

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

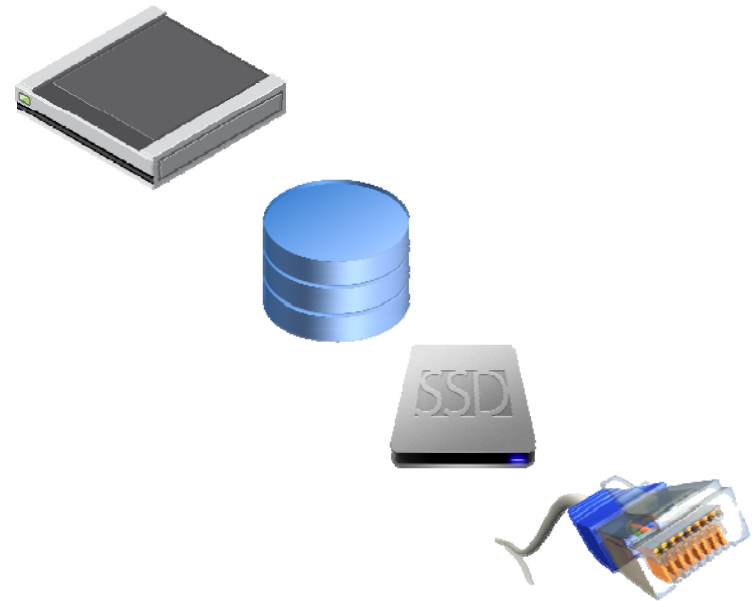
- **Geographically aware**

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



Based on Commodity Components

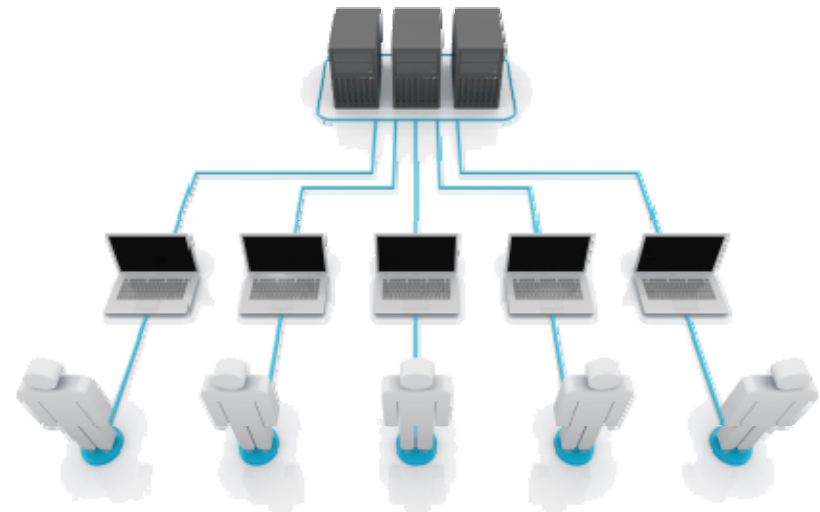
- **Off the shelf components**
 - x86 servers
 - HDDs – SATA, Nearline SAS, SAS
 - SSDs – SLC, EMLC, MLC
 - Ethernet – 1/10/40 Gbps



