AWS Storage

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Agenda

- Storage…
- Types of storages in AWS
- Brief on each storage type
- Why AWS Storage than on-premises !!!

Storage…?

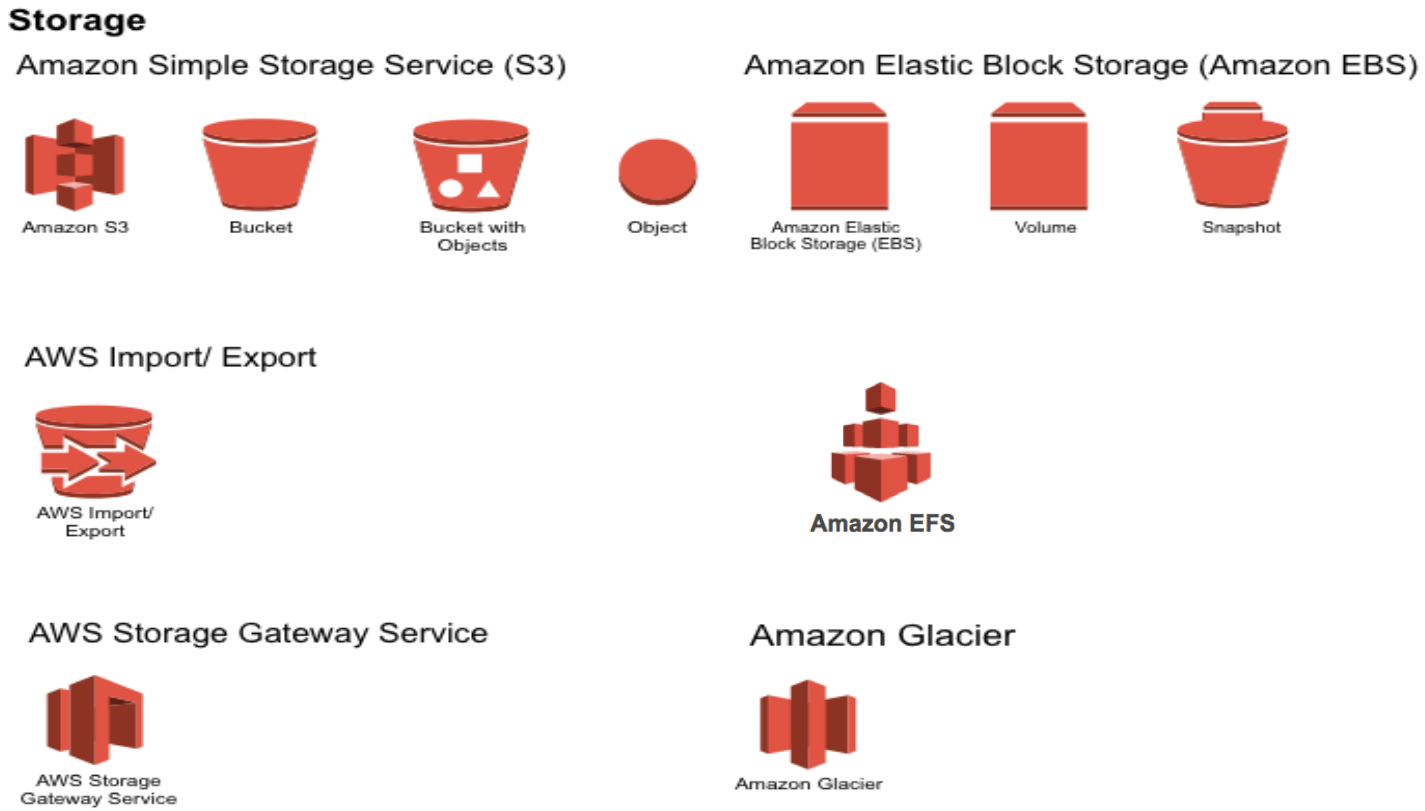
- **Storage** - method of storing something for future use.
- **memory** is any physical device capable of storing information temporarily or permanently.

- Difference between general vs digital storage unit
  - General units – KB,MB,GB,TB,PB,EB(ExaByte),ZB(ZettaByte)
  - Digital units – KB(KibiByte),MiB(MebiByte),GiB(gibiByte), TIB(tibiByte),PiB,EiB,ZiB
    - **1 GiB – 1.07 GB or 1073.74 MB**

Types of Storages in AWS

- S3(Simple Storage Service)
- EBS(Elastic Block Storage)
- EFS(Elastic File Storage)
- Glacier
- AWS Export/Import

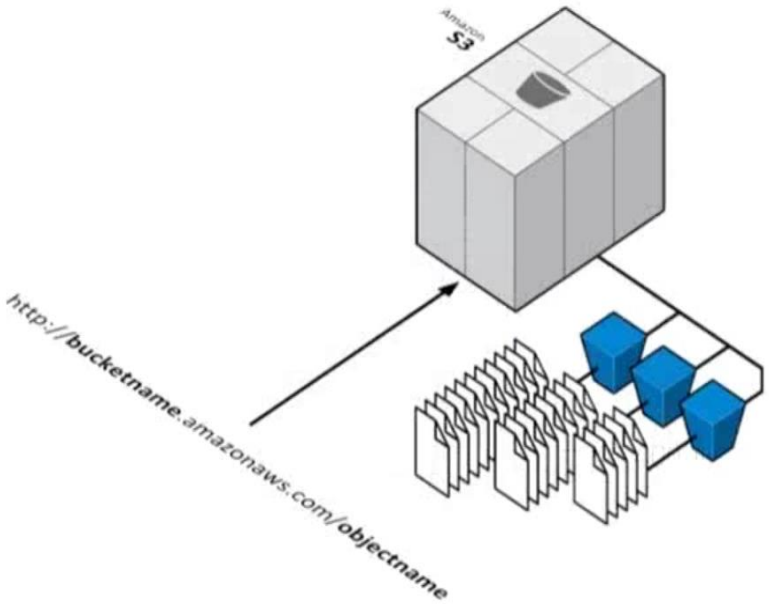
AWS Storages types in vivid way



Simple Storage Service (S3)

