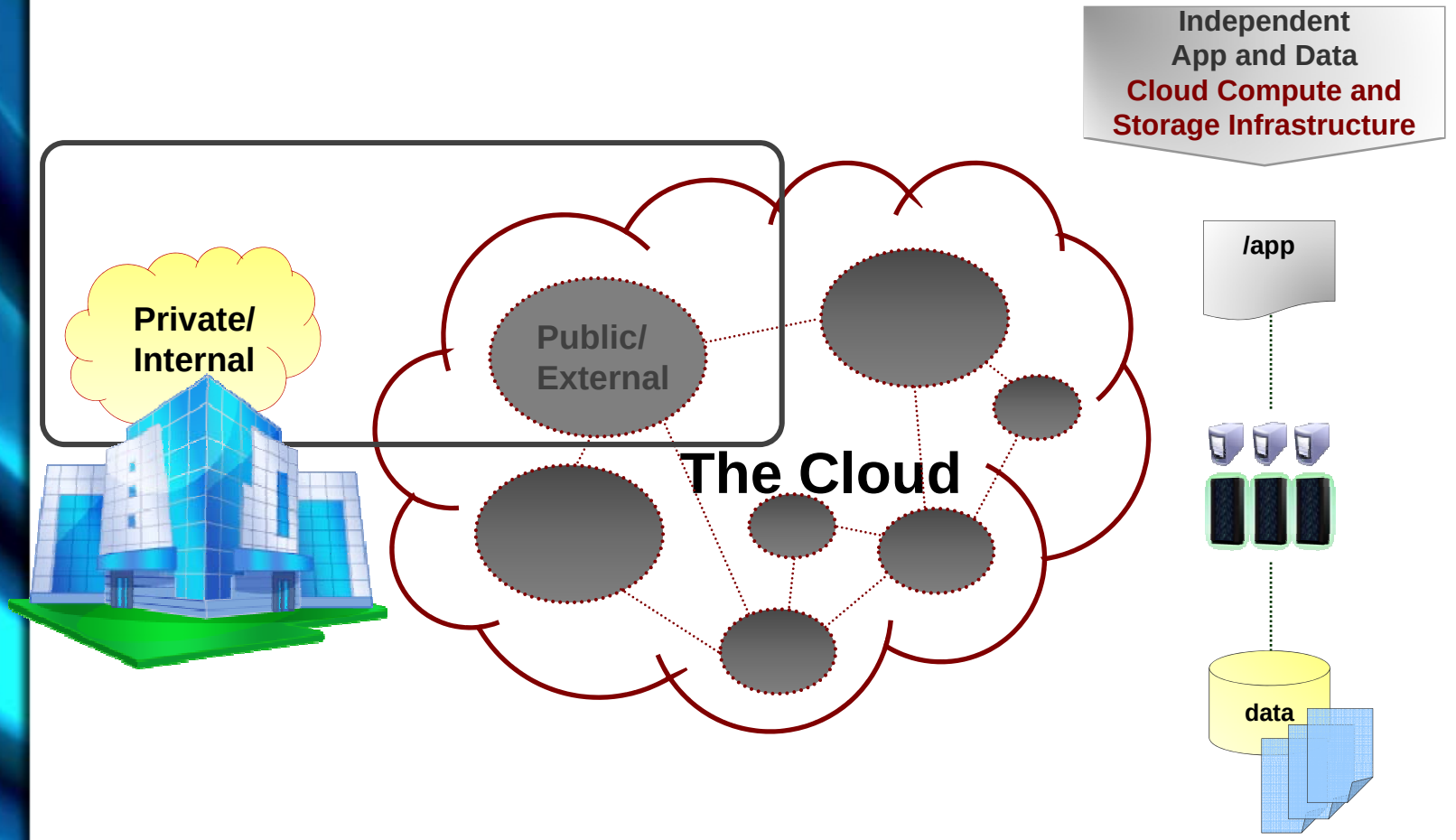
Private Cloud = Services delivered behind the firewall from Cloud-like infrastructure



Characteristics of Hybrid Cloud



Where Is Cloud Deployed?



A Simple Taxonomy: Cloud Services

Lower SLA

Higher SLA

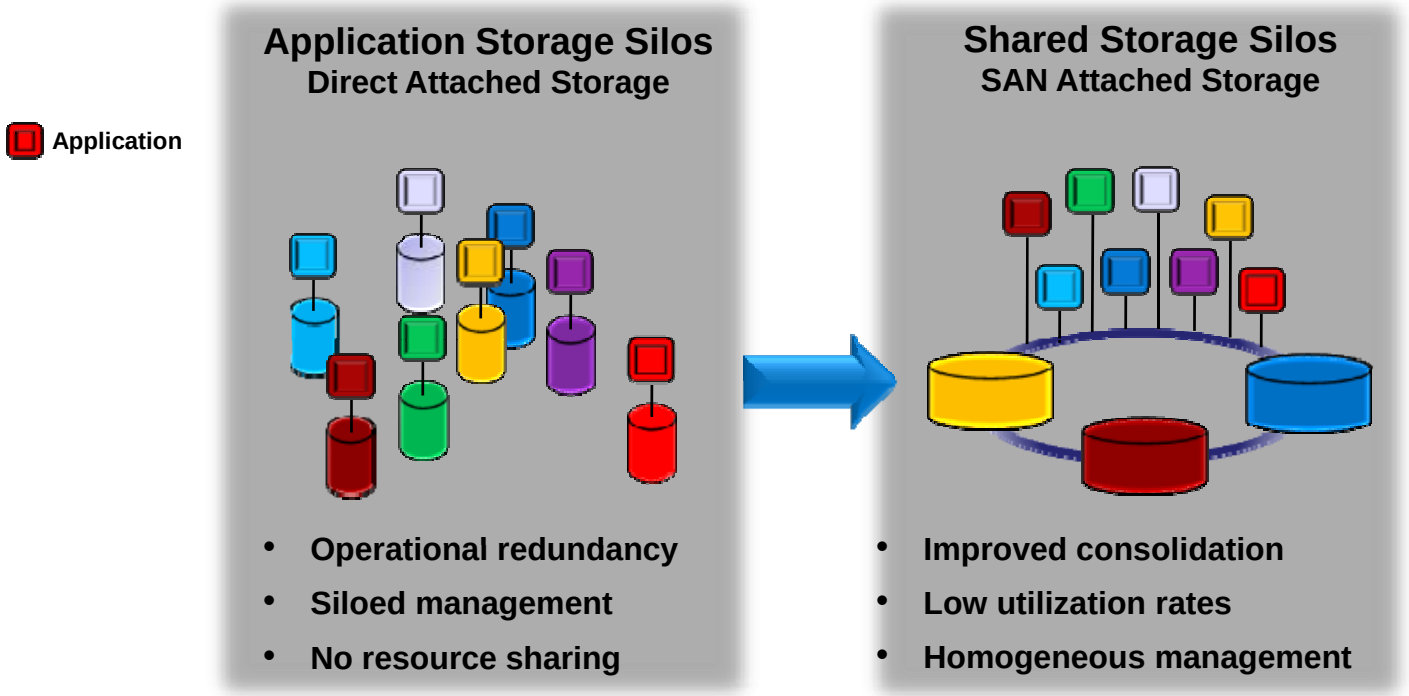
Public Clouds Non-IT	✓ *General access* ✓ *Low security* ✓ *Low SLAs* ✓ *Cheap or free*	**Examples:** Facebook, LinkedIn, iTunes
Public Clouds Consumer		**Examples:** Yahoo Mail, Google Apps, SWaaS
Public Clouds SME/Enterprise	✓ *Limited access* ✓ *Inter/Intranet delivery* ✓ *Defined SLAs* ✓ *Security*	**Examples:** Pay per use - $GB Utility
Hybrid Clouds		**Examples:** Trusted SP/SI/Telco
Private External Customers only	✓ *Inter/Intranet delivery* ✓ *Data Center Security/firewalls* ✓ *Enterprise SLAs*	**Examples:** SaaS, STaaS
Private Internal Employees Only		**Examples:** IaaS