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



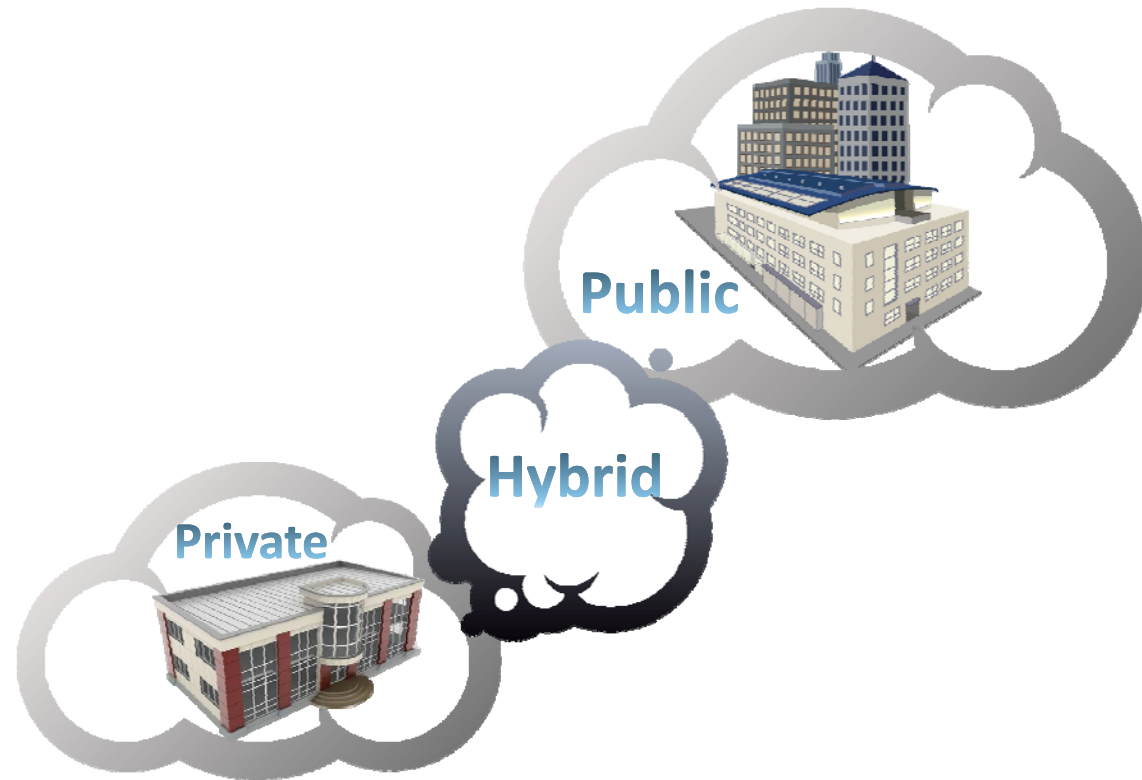
Primary Access via REST and/or SOAP

- **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**



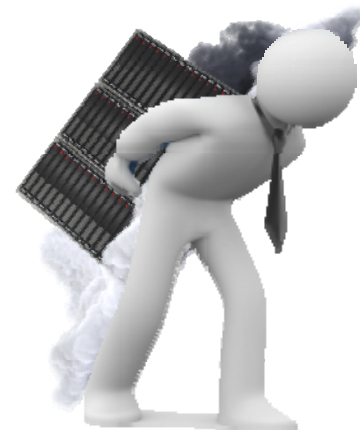
Public Cloud Storage



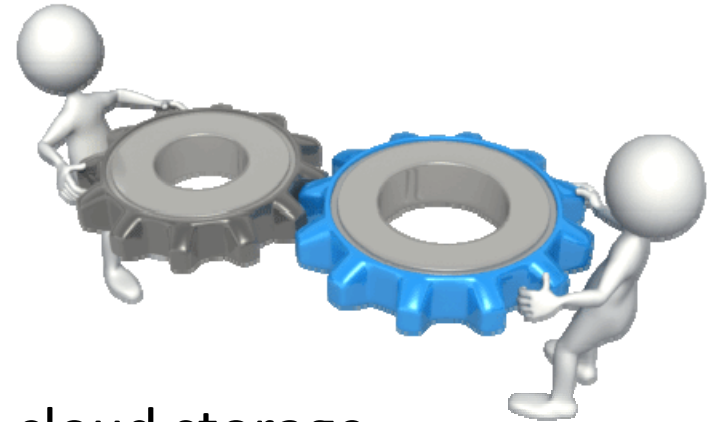
- **Storage as a service (STaaS)**
 - Over the Internet or VPNs
 - Pay-by-the-drink & only for what's actually being used
 - Accessed via REST and/or SOAP
 - Also accessed via hardware & software gateways
 - Typically has multiple data centers
 - Geographically separated by regions
 - 3 classes
 - Consumer,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