Simple, durable, massively scalable object storage

S3 – Buckets and Objects



- Fully managed
- Store in buckets
- Versioning
- Access control lists and bucket policies
- AES-256 bit encryption at rest
- Private by default
- Addressable over the internet if public
- Ideal for images, videos, application data, backups and more

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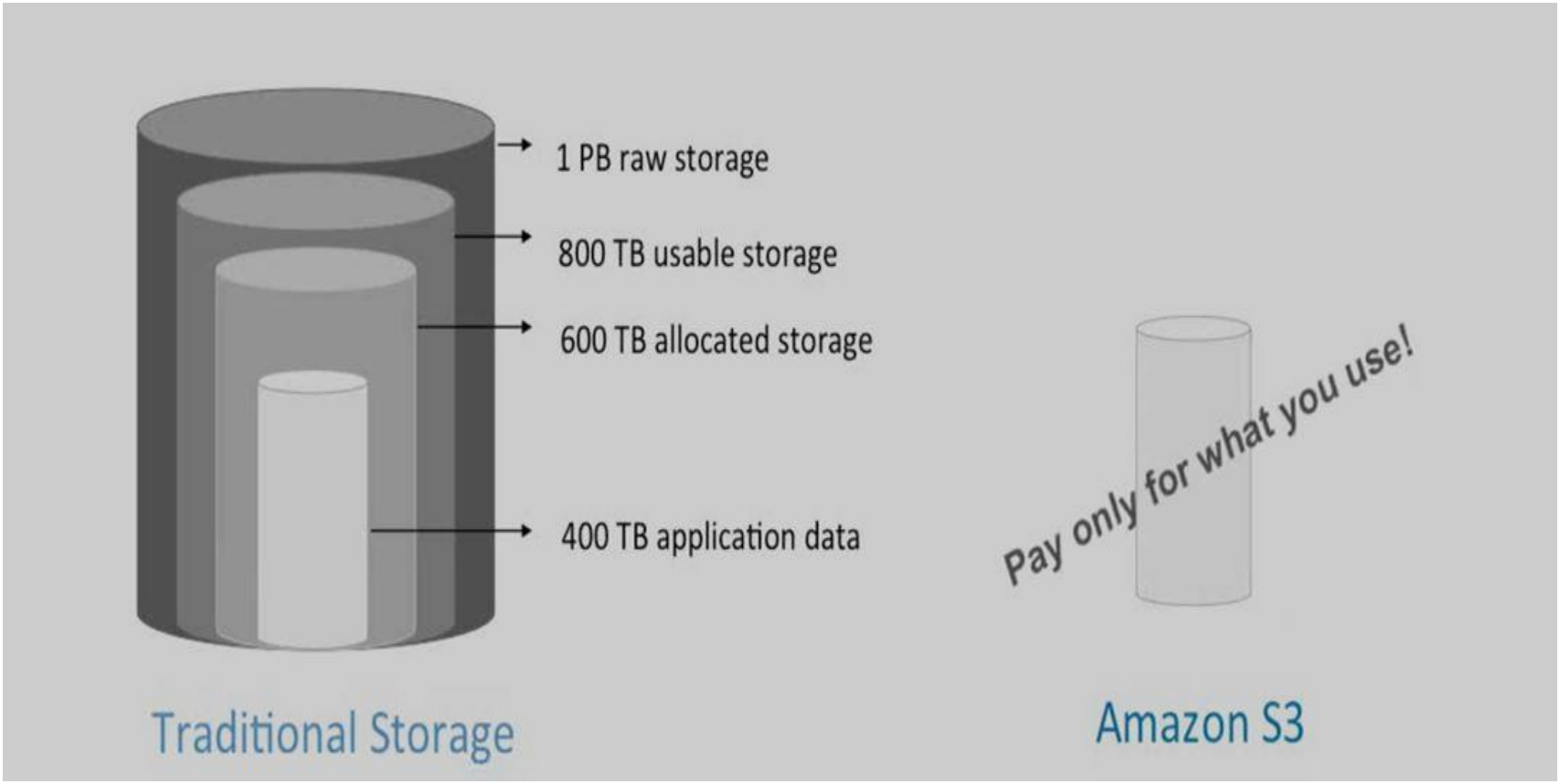
S3 vs Normal Storage



S3 Storage Types

	Standard	Standard - Infrequent Access	Reduced Redundancy Storage
Durability	99.999999999%	99.999999999%	99.99%
Availability	99.99%	99.9%	99.99%
Concurrent facility fault tolerance	2	2	1
SSL support **	Yes	Yes	Yes
First byte latency	Milliseconds	Milliseconds	Milliseconds
Lifecycle Management Policies	Yes	Yes	Yes

**SSL – Secure Socket Layer are cryptographic protocols designed to provide communications security over a computer network

