

The Truth About Cloud Storage— What Is It, Do You Need It and How Can You Use It?

Presented By:

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Dragon Slayer Consulting Intro

- **Marc Staimer - President & CDS**

- 13+ years consulting
 - Storage, SANS, SW, Networks, Server, Data Centers, MSPs
 - Consults vendors (> 200)
 - Consults end users (> 600)
 - Market and Technology Analysis
 - Publishes consistently with Tech Target
 - Periodically published for trade magazines
- 31+ years industry experience



Remember this Technology Truth

- Never fall in love with a technology

- All technology is imperfect
 - Why there are always new releases
 - No one likes to admit their baby might have some...issues



"Recommend CAT scan if symptoms persist."



"Recommend casket if symptoms persist."

Agenda

- Defining Cloud Storage
- Types of Cloud Storage
- Cloud Storage vs Cloud Computing w/Storage
- Problems Solved by Cloud Storage
- “Cloud Washing” Concept
- Who Does What
- Conclusions



Defining Cloud Storage – What is it?

- Massively scalable
- Not tied to geographic location
- Based on commodity components
- Secure multi-tenant
- Enduring data resiliency/permanence
- Allocation on-demand
- Billed or licensed per usage
- Application agnostic
- Primary access via REST or SOAP



Massively Scalable

- **Capacity Scalability**

- From petabytes to exabytes even zettabytes

- **Performance Scalability**

- Increases linearly as capacity scales
 - Throughput and IOPS per TB improves or stays the same

- **Object or File Scalability**

- Multiple billions



Loosely Coupled to Geographic Location

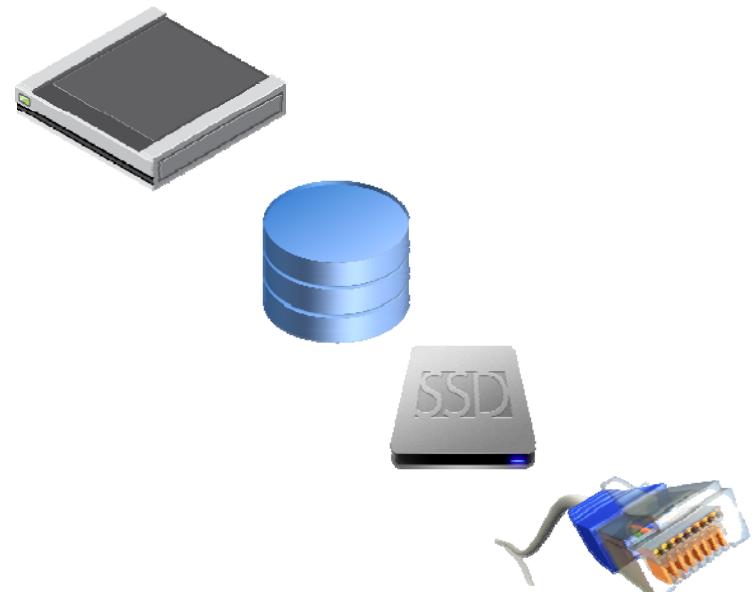
- **Geographically aware**
 - Geographically distributable
 - On-demand data movement based on policy
 - Round-trip latency/response time



Based on Commodity Components

- Off the shelf components

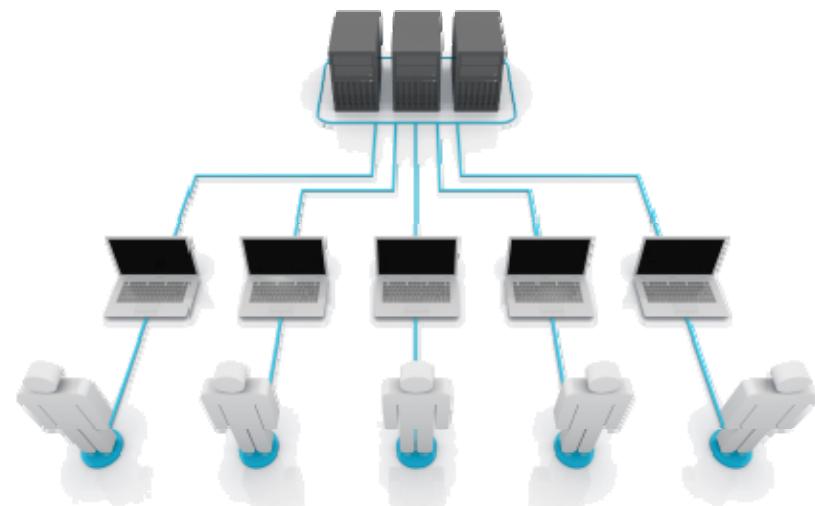
- x86 servers
- HDDs – SATA, Nearline SAS, SAS
- SDDs – SLC, EMLC, MLC
- Ethernet – 1/10/40 Gbps



Secure Multi-Tenant

CONFIDENTIAL

- **No unauthorized user or employee**
 - Can ever read/write someone else's data
 - Including some or all of the following levels of security:
 - Encryption – AES, Erasure Codes, FIPS 140-2
 - ACL
 - Automated rotating passwords



Enduring Data Resilience/Permanence

- ▀ Accessible online for years or decades
 - ▀ Searchable
 - ▀ Capable of locking down data (immutability)
 - ▀ WORM



Allocation On-Demand

- Capacity, Performance, and Location
 - Policy based
 - User transparent



Billed or Licensed per Usage

- True “Pay-as-you-go”
 - Charged on usable storage
 - Versus traditionally raw storage
 - A.K.A. “Pay-by-the-drink”



Application Agnostic

- **Transparent to all applications**

- Structured or unstructured
- The only difference is the REST and/or SOAP interface
 - Apps are easily modifiable
 - Hardware & software gateways are also available