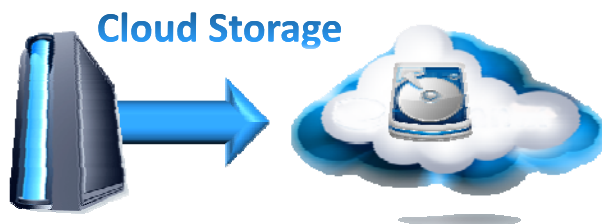
• Best of both worlds

- 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



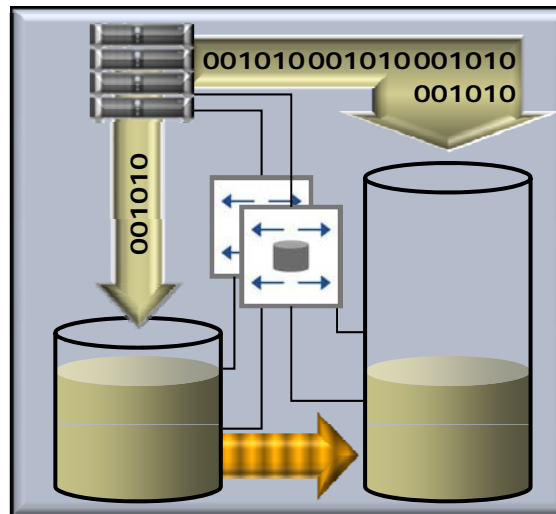
Minimal Storage Containers as Data Scales

- **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



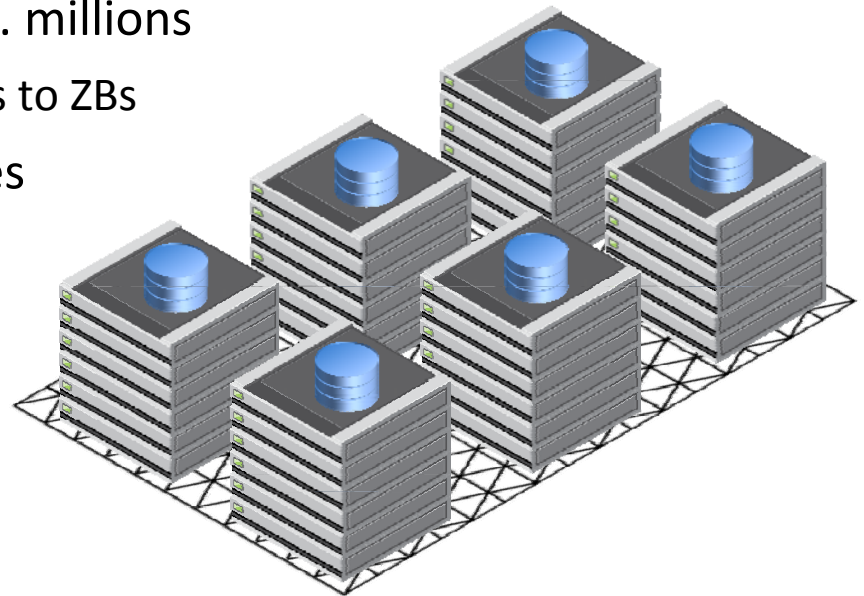
Data Migration is Manually Labor Intensive

- **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



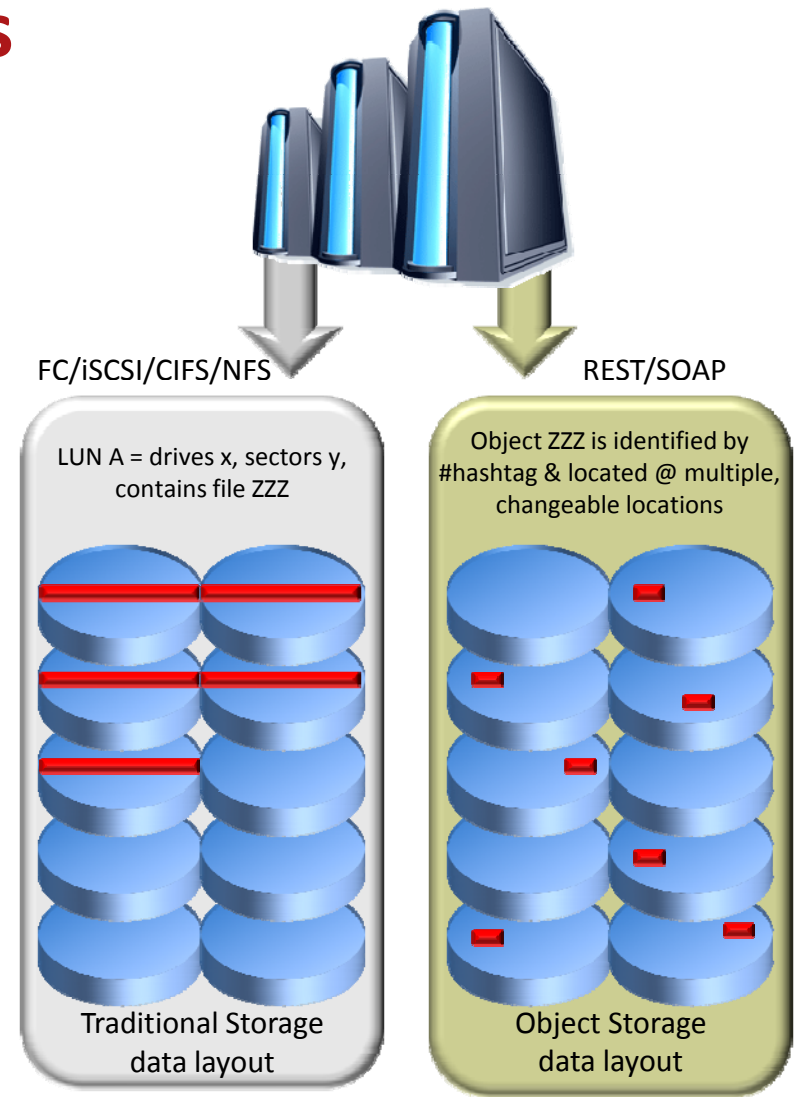
Cloud Storage Minimizes Storage Containers as it Scales Because it's Object Storage