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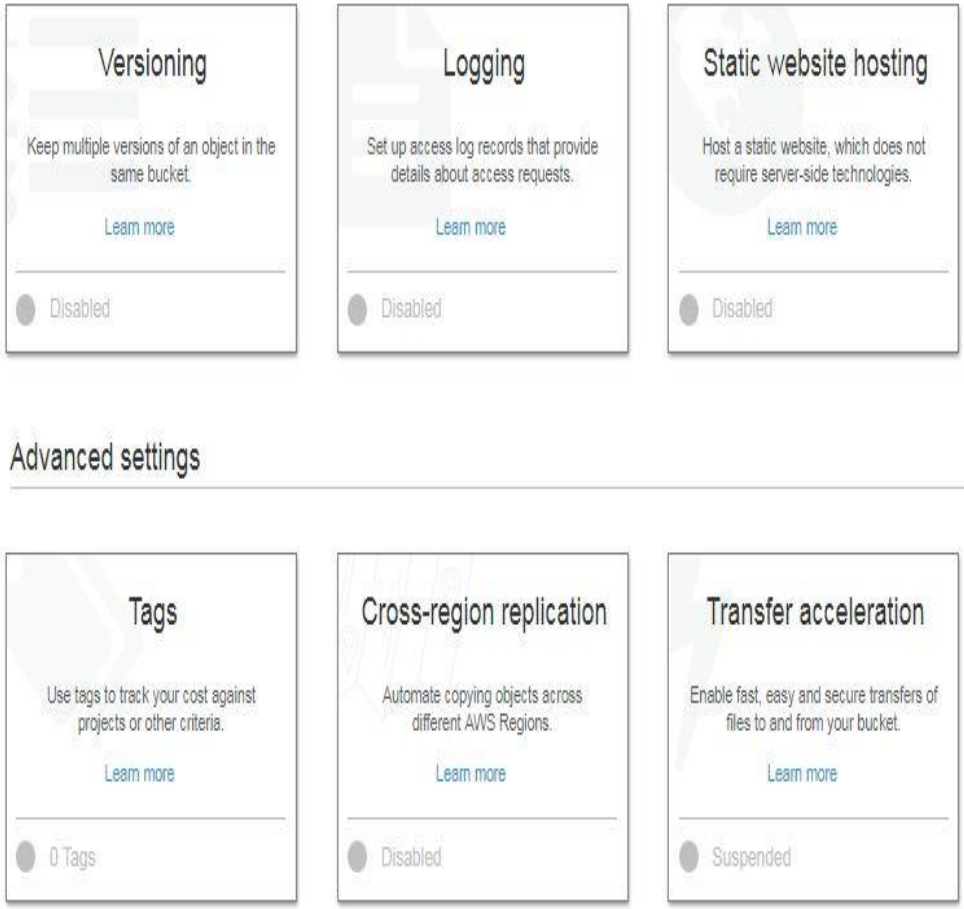
S3 Properties in console



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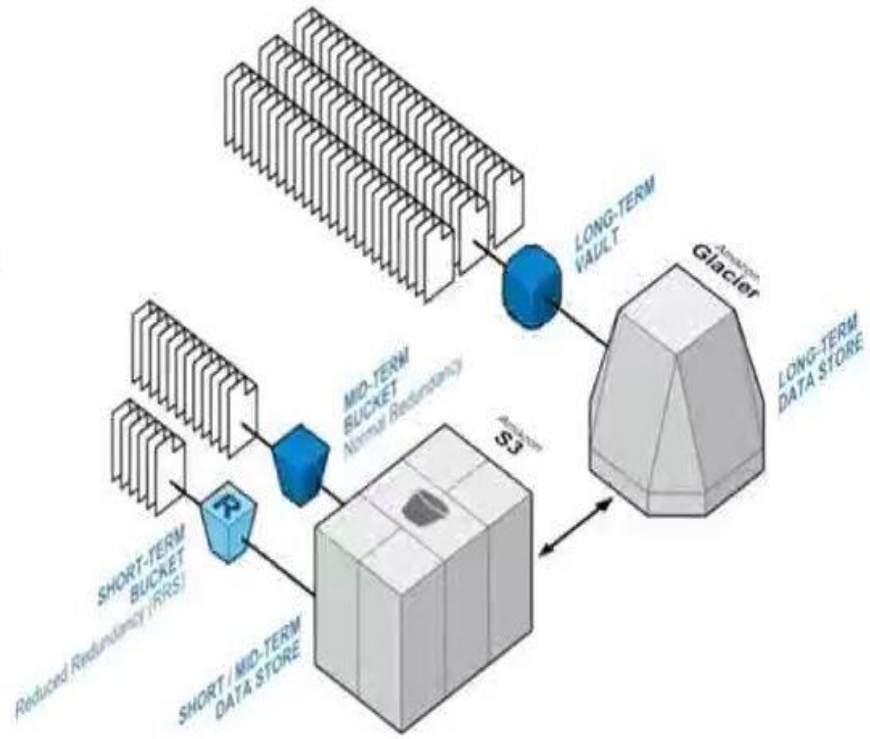
S3 LifeCycle Management



- S3 Lifecycle policies allow to delete or move objects based on age
- Set rules per S3 bucket
- Example:
  - Move object to Glacier after 30 days
  - Delete object after 365 days

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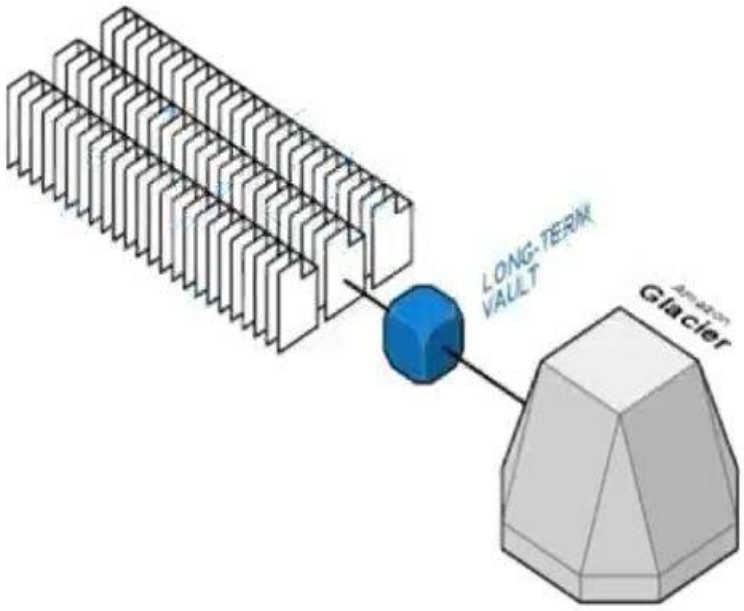
Glacier