Why Cloud 

- Offload storage acquisition and management costs
  - Move from larger CAPEX => smaller OPEX
  - Move from “Fixed Costs” => “Variable Costs”
- Provide elasticity
  - Grow or shrink capacity and resources on demand
- Simplify deployments
  - Speed time-to-value
- Support business user groups’ requirements
  - Speed time-to-market
  - Mitigate risk and maintain control
- Enable choice
  - Multiple SLA options
  - Value-added features

IT Evolution - Virtualization

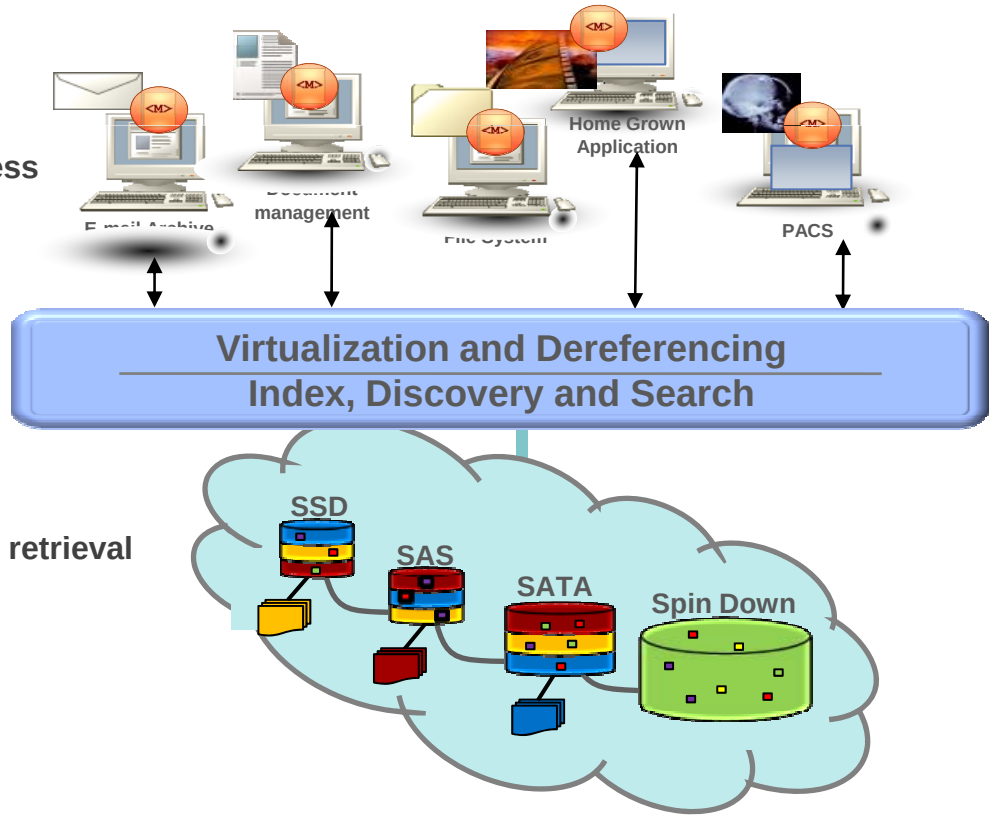
- The role of storage virtualization in the data center has become more strategic to sustainable efficient infrastructures
- Past focus on storage infrastructure



IT Evolution:

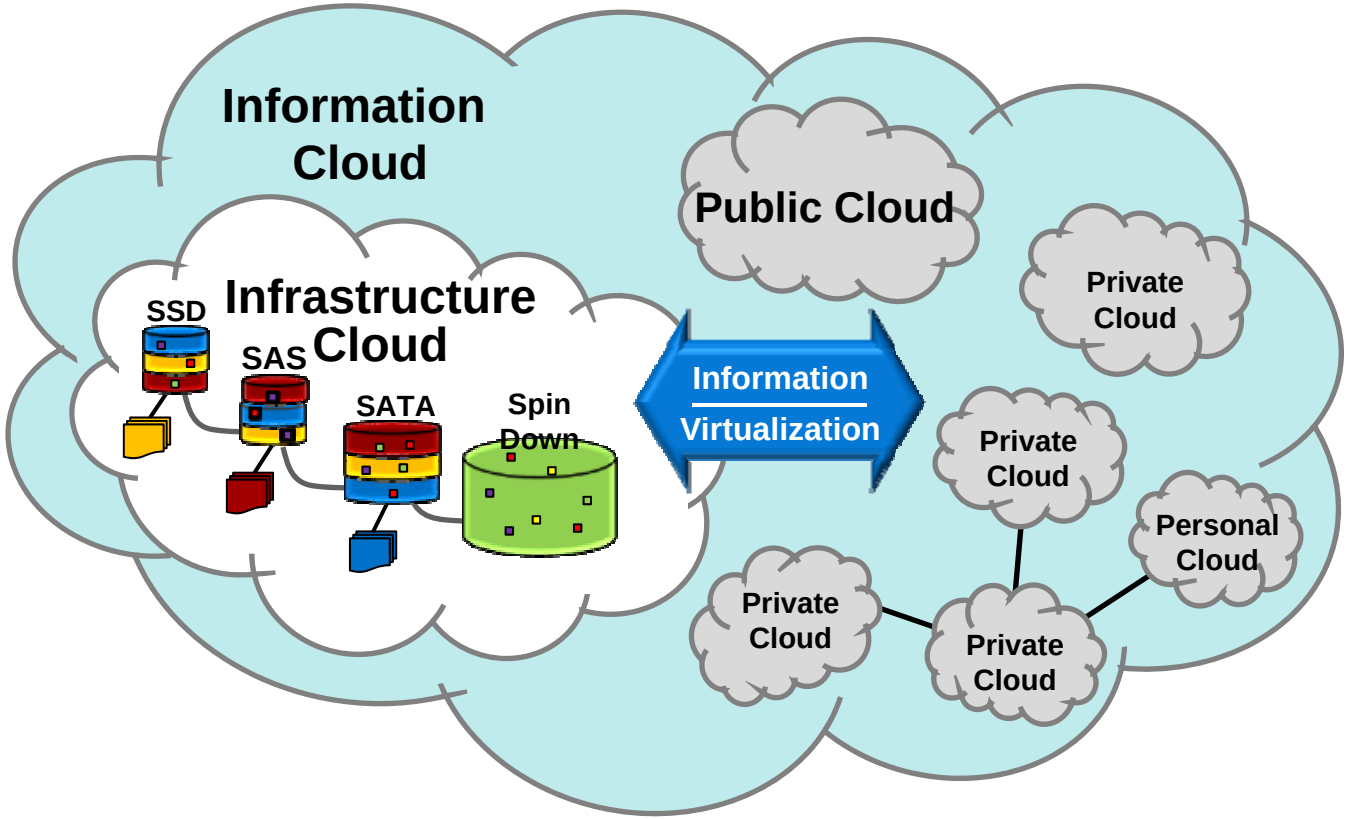
Active management of Data and Information Over Time

- Application/owner policy
- Taxonomy, collaboration, business process of application and data
- Data/information requestors
- Common data governance
- Dynamic lifecycle management
- Seamless search, discovery and retrieval across apps, media, time.
- Central data repurposing
- SCALE