- **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

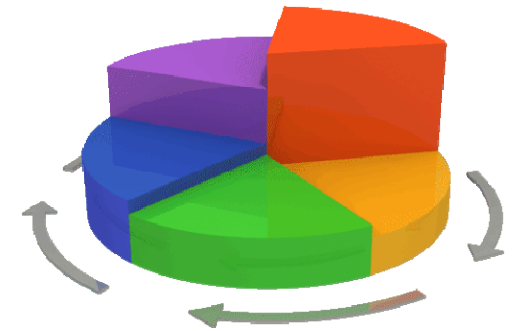
● Traditional Storage

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



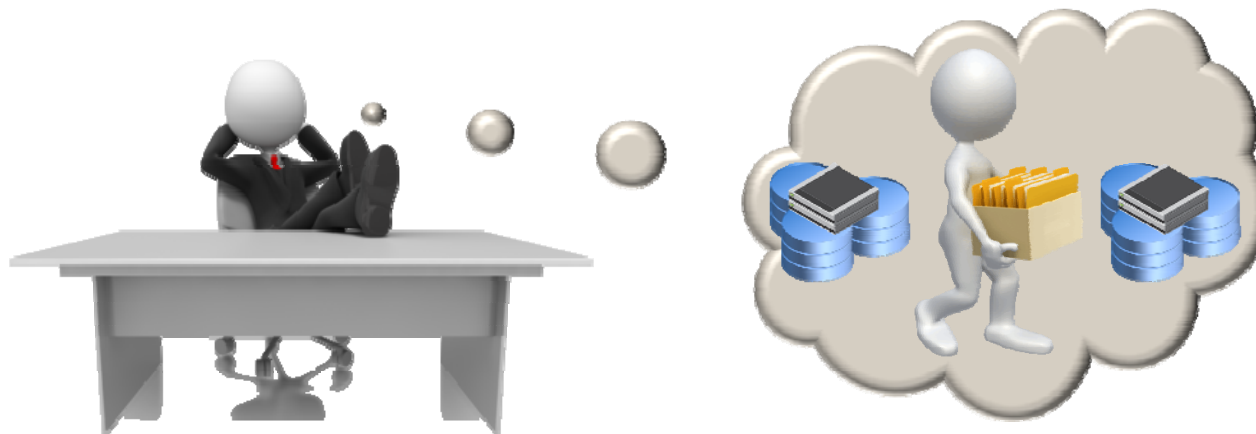
Object Storage Has a Lot More Metadata

- 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



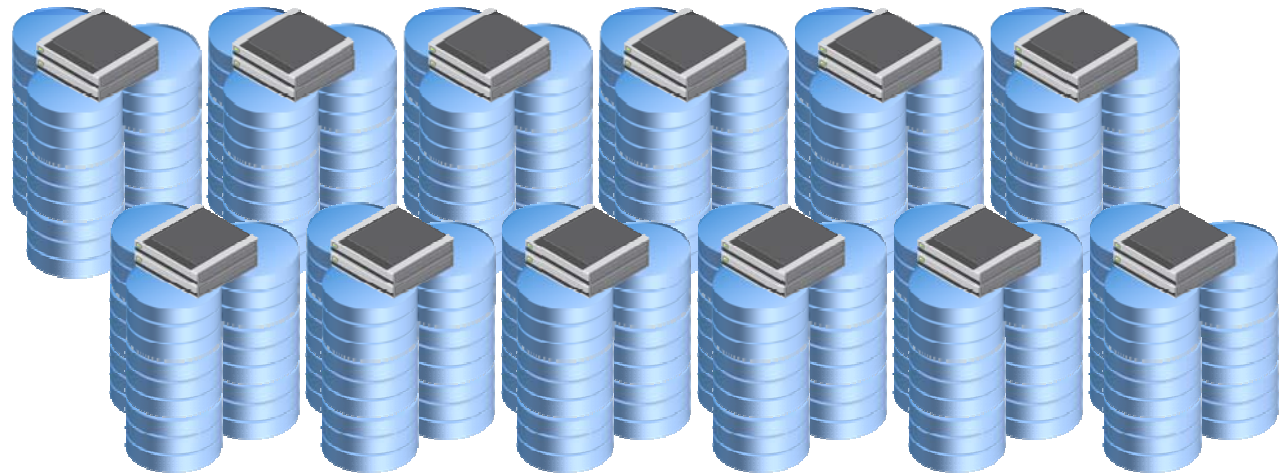
Greater Automation = Reduced Management