Archive Storage in the Cloud

- Extremely low cost storage for archiving and long-term backup
- Secure and durable
- No limit to amount of data stored
- Flexible
- Pay only for what you use
- Simple integration with S3

Glacier



- Long term low-cost archiving service
- Optimal for infrequently accessed data
- 99.999999999% durability
- 3-5 hours retrieval time
- $0.01 per GB / month
- $120 per TB / year

Key points on S3

- S3 bucket is a universal namespace must be unique globally.
- Objects(files) in S3 can be from 0 bytes to 5 TB.
- By default all newly created buckets are PRIVATE
- Setup access by using bucket policies or ACL.
- Unlimited storage – no limit for S3 Bucket.
- Read after write consistency for PUTs of new objects.
- Eventual consistency for overwrite PUTS and DELETES.
- Pay for each version of the object in S3.
- Once versioning is enabled, it cannot be disabled, only suspended.

Elastic Block Store (EBS)

Block Storage for EC2

- High Performance Block Storage
- Persistent off-instance storage
- SSD or magnetic disk
- 1 GiB to 16 TiB in size
- Mount as drive to ec2 instance
- Durable snapshots to S3
- Encryption support
- Burstable or Provisioned throughput

Types of EBS Volume Storages

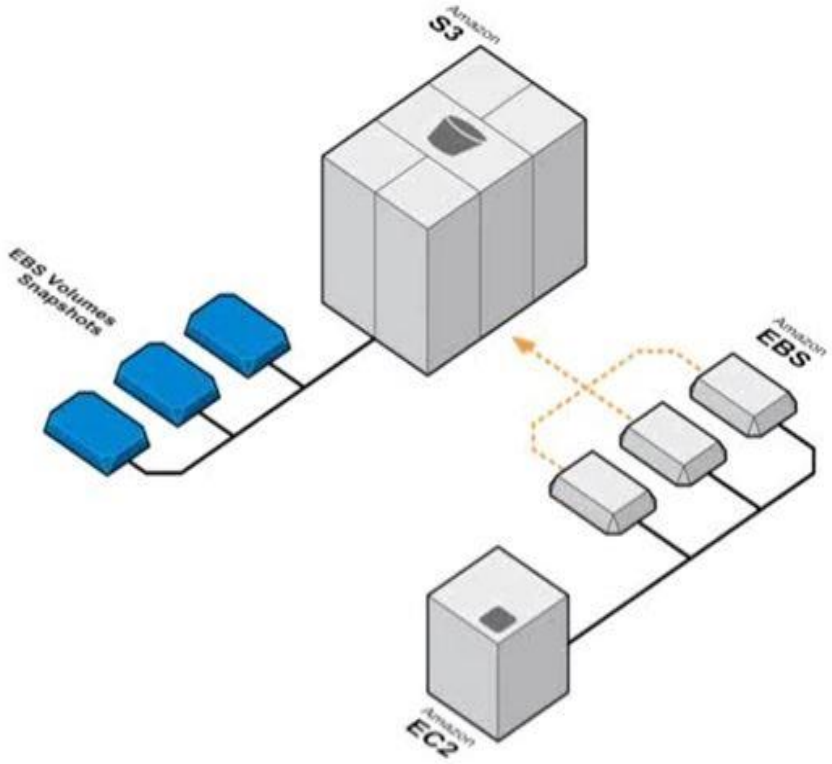
SSD-backed storage for transactional workloads such as databases and boot volumes (performance depends primarily on IOPS) . SSD-backed volumes include the highest performance Provisioned IOPS SSD (io1) for latency-sensitive transactional workloads and General Purpose SSD (gp2) that balance price and performance for a wide variety of transactional data.

HDD-backed storage for throughput intensive workloads such as MapReduce and log processing (performance depends primarily on MB/s). HDD-backed volumes include Throughput Optimized HDD (st1) for frequently accessed, throughput intensive workloads and the lowest cost Cold HDD (sc1) for less frequently accessed data.

Magnetic Storage are backed by hard disk drives (HDDs) and can be used for workloads with smaller datasets where data is accessed infrequently (1GB to 1TB in size.)

	General Purpose (SSD)	Provisioned IOPS (SSD)	Magnetic
Recommend use cases	Boot volumes Small to med DBs Dev and test	I/O intensive Large DBs	Cold storage
Storage media	SSD-backed	SSD-backed	Magnetic-backed
Volume size	1GB- 16TB	4GB- 16TB	1GB- 1TB
Max IOPS per volume	10,000 IOPS	20,000 IOPS	~100 IOPS
burst	< 1TB to 3000 IOPS	baseline	baseline
Read and write peak throughput	160 MB/s	320 MB/s	~50-90 MBps
Max IOPS per node (16k)	48,000	48,000	48,000
Peak throughput node	800 MB/s	800 MB/s	800MB/s
Latency (random read)	1-2ms	1-2 ms	20-40 ms
API name	gp2	io1	standard
Price*	$.10/GB-Month	$.125/GB-Month $.065/provisioned IOPS	$.05/GB-Month $.05/ 1M I/O

EBS Snapshot



- You can snapshot your EBS volume into our highly durable storage service
- Create new EBS volumes from snapshots or clone drives