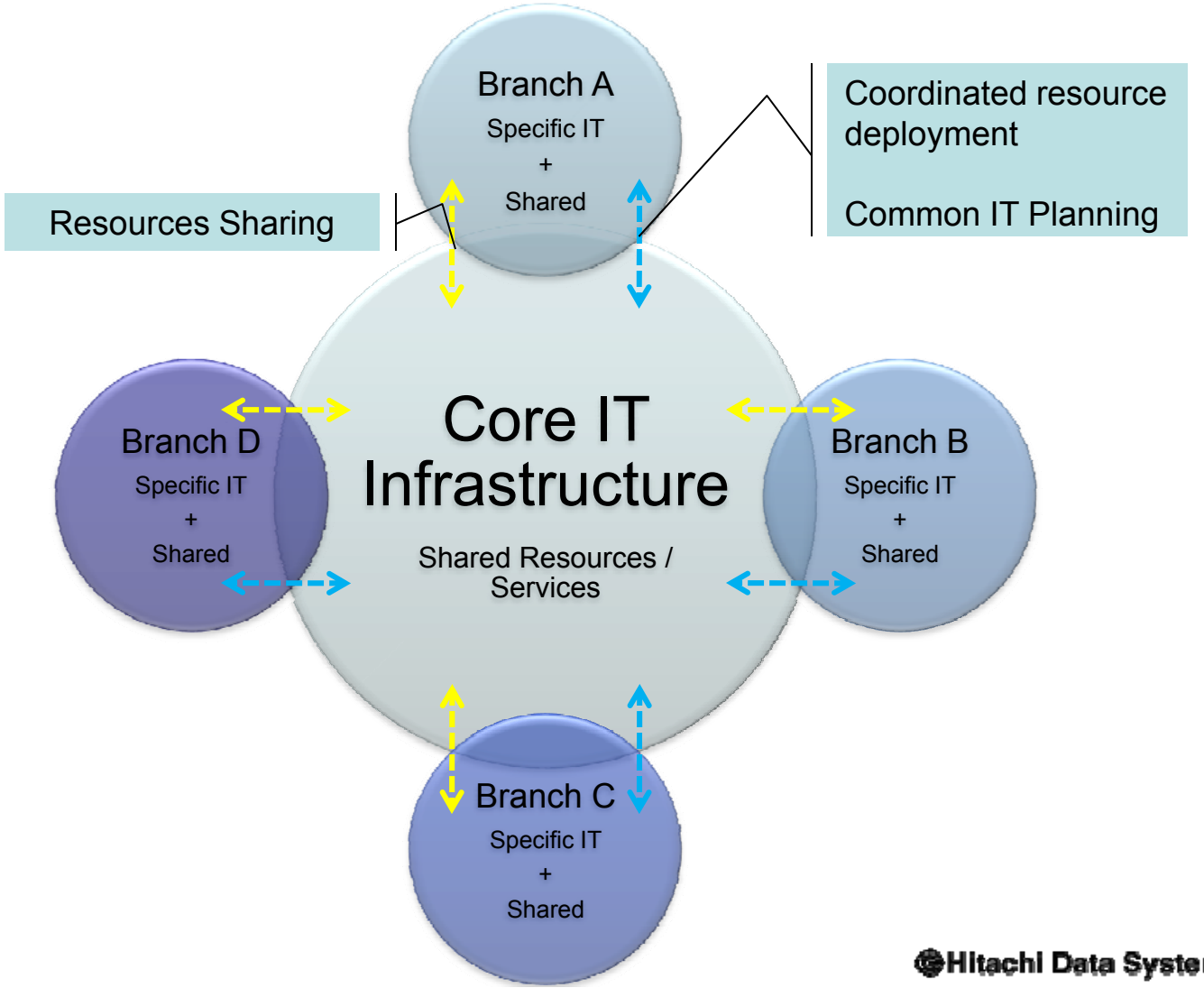
Data Center → Information Center

Near Future: The Information Centre

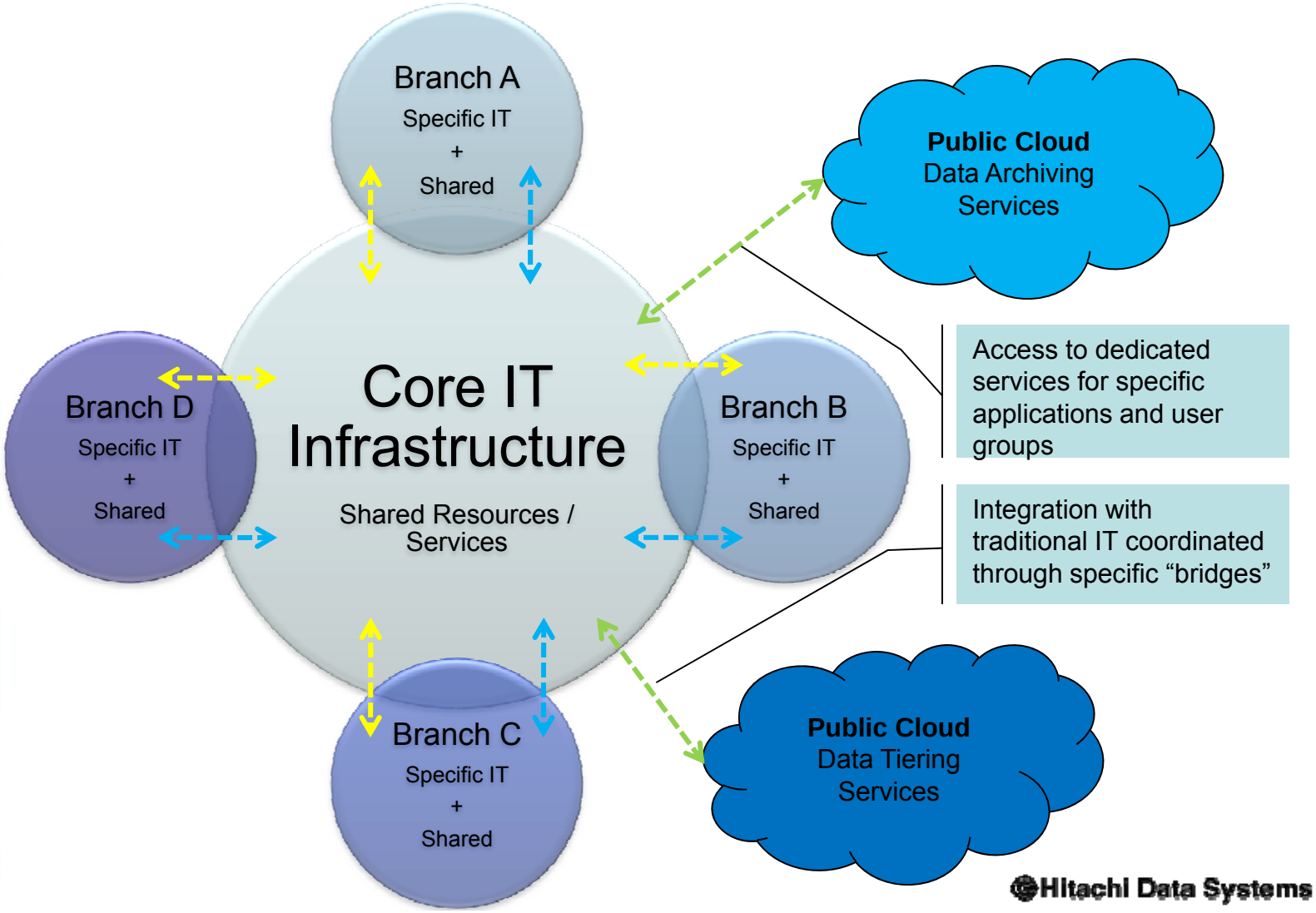


- Effective information center depends on virtualized data center
  - Seamless access and integration of virtualized data
  - Object catalog and index allows application independent information clouds