Primary Access via REST and/or SOAP

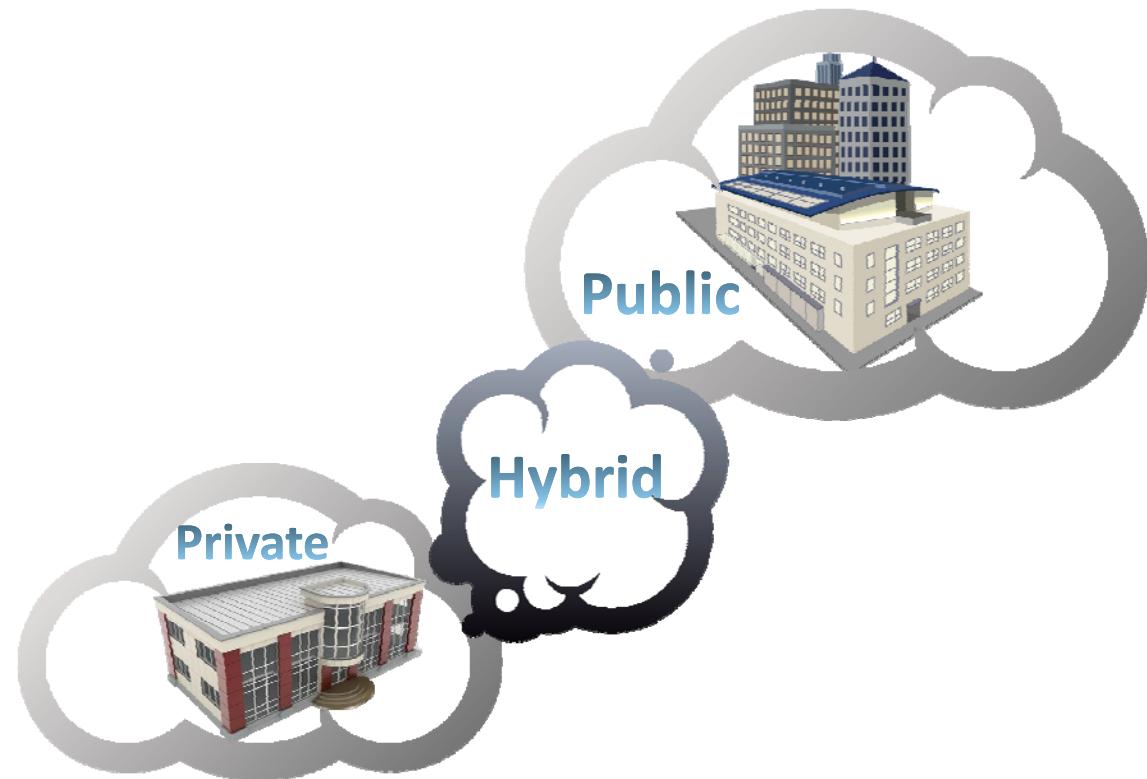
- Same interface as World Wide Web & Web 2.0

- REST – Representational State Transfer
 - HTTP puts and gets
- SOAP – Simple Object Access Protocol
 - XML, RPC, and HTTP



Types of Cloud Storage

- **Public**
- **Private**
- **Hybrid**



Public Cloud Storage

Storage as a service (STaaS)

- Over the Internet or VPNs
- Pay-by-the-drink & only for what's actually being used
- Accessed via REST and/or SOAP
 - Also accessed via hardware & software gateways
- Typically has multiple data centers
 - Geographically separated by regions
- 3 classes
 - Consumer, Industrial, Enterprise



Private Cloud Storage

- **IT owns/operates/manages their cloud storage**
 - On customer's premises or Co-lo
 - Leveraging cloud storage technology
 - On VLAN and/or VPN
 - Can charge-back to departments if desired
 - Still accessed primarily via REST and/or SOAP
 - Also accessed via hardware & software gateways
 - Provides many public cloud advantages
 - Just requires own or co-lo data centers



Hybrid Cloud Storage

Best of both worlds

- Combination of public and private cloud storage
- Infinite variations
 - Mostly private with public for DR or extra copy
 - Mostly public with private for local caching
 - Everything possible in-between



Cloud Computing w/Storage

A.K.A. Storage in the Cloud

- Not the same as Cloud Storage
- Cloud computing can use any type of local storage
 - DAS, NAS, SAN, or Object
 - Examples include:
 - Google docs, Office 365, Shutterfly, SalesForce.com, iCloud, BURR, etc.
 - This is storage in the cloud, not cloud storage



Storage in the Cloud



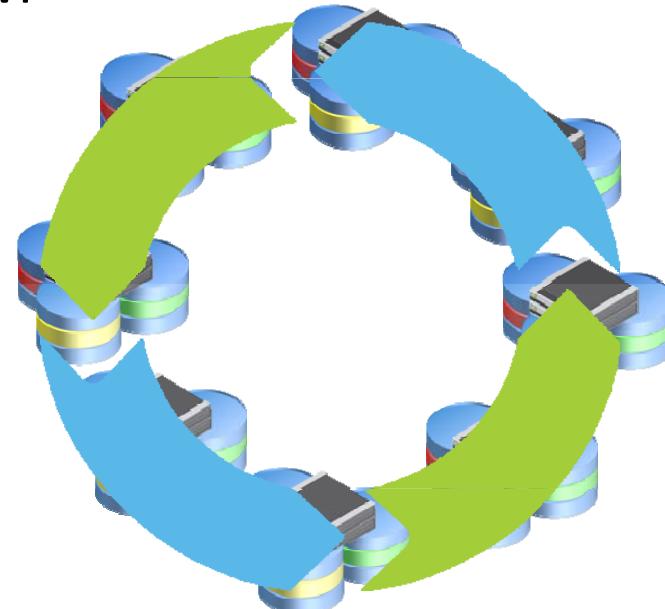
Problems Solved by Cloud Storage

- Minimal storage containers as data scales
- Greater automation w/reduced management
- Multi-tenancy
- Long-term data permanence with data reliability
- Ending tech refresh disruptive data migrations
- Cost effective DR
- Reduced TCO