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EBS Snapshot

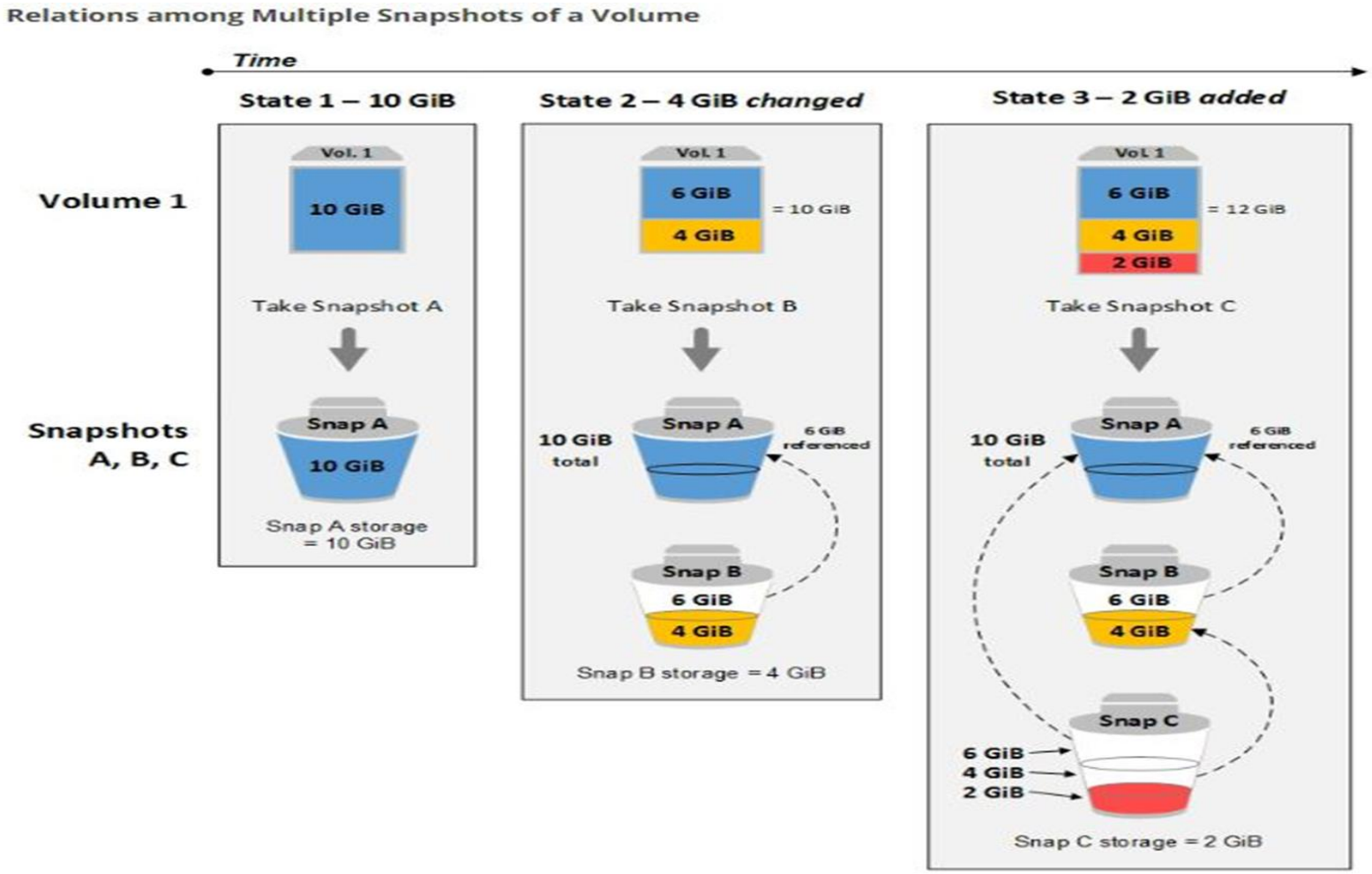
Uses of Copying Snapshot

- You can use a copy of a snapshot in the following ways:
- Geographic expansion: Launch your applications in a new region.
- Migration: Move an application to a new region, to enable better availability and to minimize cost.
- Disaster recovery: Back up your data and logs across different geographical locations at regular intervals. In case of disaster, you can restore your applications using point-in-time backups stored in the secondary region.
- Data retention and auditing requirements: Copy your encrypted EBS snapshots from one AWS account to another to preserve data logs or other files for auditing or data retention. Using a different account helps prevent accidental snapshot deletions, and protects you if your main AWS account is compromised.

Encryption Support for Snapshots

- EBS snapshots broadly support EBS encryption. The following list
- Snapshots of encrypted volumes are automatically encrypted.
- Volumes that are created from encrypted snapshots are automatically encrypted.
- When you copy an unencrypted snapshot that you own, you can encrypt it during the copy process.
- When you copy an encrypted snapshot that you own, you can reencrypt it with a different key during the copy process.

Example for EBS Snapshot



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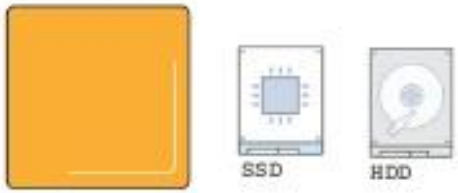
Instance Volume VS EBS Volume

Instance Store vs EBS

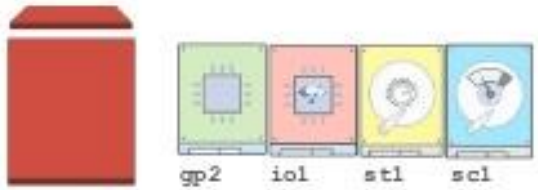
EC2 Instance Store

- Local to instance
- Non-persistent data store
- Data not replicated (by default)
- No snapshot support
- SSD or HDD



Elastic Block Store

- Persistent block storage volumes
- 99.999% availability
- Automatically replicated within its Availability Zone (AZ)
- Point-in-time snapshot support
- Modify volume type as needs change
- SSD or HDD
- Auto recovery



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Key Points on EBS

- You cannot mount 1 EBS volume to multiple EC2 instances, instead use EFS.
- Volumes exist on EBS are Virtual hard disk.
- HDD Volumes cannot be used for boot volume, however they can be used as additional volume.
- Snapshot of volume is stored on S3.
- Snapshots are incremental. Only the blocks that have changed since your last snapshot are moved to S3.*
- Snapshots are encrypted automatically when Volume is encrypted.
- Snapshots can be shared with other AWS accounts, but only if they are unencrypted.
- Amazon EBS volumes that serve as root devices, you should stop the instance before taking snapshot.