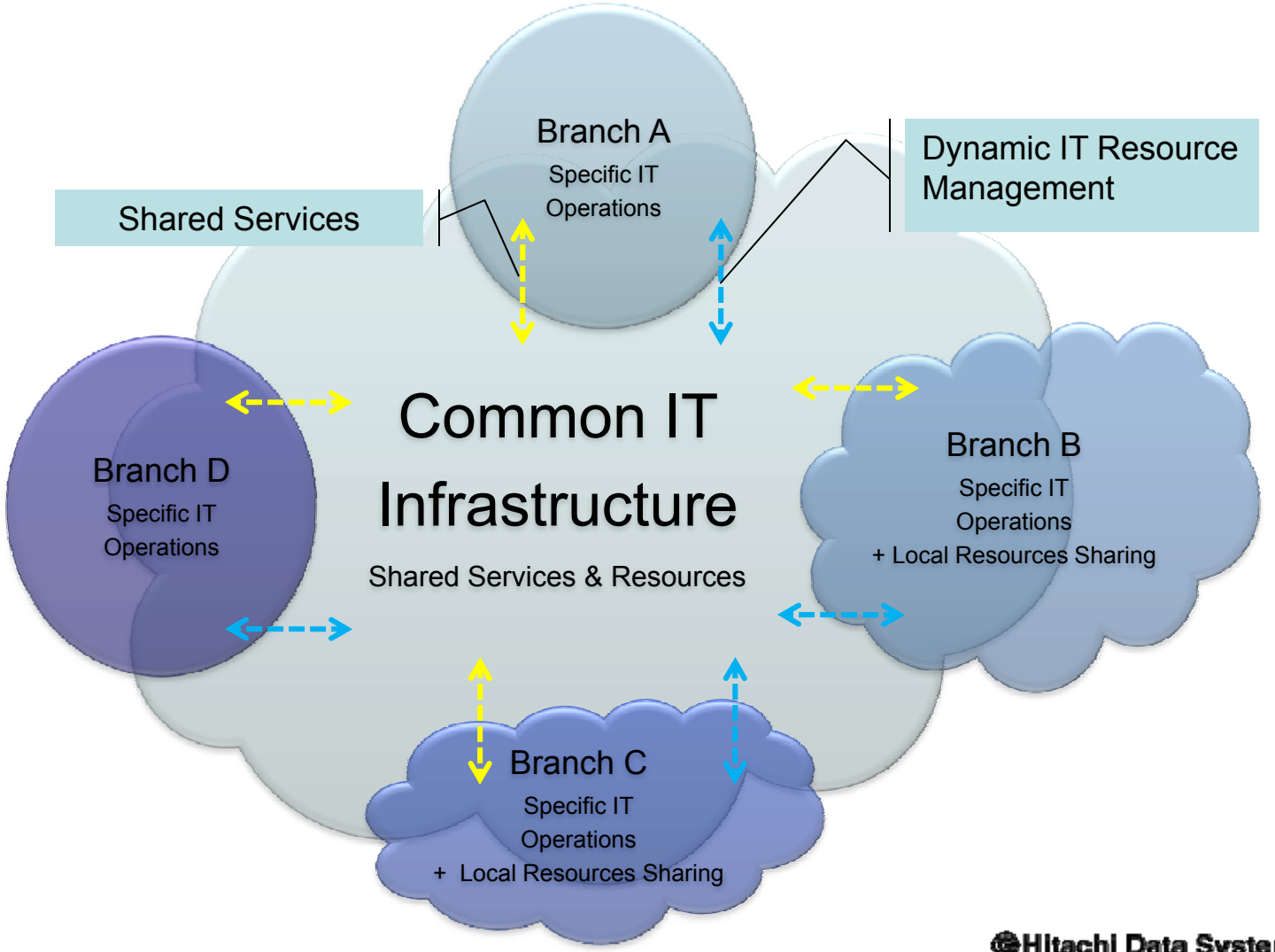
Distributed Enterprise



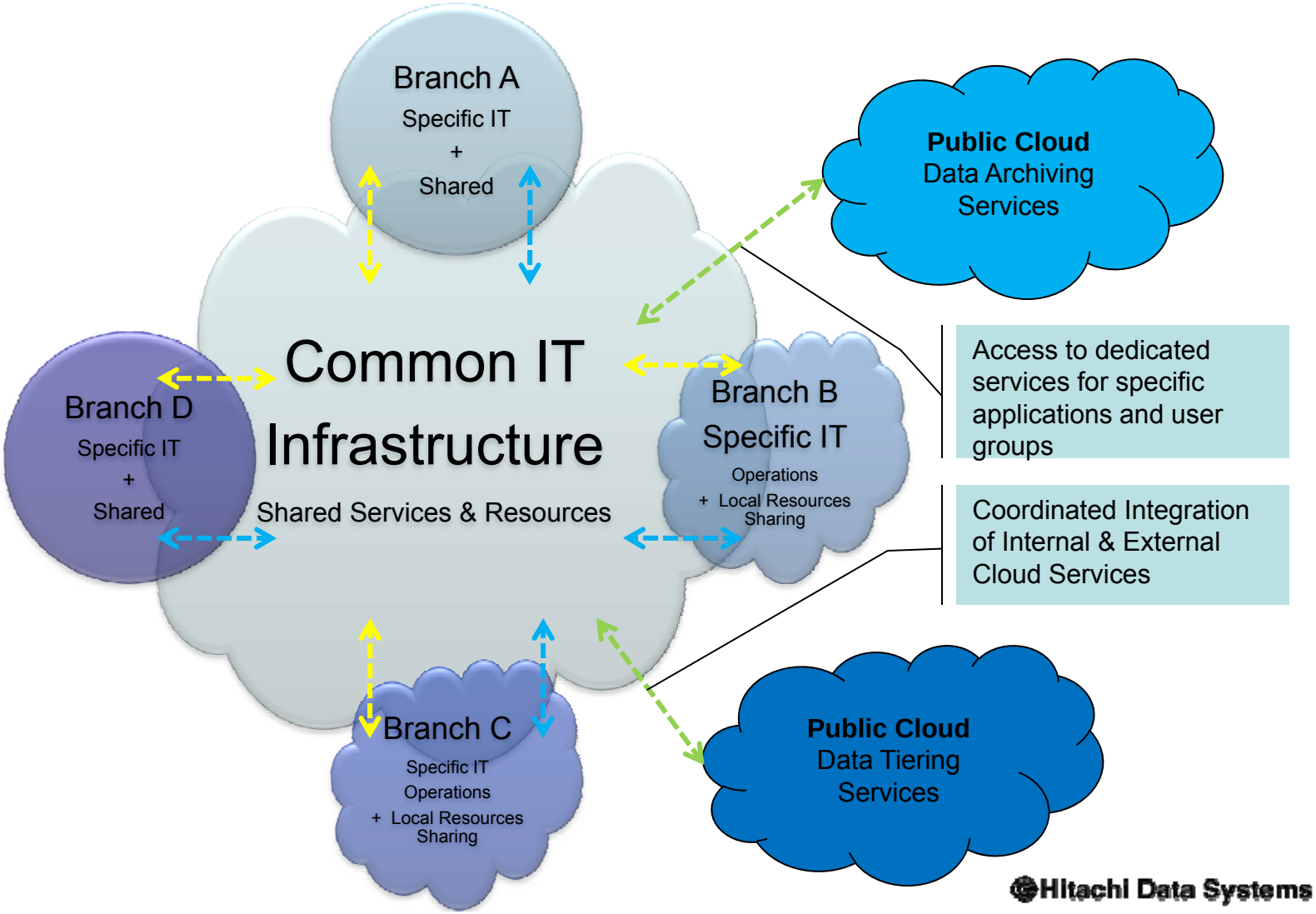
Enters (Public) Cloud

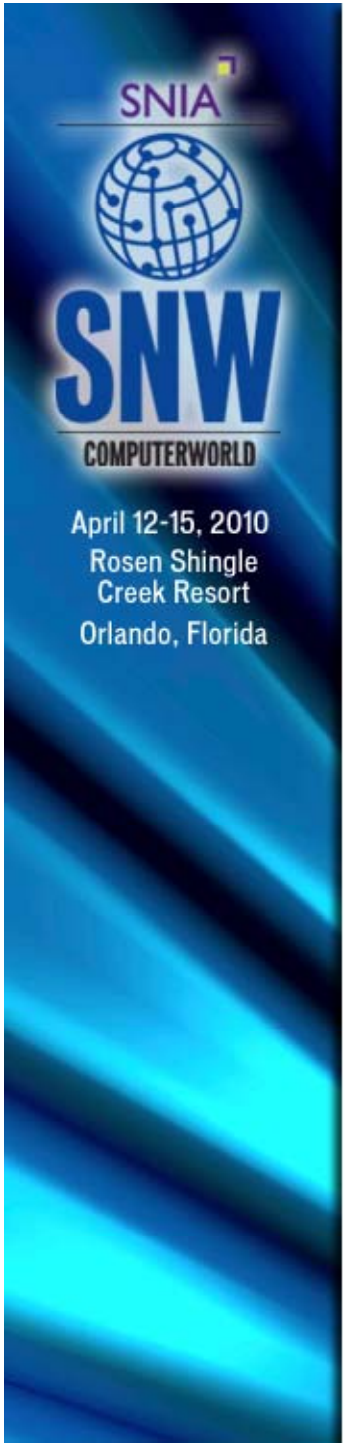


Enters (Private) Cloud



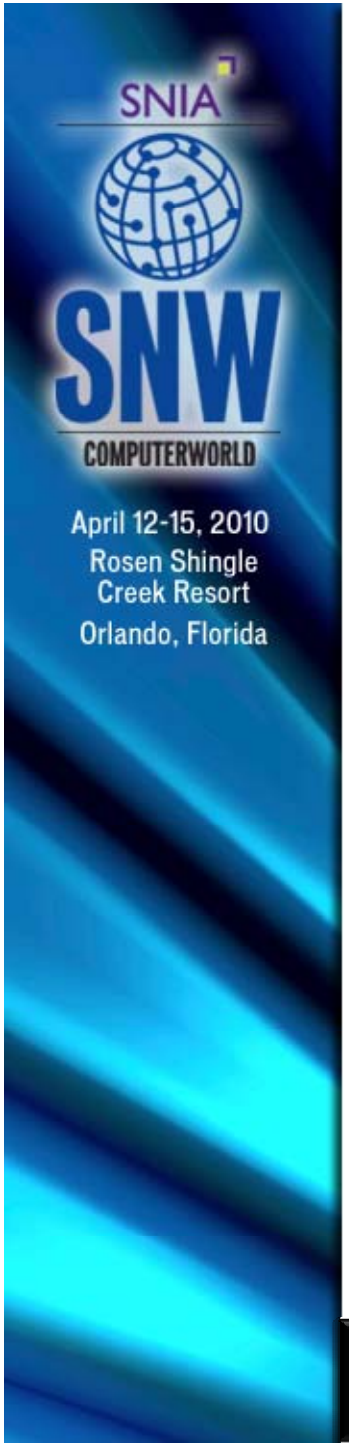
Enters (Hybrid) Cloud





What Cloud Will Inevitably Challenge

- The Network with a big N
  - Can Networks cope with the increase in data traffic due to Clouds?
- Security & Privacy, Technologies & Policies
  - Will it be “safe enough” and can I manage it to my standards?
- Data Centres
  - Service Subscriber: What do I need to do to consume Cloud services efficiently?
  - Service Provider: What Do I need to do to provide adequate services at the right price level?
- Source of IT
  - Which services are likely candidates to be shifted to the Clouds?
- Expertise for Data Centres / IT
  - Will data center jobs evolve?
- IT Services Delivery
  - Who’s in charge?
- Software models
  - Which Software can really take advantage of Cloud services?