- **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

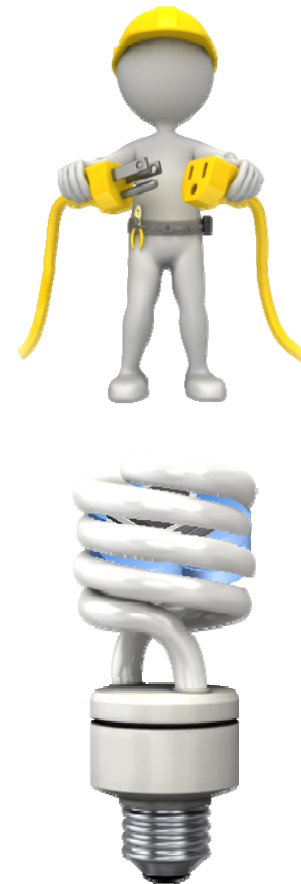
- ~ 62% CAGR¹ = capacity doubling every 18 mos
- HDD capacity improvements slowing
 - .5TB to 1TB to 2TB to 3TB to 4TB
 - 100% growth to 50% to 25% means more HDDs over time



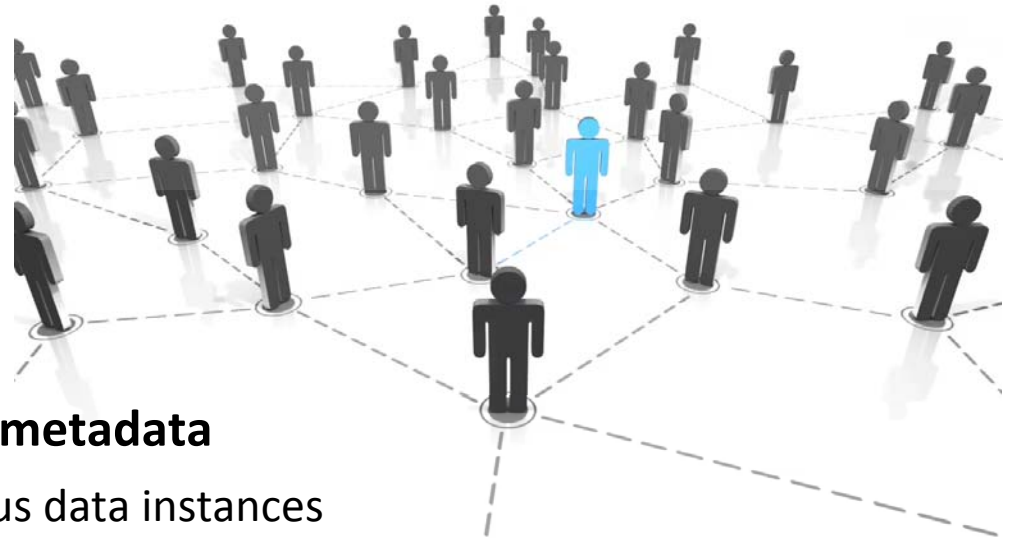
¹Sources: Gartner, IDC, 451 Group, Forester – CAGR varies & all agree with this rate for unstructured data