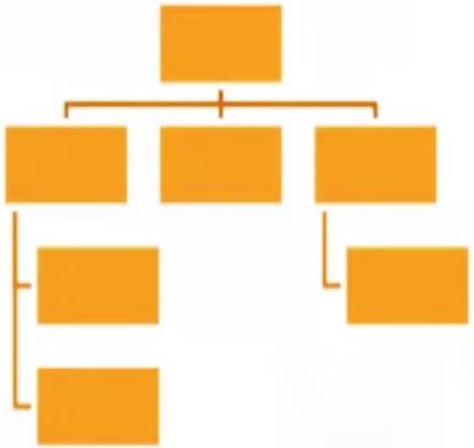
* Example in slide 19

Elastic File System(EFS)

- Fully managed file system for EC2 instances
- Provides standard file system semantics
- Works with standard operating system APIs
- Sharable across thousands of instances
- Elastically grows to petabyte scale
- SSD-based
- Delivers performance for a wide variety of workloads
- Highly available and durable
- NFS v4-based

What is a file system?

- The primary resource in EFS
- Where you store files and directories
- Can create unlimited file systems per account



We focused on changing the game

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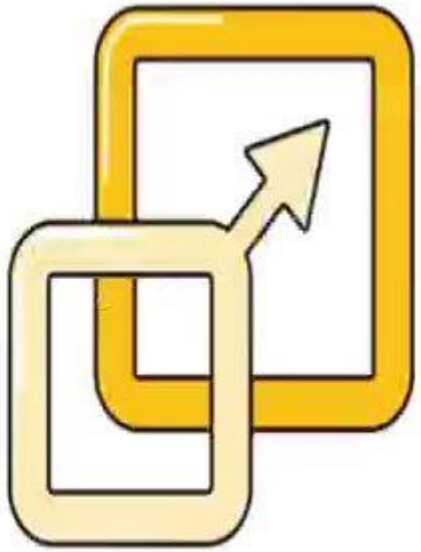
EFS is Simple

- Fully managed
  - No hardware, network, file layer
  - Create a scalable file system in seconds!
- Seamless integration with existing tools and apps
  - NFS v4—widespread, open
  - Standard file system semantics
  - Works with standard OS file system APIs
- Simple pricing = simple forecasting

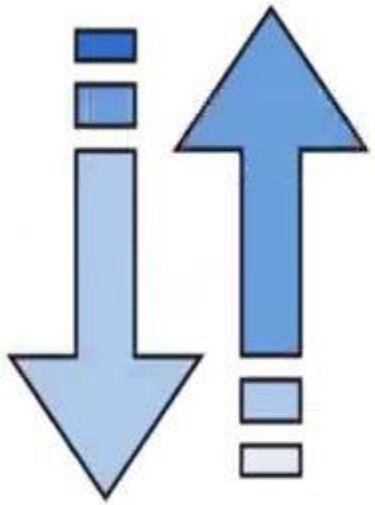
EFS is Elastic

- File systems grow and shrink automatically as you add and remove files
- No need to provision storage capacity or performance
- You pay only for the storage space you use, with no minimum fee