Minimal Storage Containers as Data Scales

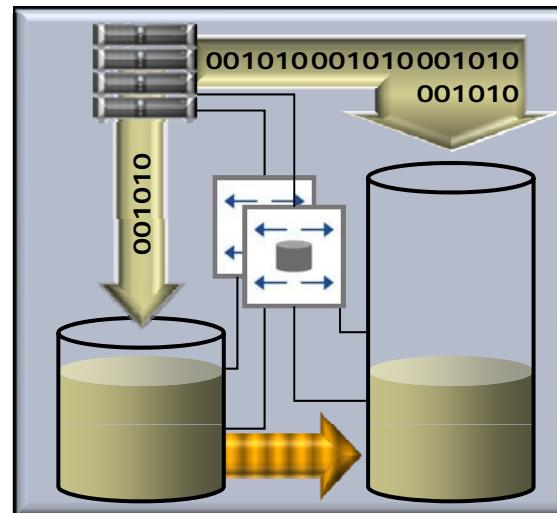
- **Traditional storage not designed for massive data**
 - Used to be 1PB was a lot of storage...not any more
 - Dozens of PBs, 10EBs, 100EBs, even a ZB is a lot of storage
 - Leads to storage system sprawl
 - And lots of data migrations



Data Migration is Manually Labor Intensive

▀ Rip-Out-And-Replace Architectures require DM

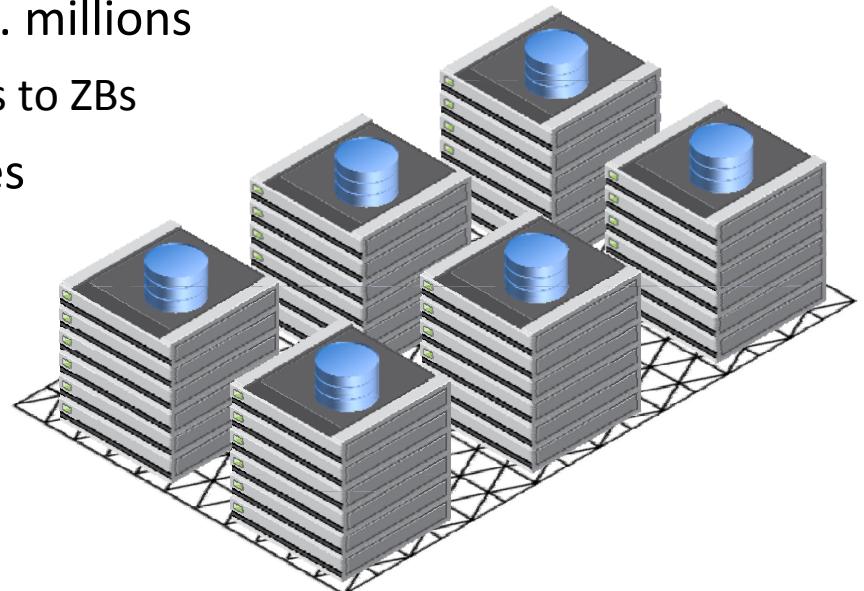
- ▀ Required as storage systems approaches limitations
- ▀ And larger more capable versions are implemented
- ▀ Also required for equalizing storage sprawl
- ▀ And expensive



Cloud Storage Minimizes Storage Containers as it Scales Because it's Object Storage

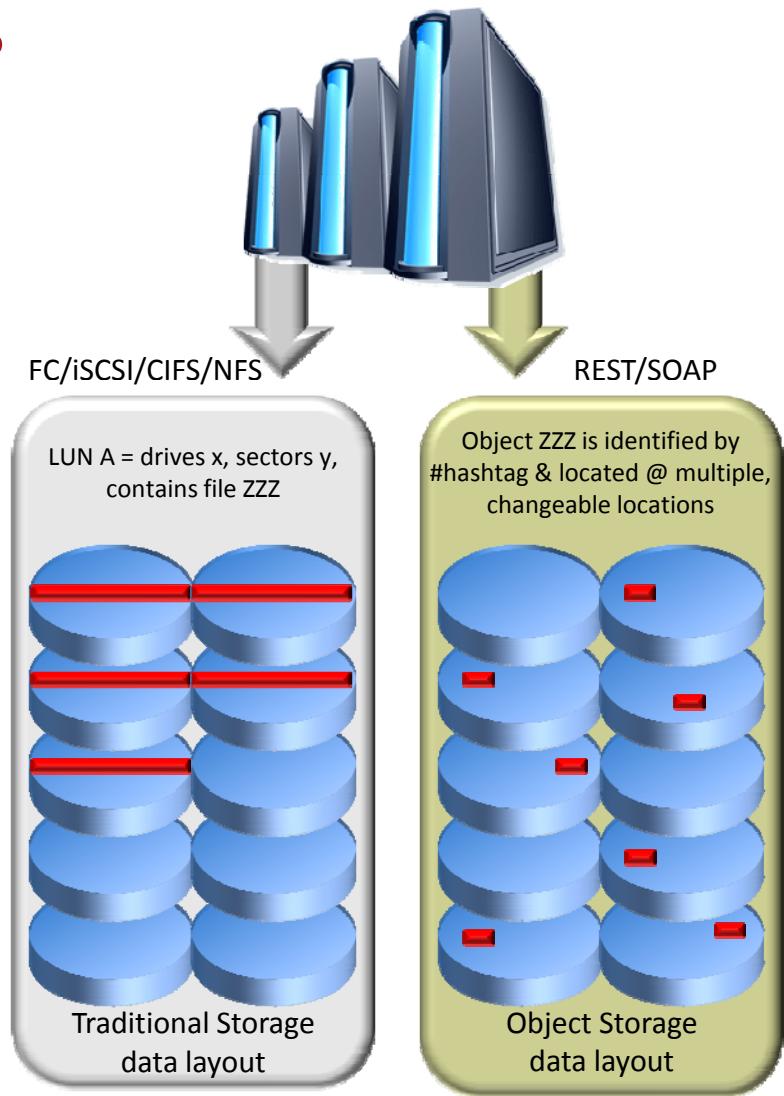
- **No known object storage limits**

- Each add'l node increases capacity & performance
 - Always positively
- Objects measured in the billions vs. millions
 - Capacity measured from PBs to EBs to ZBs
- Capacity and/or performance scales
 - In small or large increments
 - without limitations