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

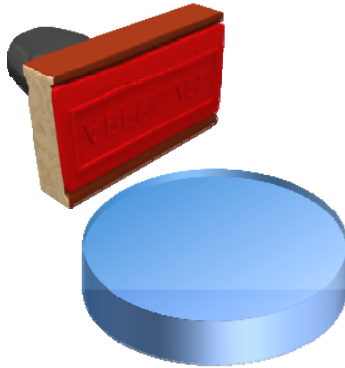


Long-term Data Permanence



- **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



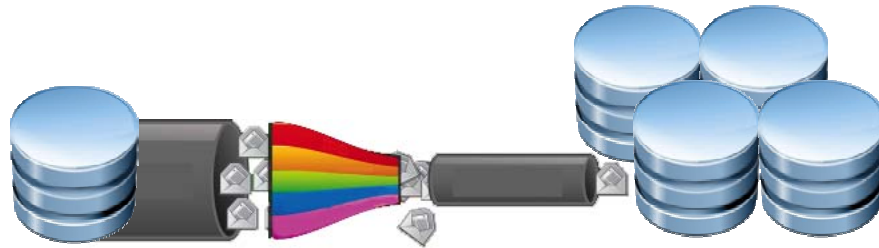
- **Object data is location independent**
 - Object storage systems are based on grid technology
 - It natively preserves data
 - Data is inherently WORM (write once read many)
 - Once data is saved it's tagged with a unique identifier
 - Guarantees immutability of that object – mods/edits create new 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**

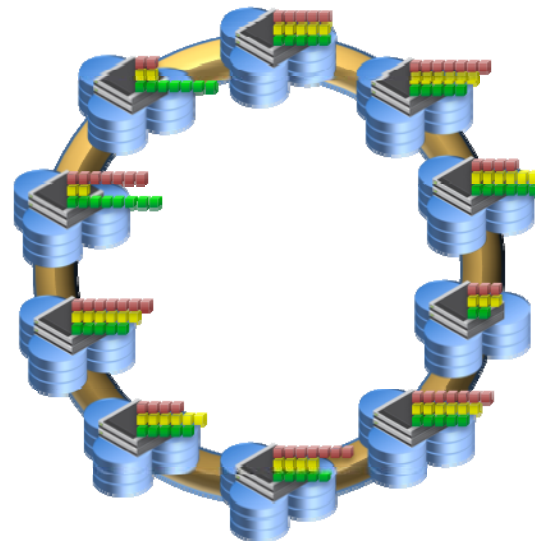
Storage Technology Locked Into Refresh Cycle