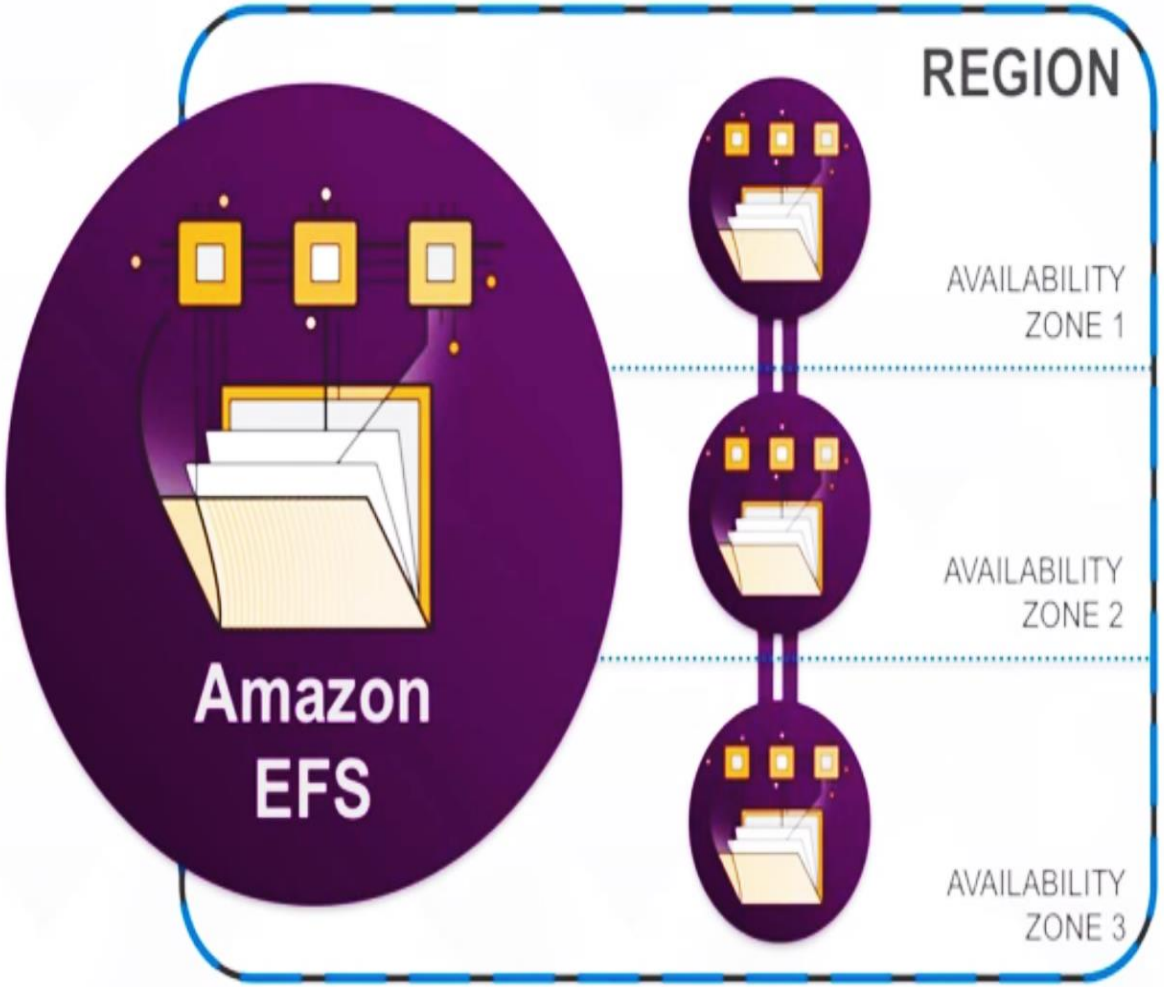
EFS is Scalable

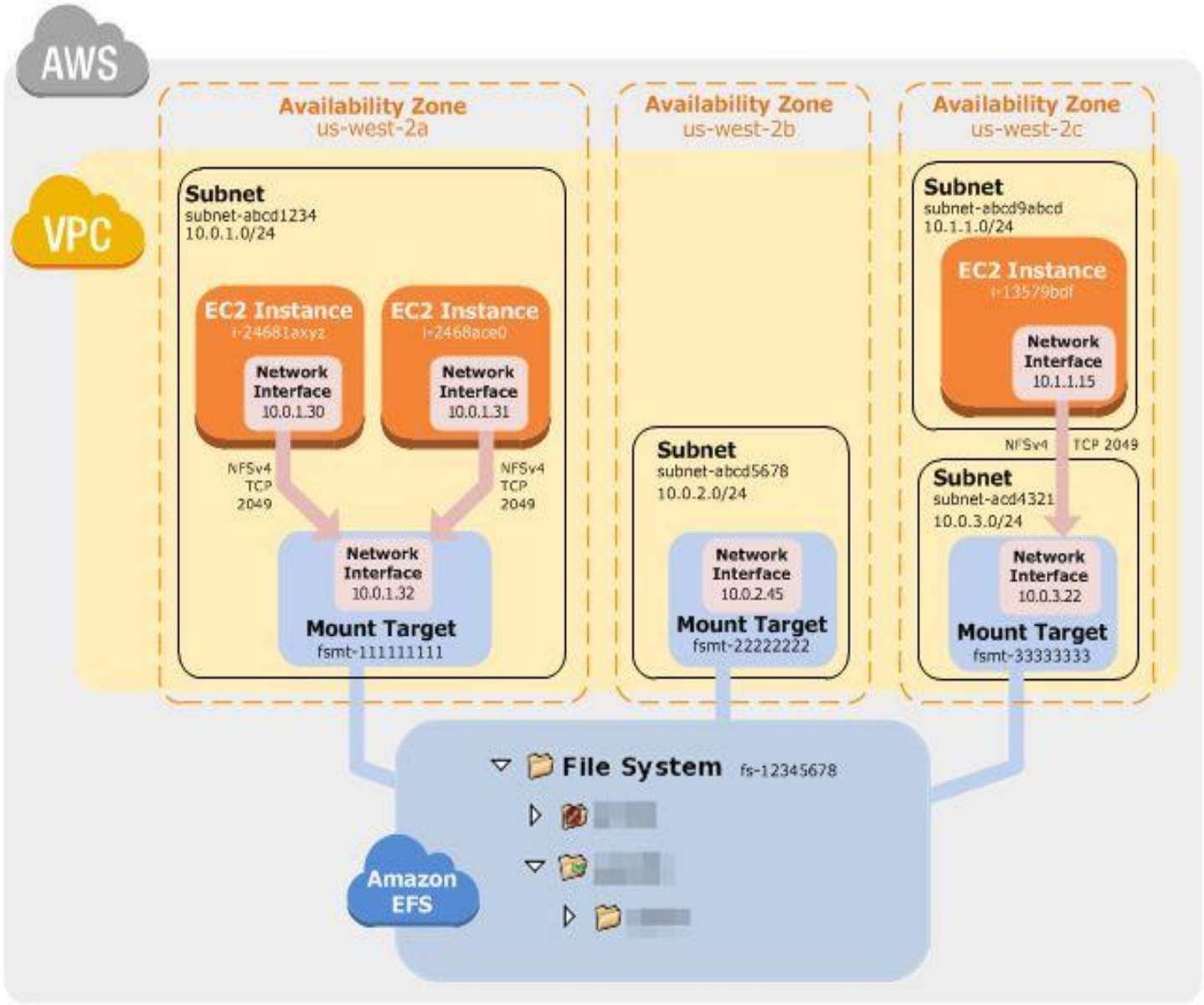
- File systems can grow to petabyte scale
- Throughput and IOPS scale automatically as file systems grow
- Consistent low latencies regardless of file system size
- Support for thousands of concurrent NFS connections



Data is stored in multiple AZs for high availability and durability

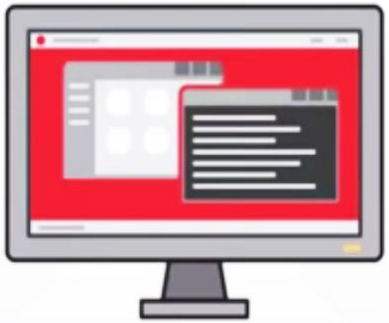
- Every file system object (directory, file, and link) is redundantly stored across multiple AZs in a region





There are three ways to set up and manage a file system

- AWS Management Console
- AWS Command Line Interface (CLI)
- AWS Software Development Kit (SDK)