- SLA Management
  - Beyond SLA/SLO definition, how much can be automated?
- Combining Clouds
  - How difficult will it be to have a multi-cloud strategy?
- Standards & Best Practices
  - What safeguards exist / will exist to protect my investments?
- IT purchase/spending Cycles
  - What are the new priorities?



Top Threats to Cloud Computing

1. Abuse and Nefarious Use of Cloud Computing (IaaS & PaaS)
2. Insecure Interfaces and APIs (IaaS, PaaS, SaaS)
3. Malicious Insiders (IaaS, PaaS, SaaS)
4. Shared Technology Issues (IaaS)
5. Data Loss or Leakage (IaaS, PaaS, SaaS)
6. Account or Service Hijacking (IaaS, PaaS, SaaS)
7. Unknown Risk Profile (IaaS, PaaS, SaaS)

SOURCE: Cloud Security Alliance, *Top Threats to Cloud Computing,* Version 1.0, 2010, http://www.cloudsecurityalliance.org/topthreats.

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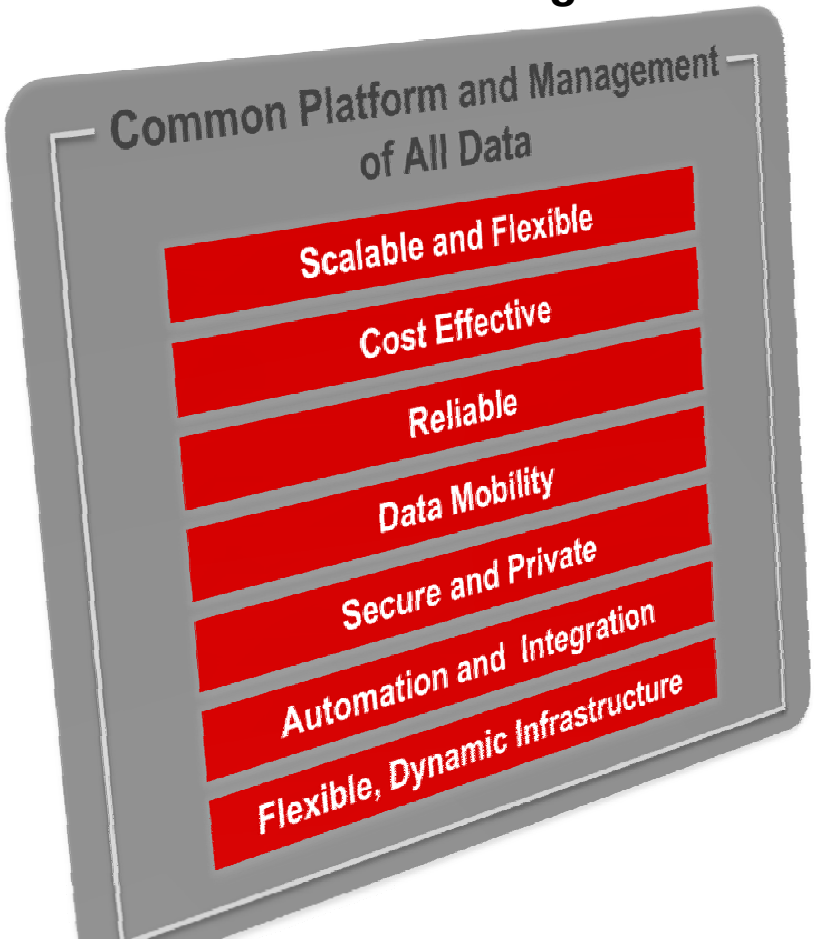
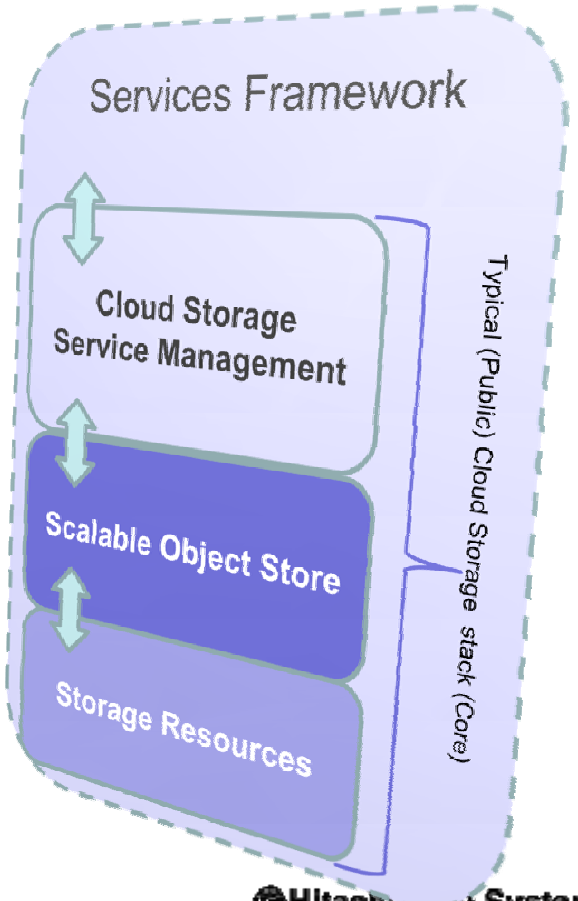
Simplify The Management Of Cloud Storage Stack