- **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

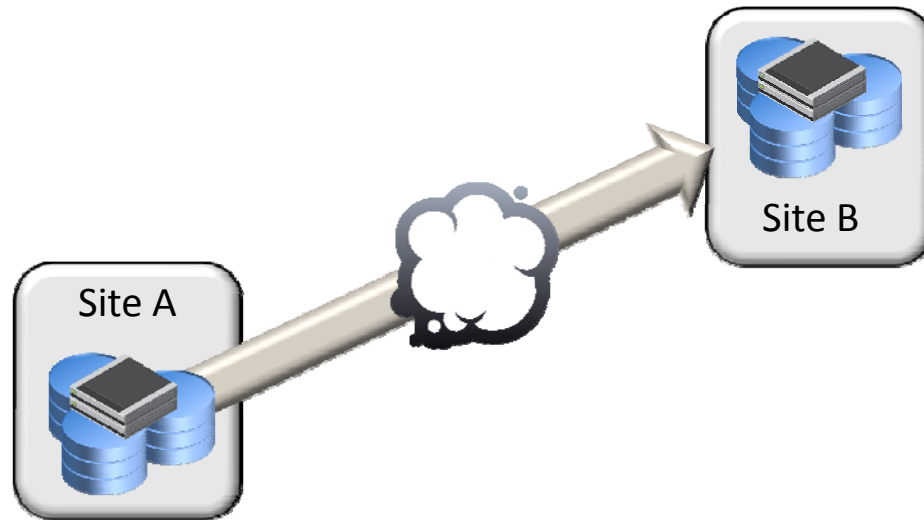


How Cloud Storage Makes Tech Refresh Painless

- 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

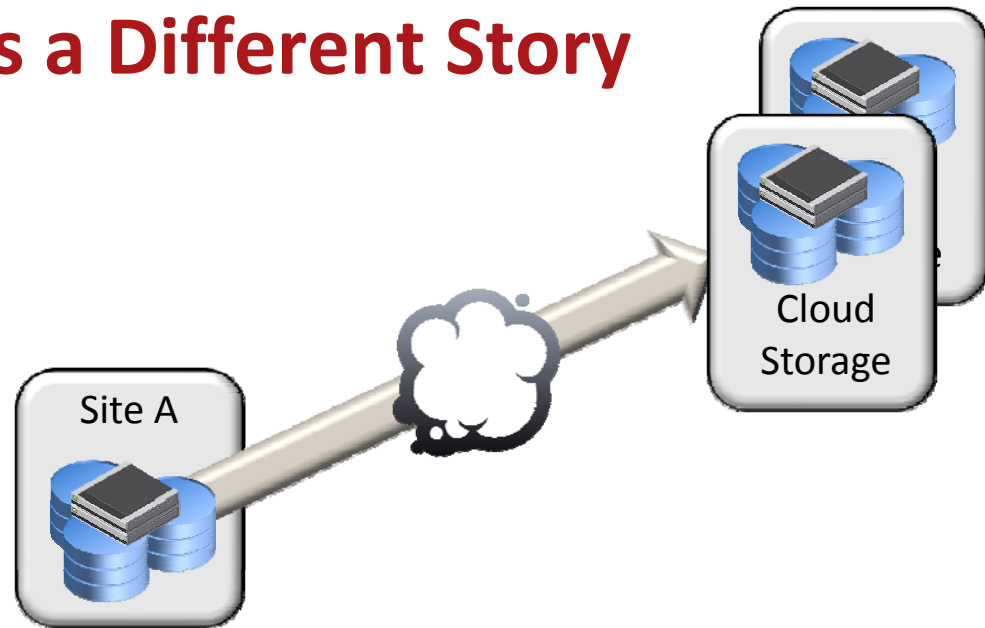


Costly DR



- **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

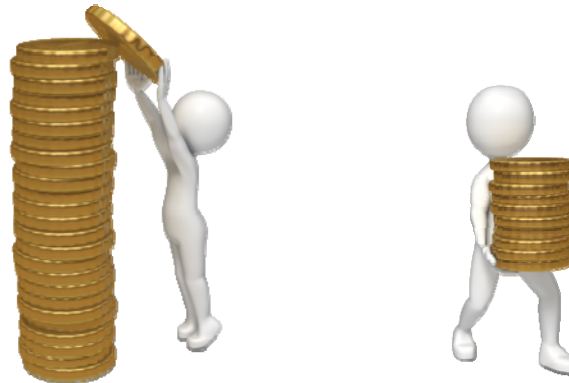


- **Cloud Storage is the 2nd site**

- 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
OpEx over 3 yrs = 5 x CapEx		Private = yes (less)
<i>Data migration costs</i>	Yes	No
<i>Hidden costs</i>	Yes	No

What is Cloud Washing?



- **Calling a storage system “Cloud Storage”**
 - When in reality it has only some of its characteristics
 - It’s a way to attempt to leverage the market hype
 - Just because something says it’s cloud storage
 - 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?

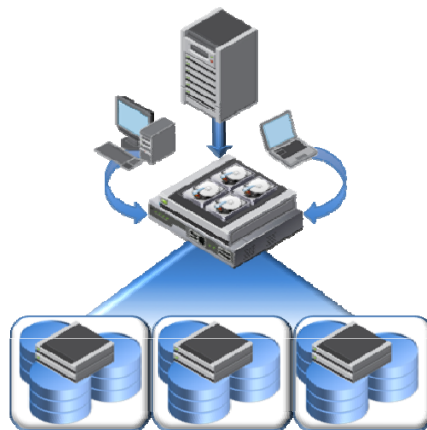
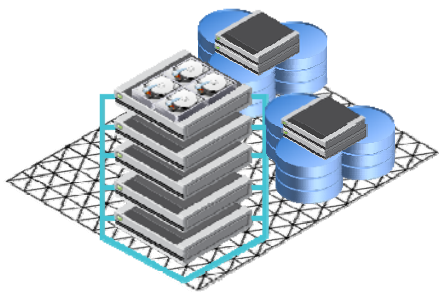
- **Scale-out storage often perceived as Cloud Storage**
 - Scale-out NAS
 - Scale-out SAN