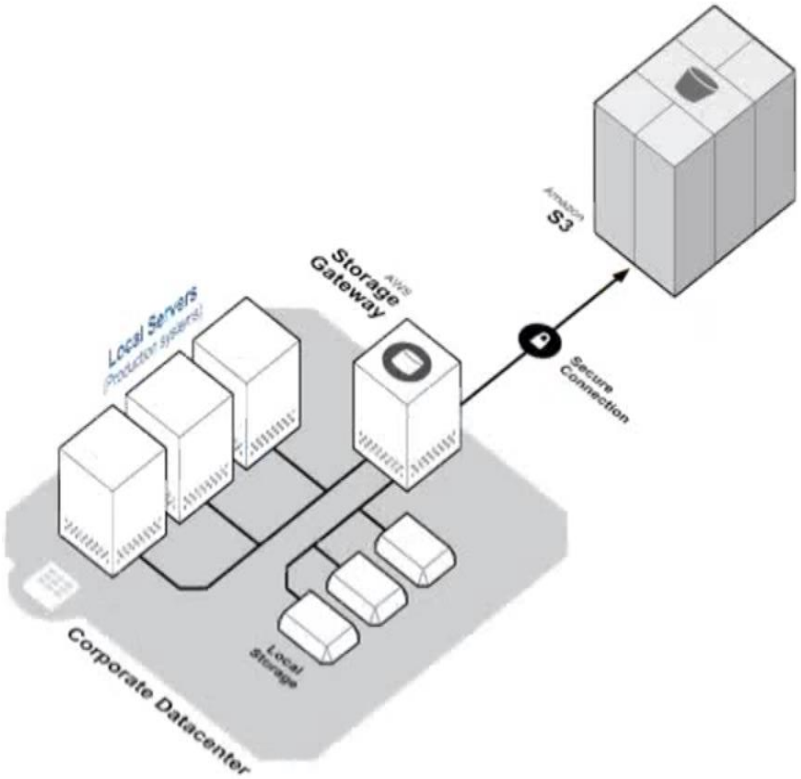
Feature	S3	EBS	EFS
Storage Size	No limit	Max 16 TiB	No limit
File Size	Object – 5TB	No limit on file	File max size 52TiB
Performance	Highly scalable supports 100 PUT/LIST/DELETE requests per second by default	Manually Scale the size of the volumes without stopping instance	Highly Scalable Managed Service Supports up to 7000 file system operations per second
* Data Stored	Stored data stays in the region.	Data stored stays in the same Availability zone.	Data stored and stays in the region.
Data Access	Accessible over internet	accessed only by single EC2 instance	Can be accessed by 1 to 1000s of EC2 instances from multiple AZs, concurrently
Encryption Mechanisms	•Server Side Encryption SSE-Amazon S3,SSE-KMS and SSE-c •Client Side Encryption Customer Master Key (CMK)	Uses an AWS KMS–Managed Customer Master Key (CMK) and AES 256-bit Encryption standards	No Encryption options available

*For more https://cloud.netapp.com/blog/ebs-efs-amazons3-best-cloud-storage-system

Storage Gateway

AWS Storage Gateway is a service that connects an on-premises software appliance with cloud-based storage to provide seamless and secure integration between an organization's on-premises IT environment and AWS's storage infrastructure. The service enables you to securely store data to the AWS cloud for scalable and cost-effective storage.

AWS Storage Gateway



- Connect an on-premises software appliance to provide integration with Amazon S3
- Supports three configuration
  - Gateway-Cached Volumes
  - Gateway-Stored Volumes
  - Gateway-Virtual Tape Library (VTL)

AWS Import/Export

Uses portable storage volumes

Economic and fast

Faster than Internet for significant data sets

Import into S3, EBS, or Glacier

- Dependent upon region support

Snowball

- 50TB Storage
- 10Gb Network
- 8.5G Impact
- Encryption with KMS
- Schedule via AWS Console

CREATE A JOB

*Create a new data transfer job in the **AWS Management Console.** AWS will ship you one or more Snowball appliances based on the amount of data.*

CONNECT THE SNOWBALL

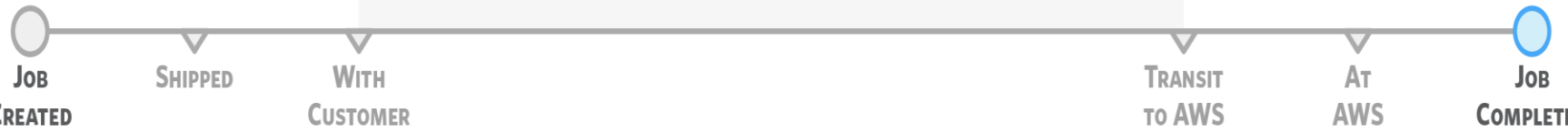
*Connect the appliance to your network and set the **IP address**. Download the Snowball client and job **manifest** from the Console, run the client to connect and identify data to transfer.*

COPY TO THE SNOWBALL

The client will encrypt and copydata to the appliance at high speed. Once complete, the E ink shipping label will automatically update.

AWS WILL MOVE YOUR DATA TO S3

Track the job status via Amazon SNS, text messaging, or directly in the Console.



Snowmobile broad strokes

- 100 Petabytes per job
- Truck with 45 foot container
- 68,000 pounds
- Up to 500Gbps

- Site Survey
- Dispatch
- Fill
- Return for Ingest

Why AWS for storage?

Reduce CAPEX while dramatically increasing scalability

Eliminate the need for secondary sites

Reduce costs

Eliminate on premise equipment to manage archives

Consolidate on-premise and augment with cloud

Reduce on-premise

Eliminate capacity planning

Eliminate provisioning for peak demand

Change processes

Remove tape archives

Cycle out aging disk arrays

Remove aging technologies


That's all Folks!