How Object Storage Works

- **Loosely federated data**
 - Vs. consistent storage system
 - Across all resident data
 - E.g. No requirements for
 - Cache consistency
 - Nodal awareness of objects owned by other nodes
 - Single aggregated namespace
- **Data scales based on rules**
 - Rules About the data itself
 - Rather than about the system
 - Can scale nearly indefinitely



Management Overload - Complicated

Traditional Storage

- Manually labor intensive
 - Load balancing
 - Operations
- Infrastructure
 - Ports
 - Switches
 - Cables
 - Connectors
 - Multi-pathing software



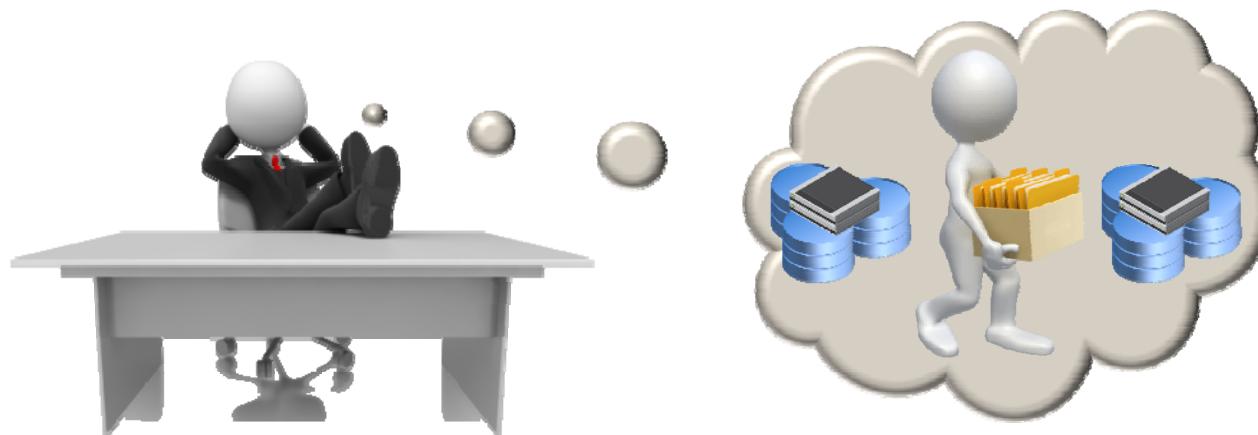
Object Storage Has a Lot More Metadata

- More customized control over the data
 - Vs. file system w/fixed amount of metadata
 - File type, creation date, & last-accessed date
 - Vs. SAN storage which typically has virtually none
 - Object Storage increases # of possible metadata fields
 - Customizable for specific business and system functions
 - Allows system to manipulate data based on policy triggers
 - Data scales based on rules
- Rules that also automate many traditional manual tasks
 - Tiering, security, migration, redundancy, and deletion



Greater Automation = Reduced Management

- **Data dynamically laid out & optimized automatically**
 - Traditional storage systems require physical data location assignments
 - Data must be manually migrated & optimized as system changes over time
 - Object storage data moves nondisruptively based on data policies
 - w/o admins having to make decisions about placement of each individual object



Power & Cooling Becoming a Crisis

- **In the dot com era¹**

- Major data centers were built with 2 megawatts of power

- **Today¹**

- Same data centers are built with > 50 megawatts of power

- **The key culprit...traditional storage**



¹Sources: Gartner, IDC, 451 Group, Forester

HDDs Are Electro Mechanical Devices

- **HDDs**

- Capacity storage device of choice
- Spinning platters
- Consume power
- Generate heat requiring cooling



- **Storage growth rates**

- ~ 62% CAGR¹ = capacity doubling every 18 mos
- HDD capacity improvements slowing
 - .5TB to 1TB to 2TB to 3TB to 4TB
 - 100% growth to 50% to 25% means more HDDs over time

¹Sources: Gartner, IDC, 451 Group, Forester – CAGR varies & all agree with this rate for unstructured data