Agile Cloud with Virtualized and Integrated Block, File and Object





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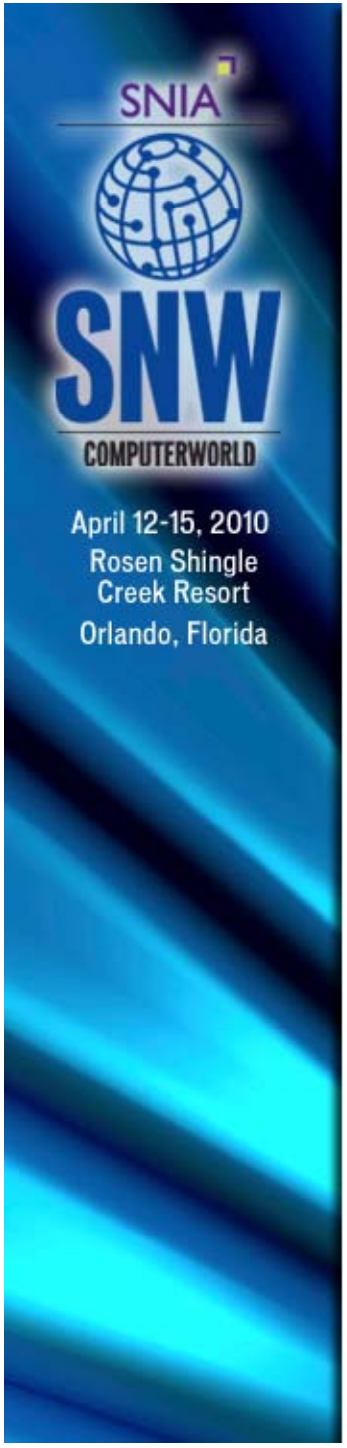
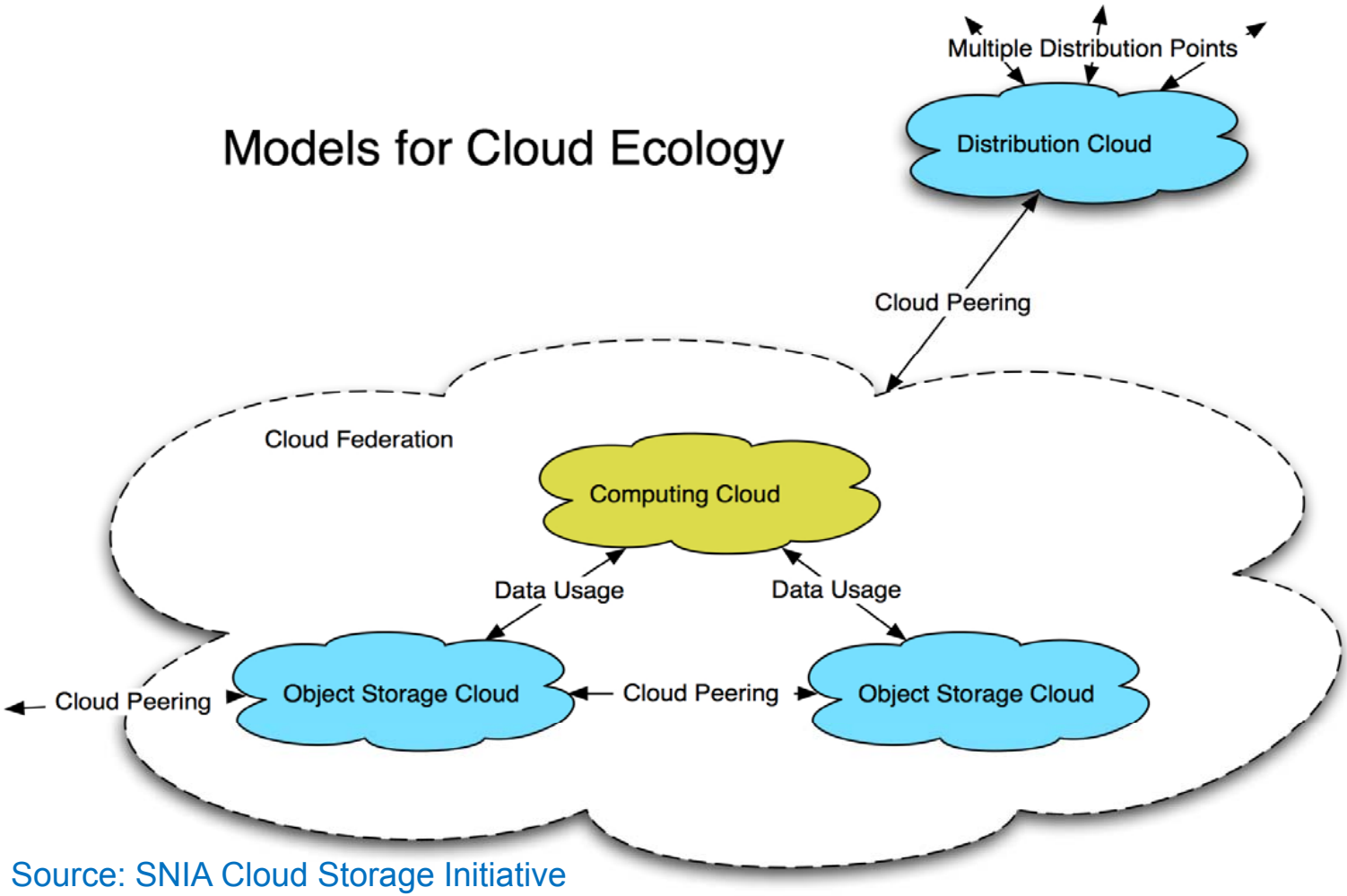