Scale-out NAS

● Similar to Object Storage

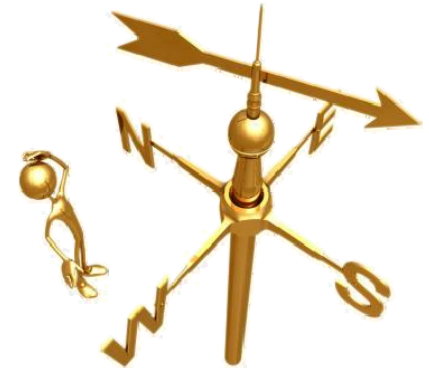
- Utilizes x86 servers with internal HDDs and/or SSDs
- Or shared external DAS, SAN Storage, or NAS systems
- Sometimes leverages GNS or File Virtualization
- But most require a metadata database = object bottleneck
 - GlusterFS is an exception – acts very similar to Object Storage



A Cloud Storage Primer



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

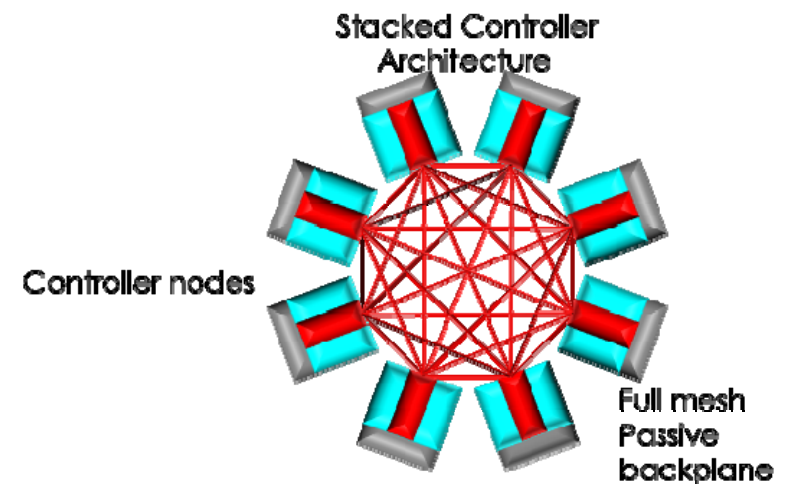
Scale-out Vendors & Products

- **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



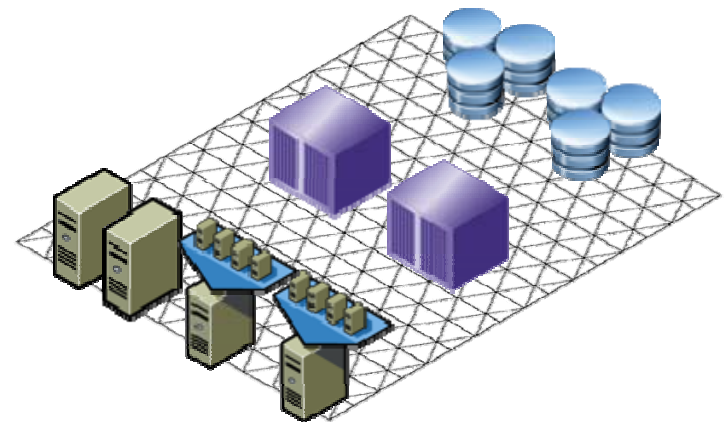
General Scale-out SAN Issues

- **Like Scale out NAS, nodes have diminishing marginal returns**
 - Eventually the next node has a negative impact
- **Tends to be the most expensive**
 - CORAID 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 as is 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**



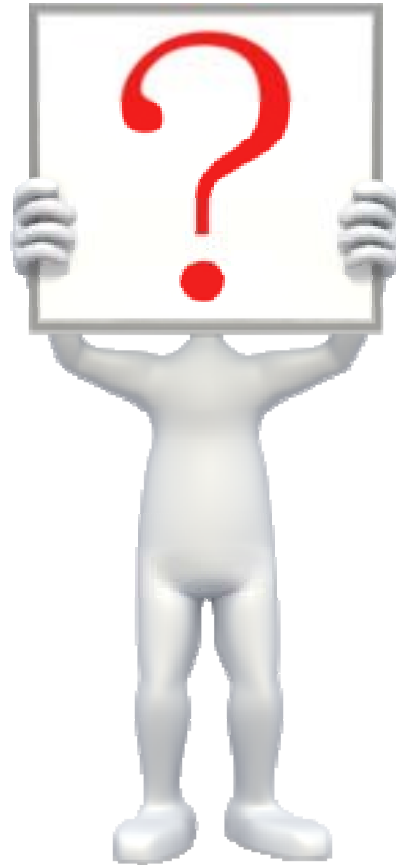
General Cloud Storage Conclusions

- **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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