Object Storage Inherently More Efficient

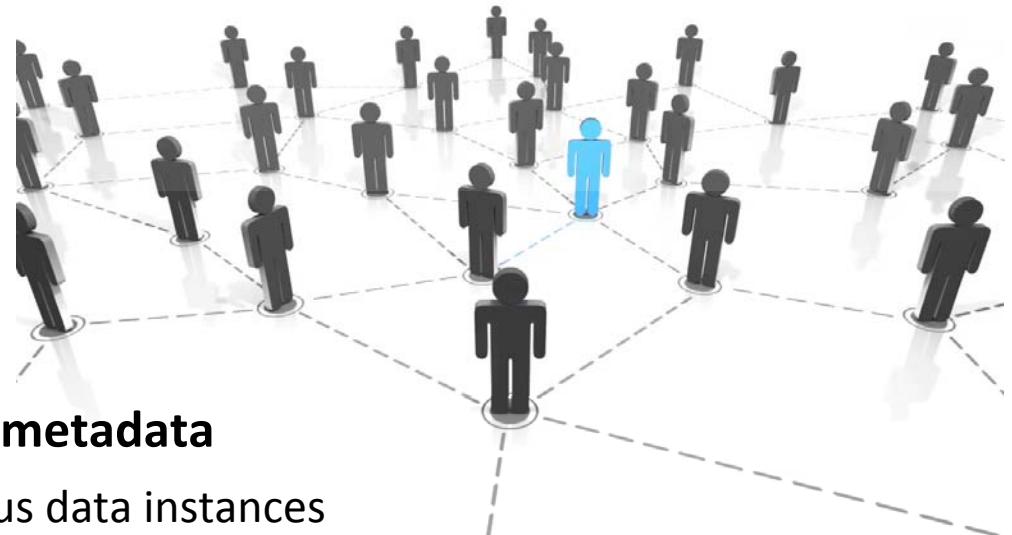
- ◆ **Provides more usable storage**

- ◆ No RAID overhead
- ◆ More usable efficiency
 - ◆ = less physical storage
 - ◆ Means a lot less of everything else too
 - ◆ Switches
 - ◆ Ports
 - ◆ Cables
 - ◆ Connectors
 - ◆ Power/Cooling/Battery BU
 - ◆ Etc.



Built-in Multi-Tenancy

- Objects have their own custom metadata
 - Functioning as fairly autonomous data instances
 - Carries a broad swath of access policies
 - Controlled & restricted access for distinct parties
- Unparalleled Security
 - Built-in encryption in-flight and at-rest
 - Erasure codes
- Embedded billing and/or chargeback
 - Only charges what's actually used



- Traditional Storage
 - Bolted on
 - Not built-in

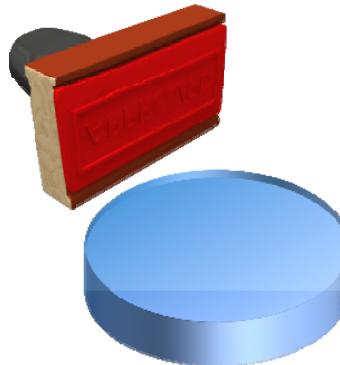


Long-term Data Permanence



- **Preserving data for long time periods is challenging**
 - Especially periods longer than storage systems' refresh cycle
 - Regulations require lengthy retention periods
 - A big issue for more organizations in more industries
 - Traditional storage makes it complicated & Time consuming
 - Requires manual labor intensive data migrations from old to new

Long-term Data Permanence w/Data Reliability



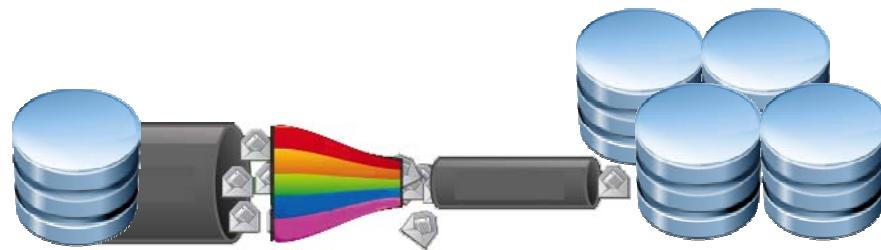
- Object data is location independent
 - Object storage systems are based on grid technology
 - It natively preserves data
 - Data is inherently WORM (write once read many)
 - Once data is saved it's tagged with a unique identifier
 - Guarantees immutability of that object – mods/edits create new object
 - Old object can be deleted or kept as P.I.T. version
 - Traditional storage require additional software
 - And a lot more effort

Traditional Storage 3 yr Tech Refresh Cycle



- Must refresh every 3 to 4 years
 - Because costs skyrocket thereafter
 - Maintenance costs go up dramatically from vendors
 - Parts become impossible to find
 - Storage systems break down more frequently
 - Greater unscheduled as well as scheduled downtime

Storage Refresh is Incredibly Time Consuming



- Currently averaging 9 to 12 months

- Because of the manually intensive data migration
- Each refresh takes longer because of 62%* stored data CAGR
 - Data volume grows 4x every 3 years
 - Making the transfer alone incredibly time consuming
- Data gets corrupted or is lost in each migration
- Server remediation takes longer with each migration

*Per IDC, Gartner, 451 & DSC, stored data grows ~62% per year quadrupling in 3 years

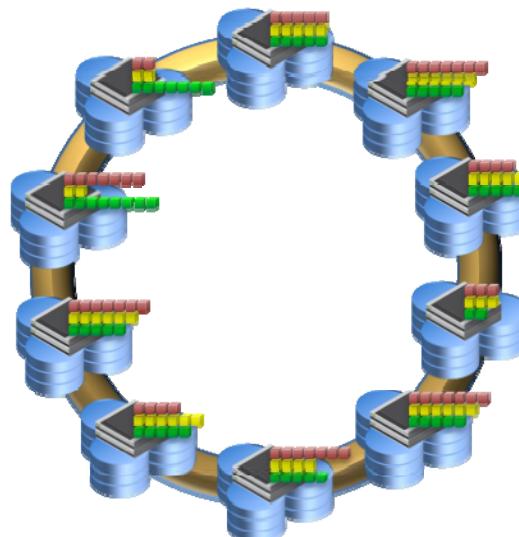
Storage Technology Locked Into Refresh Cycle

- **New innovations or savings must wait**
 - Projected cycle's capacity all bought upfront
 - Newer higher capacity HDDs or SSDs often not compatible
 - Newer software as well
 - Technology lock-in means pre-paying for unused assets
 - Often, never used