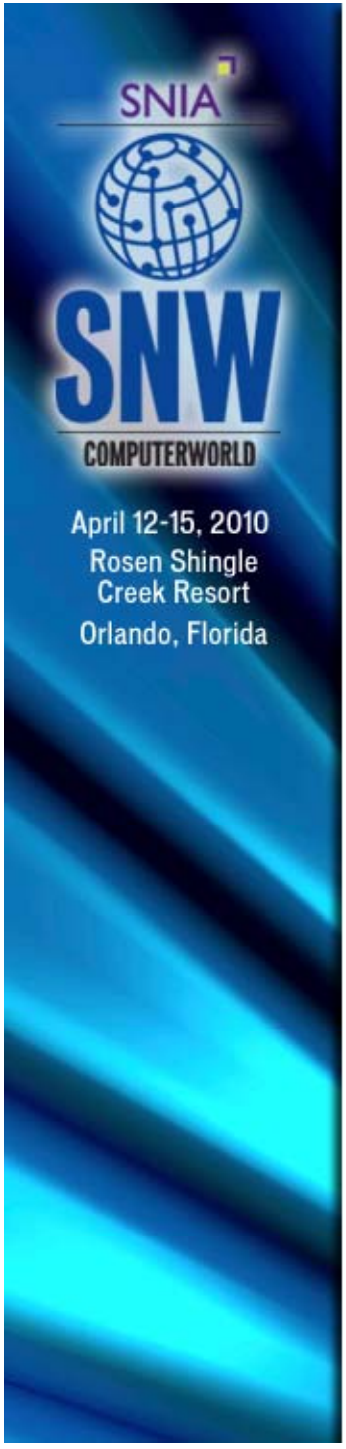
Keep It Simple

- Start with simple Cloud Use Cases
  - E.g. File Tiering
  - E.g. Data Protection
  - E.g. Data Archiving
- Not all data is eligible to Cloud Storage
- Delineate your Cloud solutions perimeter
  - Application, Server, Storage…
- Learn about Cloud Storage through low-risk projects
- Measure your success!

Future Industry Steps: Cloud Peering



Source: SNIA Cloud Storage Initiative

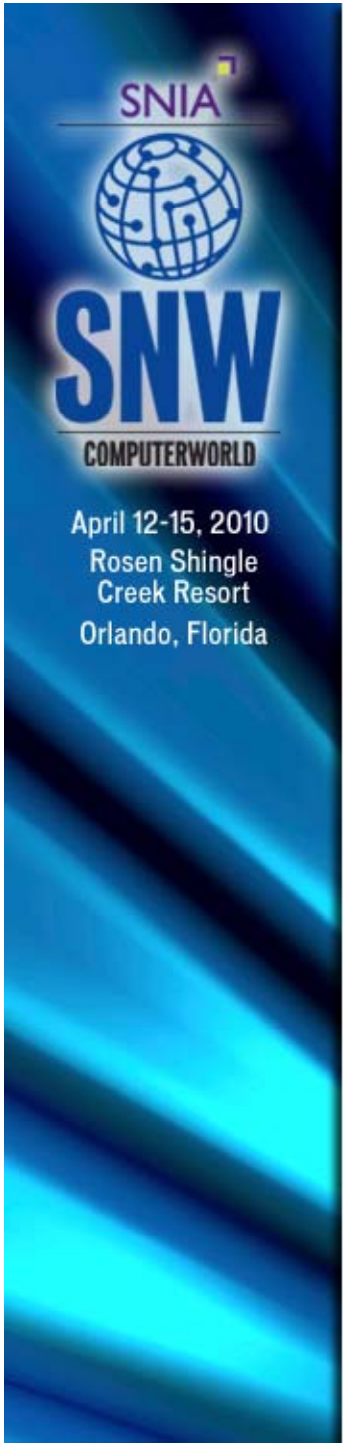


Looking Into Cloud Storage Standards

Storage standards can help:

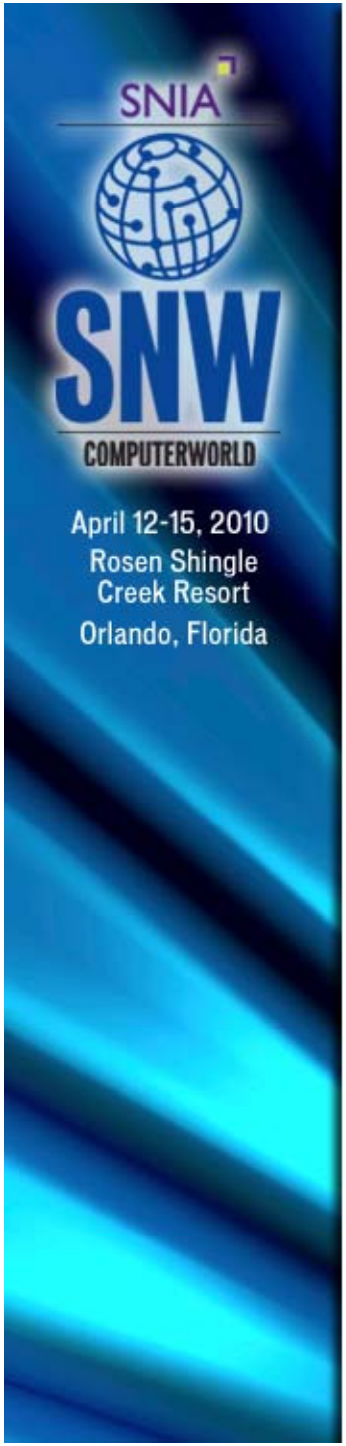
- Common method to instantiate and manage data storage resource
  - Easier development, faster deployment
- Common Cloud Storage metadata management
  - Storage, System, Network, Application, Security, Privacy
- Cloud-to-Cloud data portability
  - Migrate not only data but also management requirements
- Easier SLA/SLO management
  - Requirements pushed down object-level
- Easier integration in greater Cloud environments:
  - Cloud Storage for Cloud Computing, Federated Services

Source: SNIA Cloud Storage Initiative



Some Final Thoughts

- Cloud is yet another step toward the Service-Orientation of IT to become even more business efficient
- Cloud is also another phase in the decoupling of logical & physical IT resources
- There will be many different type of Clouds
- Enterprise will embrace various versions of (Hybrid) Clouds
- Integration is an important key to successful Cloud deployments
- Cloud stacks & services should empower providers to be trusted
- Data Storage will remain at the heart of popular Cloud Services
- Financial incentives and Quality of Cloud Services will determine the success of Clouds
- Hitachi Data Systems can help you planning your Cloud Storage projects for a more Agile IT!



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