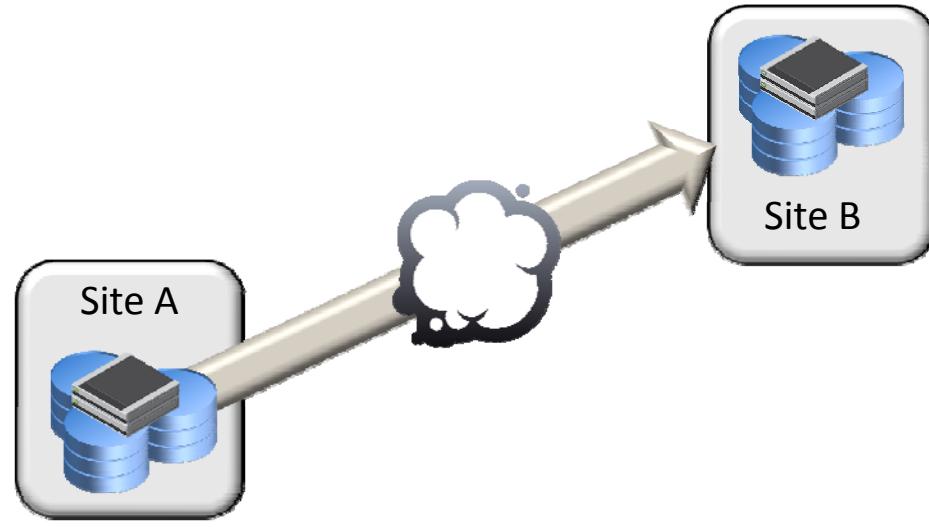


How Cloud Storage Makes Tech Refresh Painless

- **Each node is added online, no scheduled downtime**
- **As newer more advanced nodes are added**
 - New nodes are auto discovered & integrated into the system
 - Older nodes can be removed from the system at leisure - online
 - Each object system node can be a mix of old and new nodes
 - Data is copied seamlessly
- **Eliminates**
 - Data migration
 - Rip-Out-And-Replace
 - Scheduled downtime



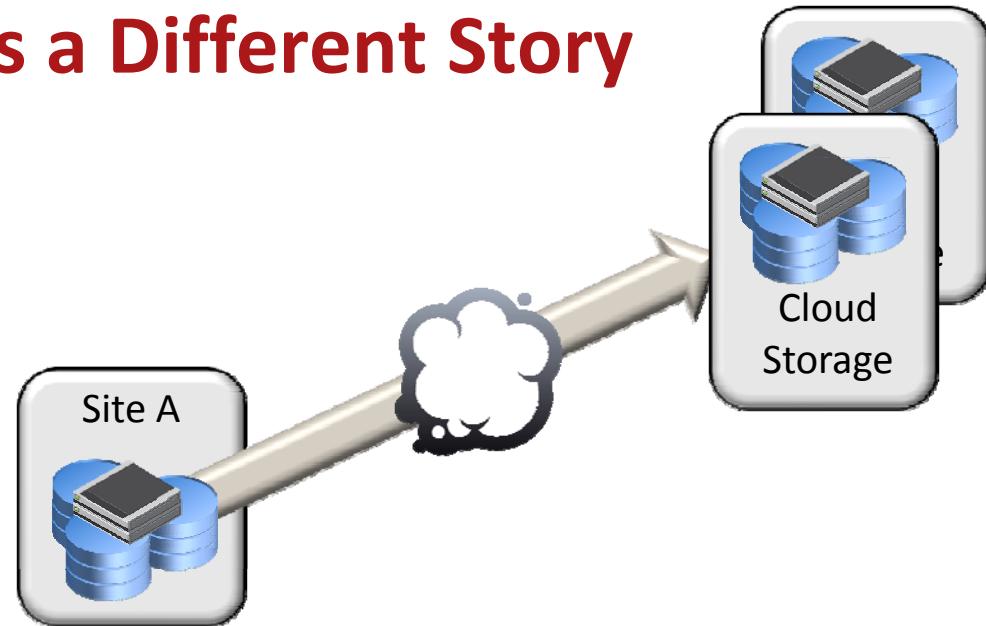
Costly DR



- Traditional Storage DR requires 2 or more sites

- 2nd site can be own, 3rd party, or outsourced (SUNGARD)
- Duplicate storage: power, cooling, etc.
- Complicated
- Expensive

Cloud Storage DR is a Different Story

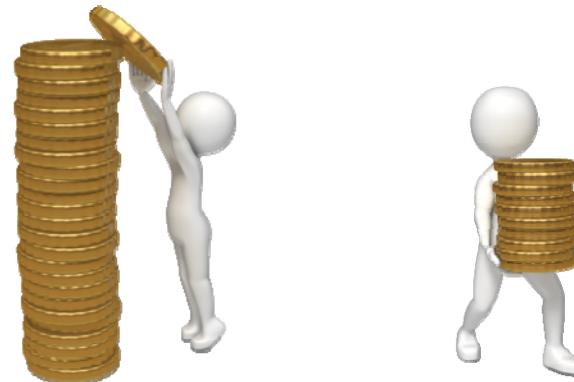


- Cloud Storage is the 2nd site

- Data is secure in one or multiple Cloud data centers
- Only paying for consumed storage
- In-expensive

Reduced TCO

- Cloud Storage is an entirely new costing paradigm



Costing Paradigm	Traditional Storage	Cloud Storage
<i>Cost basis</i>	Raw Storage	Actual used storage
<i>Pay timing</i>	Pre-usage	Post-usage
<i>OpEx costs</i>	Yes	Public = no Private = yes (less) Hybrid = yes (lot less)
OpEx over 3 yrs = 5 x CapEx		
<i>Data migration costs</i>	Yes	No
<i>Hidden costs</i>	Yes	No

What is Cloud Washing?



- ➊ Calling a storage system “Cloud Storage”
 - ➊ When in reality it has only some of its characteristics
 - ➊ It’s a way to attempt to leverage the market hype
 - ➊ Just because something says it’s cloud storage
 - ➊ Does not make it true

General Object Storage Issues

- **High latency**
- **Good throughput, generally not so good for IOPS**
 - Frequently changing data is not a good fit...usually
 - Scality Organic RING is an exception
- **Each vendor has own uniqueness & advantages**
 - Erasure Codes resilience
 - Lower cost
 - Public, private, and hybrid offerings
 - OEM relationships
 - Packaged w/hardware or as software only



Who Does What in Cloud Storage



Vendor	Product	Public-Private-Hybrid	Interfaces	Notes
Amazon	S3	Public	REST/SOAP	Public leader
Amplidata	AmpliStor	Private	REST/SOAP	Erasure codes
Basho	Riak	Private	REST/SOAP	
Caringo	CASTor	Private	REST/SOAP/NFS/CIFS	
Citrix	CloudStack	Private	REST/SOAP	Open source. Just acquired CloudStack
Cleversafe	Slicestor	Private	REST/SOAP	Largest storage containers in production. Some > several EB. Erasure codes.
DELL	DX Object Store	Private	REST/SOAP/NFS/CIFS	OEM from Caringo.
DDN	Web Object Scaler	Private	REST/SOAP	Focused on Rich Media market.
EMC	ATMOS	Private	REST/SOAP	Focused on private clouds & service providers.
Gluster	GlusterFS	Private	REST/SOAP/NFS/CIFS	Combination of Scale-out NAS and Object. Open source.
Mezeo	Cloud Storage	Private	REST/SOAP	
Microsoft	Azure	Public	REST/SOAP	
NetApp	StorageGRID	Private	REST/SOAP/NFS/CIFS	
Nirvanix	CloudComplete	Public-Private-Hybrid	REST/SOAP/NFS/CIFS	
Rackspace	Open Stack	Public	REST/SOAP	Open source.
Scality	Organic RING	Private	REST/SOAP	Object Storage w/SAN performance. Focused on service providers. Erasure codes.

What About Other Scale-out Storage Tech?

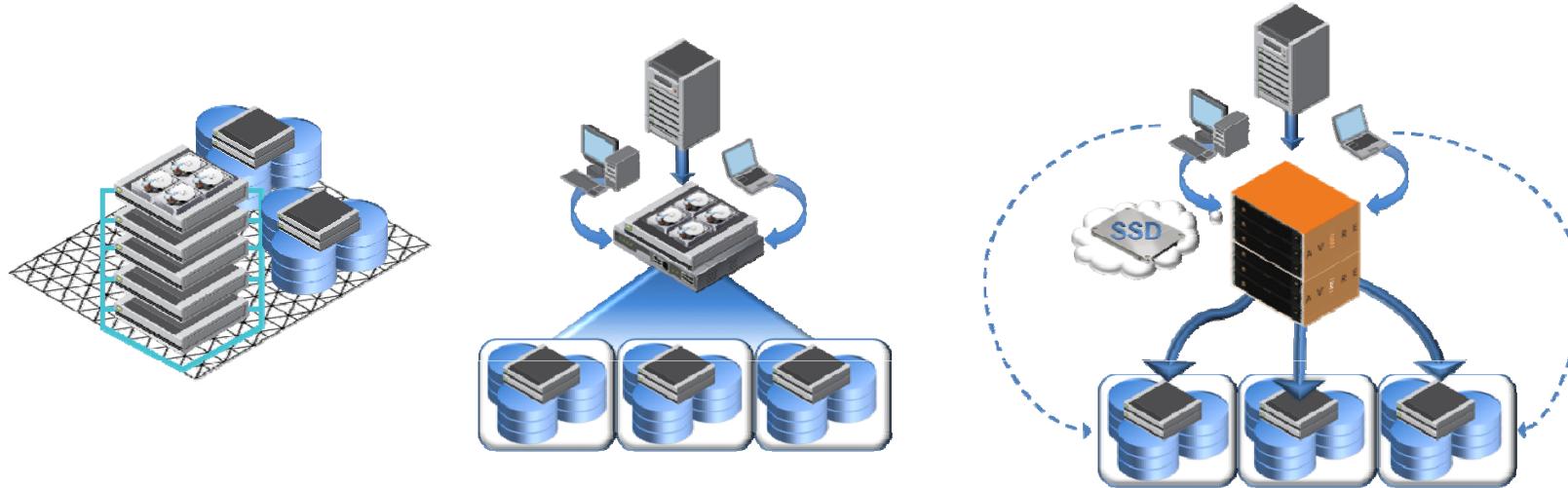
- Scale-out storage often perceived as Cloud Storage
 - Scale-out NAS
 - Scale-out SAN



Scale-out NAS

- **Similar to Object Storage**

- Utilizes x86 servers with internal HDDs and/or SSDs
- Or shared external DAS, SAN Storage, or NAS systems
- Sometimes leverages GNS or File Virtualization
- But most require a metadata database = object bottleneck
 - GlusterFS is an exception – acts very similar to Object Storage



General Scale-out NAS Cloud Issues

- **Each add'l node has diminishing marginal returns**
 - Eventually the next node has a negative impact
- **Tends to be higher cost than NAS**
 - Which is not inexpensive & too high for Cloud Storage requirements
 - Limited objects or files because of centralized or distributed DBMS
 - GlusterFS is exception – no metadata database similar to object
 - No geographical awareness
 - No automated intersystem storage tiering
 - Limited automated intrasystem storage tiering
 - Resilience based primarily on RAID (some do multi-copy mirroring)
 - Primarily still a “Rip-Out-And-Replace” architecture
 - Just a bigger bucket and especially w/tech refresh



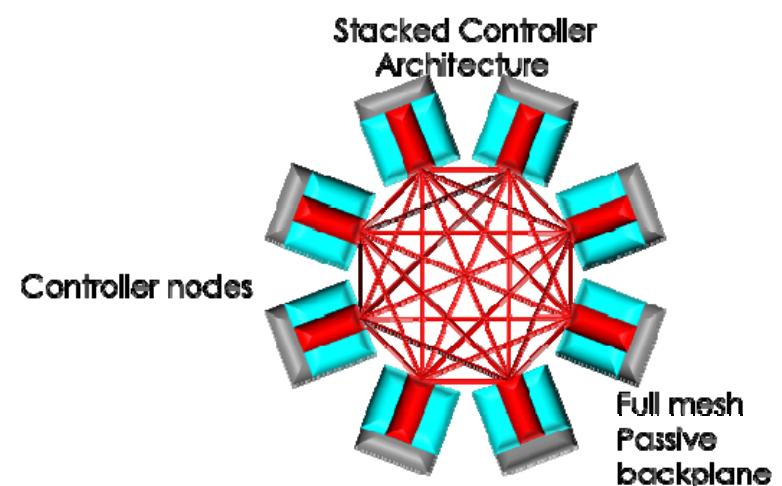
Scale-out Vendors & Products

- **Avere – FXT**
- **BlueArc – Mercury & Titan**
- **DDN**
 - NAS Scaler/GRIDScaler/EXAScaler/xSTREAM Scaler
- **EMC – Isilon**
- **GlusterFS – Open Source**
- **GRIDStore (Low End)**
- **HP – IBRIX**
- **IBM – SONAS**
- **Lustre – Open Source**
 - Wham Cloud
- **MogileFS – Open Source**
- **NetApp – FAS Ontap 8.1**
- **Panasas**



Scale-out SAN

- Utilizes x86 servers with internal HDDs and/or SSDs
- Clustered Controllers
 - With proprietary ASICs
 - IBA, Ethernet, FC, PCIe, pt-to-pt proprietary
- Lower end is switched iSCSI on 1G or 10G Ethernet
- High end tends to be within the rack
 - Or Limited # of racks
 - Mostly layer 2 networking – deterministic
 - FC, FCoE (CEE) IBA, AoE
 - Switched internal Controller
 - Or stacked controller mesh interconnect



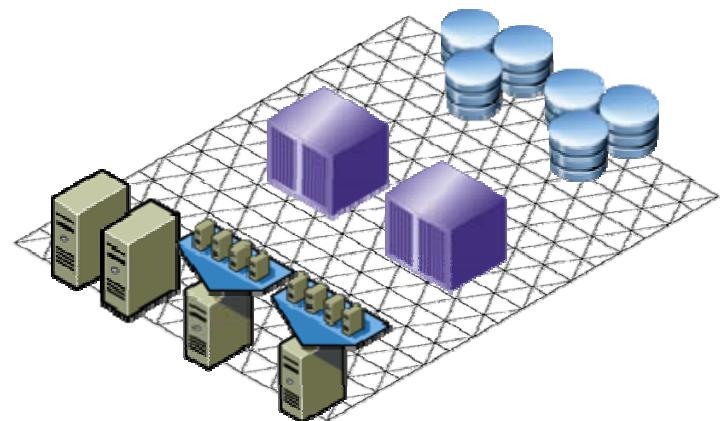
General Scale-out SAN Issues

- Like Scale out NAS, nodes have diminishing marginal returns
 - Eventually the next node has a negative impact
- Tends to be the most expensive
 - CORAIL is the exception w/AoE (*ATA or IDE over Ethernet*)
 - Most not priced for Cloud Storage requirements
 - Most of the SAN complexity and cost, just at a bigger storage scale
 - iSCSI is less complex than AoE
 - Limited to metropolitan areas
 - No automated intersystem storage tiering
 - Limited automated intrasystem storage tiering
 - Resilience based primarily on RAID
 - Still a “Rip-Out-And-Replace” Architecture
 - Especially on tech refresh



Scale-out SAN Vendors & Products

- CORAID – EtherDrive (AoE)
- DDN – S2A & SFA series (FC, FCoE, iSCSI)
- DELL – EqualLogic (Low end iSCSI)
- EMC – VMAX/VMAXe (FC or FCoE)
- GRIDStore (Low end iSCSI or FC)
- HDS – VSP (FC or iSCSI)
- HP
 - Low end – LeftHand P4000 series (iSCSI)
 - High end – 3PAR series (FC)
- IBM
 - Low end – SVC (FC)
 - High end – XIV (iSCSI)
- Pure Storage – iSCSI SSDs
- SolidFire – iSCSI SSDs



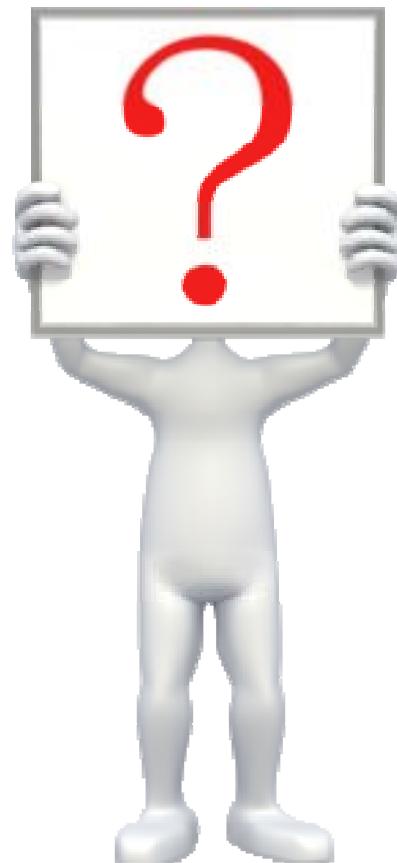
General Cloud Storage Conclusions

- Cloud Storage solves real & urgent problems
- It's good for archive data
 - Long-term
- It's extremely cost effective
- There are many choices
 - Public, private, hybrid clouds
 - Several vendors and products
- It should be part of your storage discussions



Paying Attention





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