



# Introduction to Storage on AWS

# Agenda

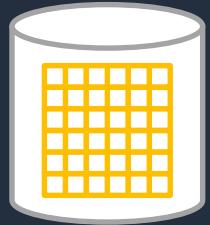
- Introduction
- Storage Primer
- Block Storage
- Shared File Systems
- Object Store
- Data Transfer and Edge Processing
- Backup
- Elastic Disaster Recovery Service



# Storage Primer



# Block vs File vs Object



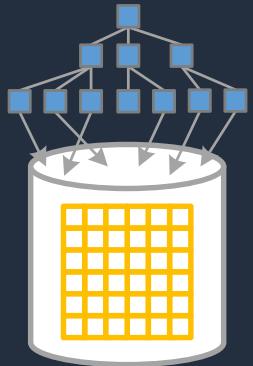
## Block Storage

Raw Storage

Data organized as an array of unrelated blocks

Host File System places data on disk

Ex: Hard Disks, Storage Area Network (SAN) Storage Arrays

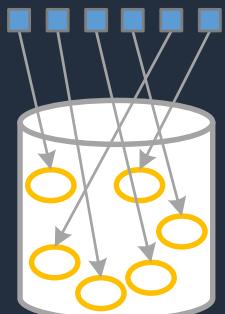


## File Storage

Unrelated data blocks managed by a file (serving) system

Native file system places data on disk

Ex: Network Attached Storage (NAS) Appliances, Windows File Servers, NetApp OnTap



## Object Storage

Stores Virtual containers that encapsulate the data, data attributes, metadata and Object IDs

API Access to data

Metadata Driven, Policy-based, etc.

Ex: Ceph, OpenStack Swift

# Storage - Characteristics

Some of the ways we look at storage

Durability	Availability	Security	Cost	Scalability	Performance	Integration
Measure of expected data loss	Measure of expected downtime	Security measures for at-rest and in-transit data	Amount per storage unit, e.g. \$ / GB	Upward flexibility, storage size, number of users	Performance metrics (bandwidth)	Ability to interact via API or with other services



# Understanding Durability



Two copies on one site

designed for  
**99.99%**  
durability



Copies on two sites

designed for  
**99.999%**  
durability



copies in three AZ

designed for  
**99.99999999%**  
durability

# Availability vs Durability

%	Availability	Durability
99.999	5 minutes 15 seconds	1 in 100,000
99.9999	31 seconds	1 in 1,000,000
99.99999	3 seconds	1 in 10,000,000
99.999999999	300 uSeconds	1 in 100,000,000,000

# More choice for more applications

## Block storage

General Purpose SSD

Provisioned IOPS SSD

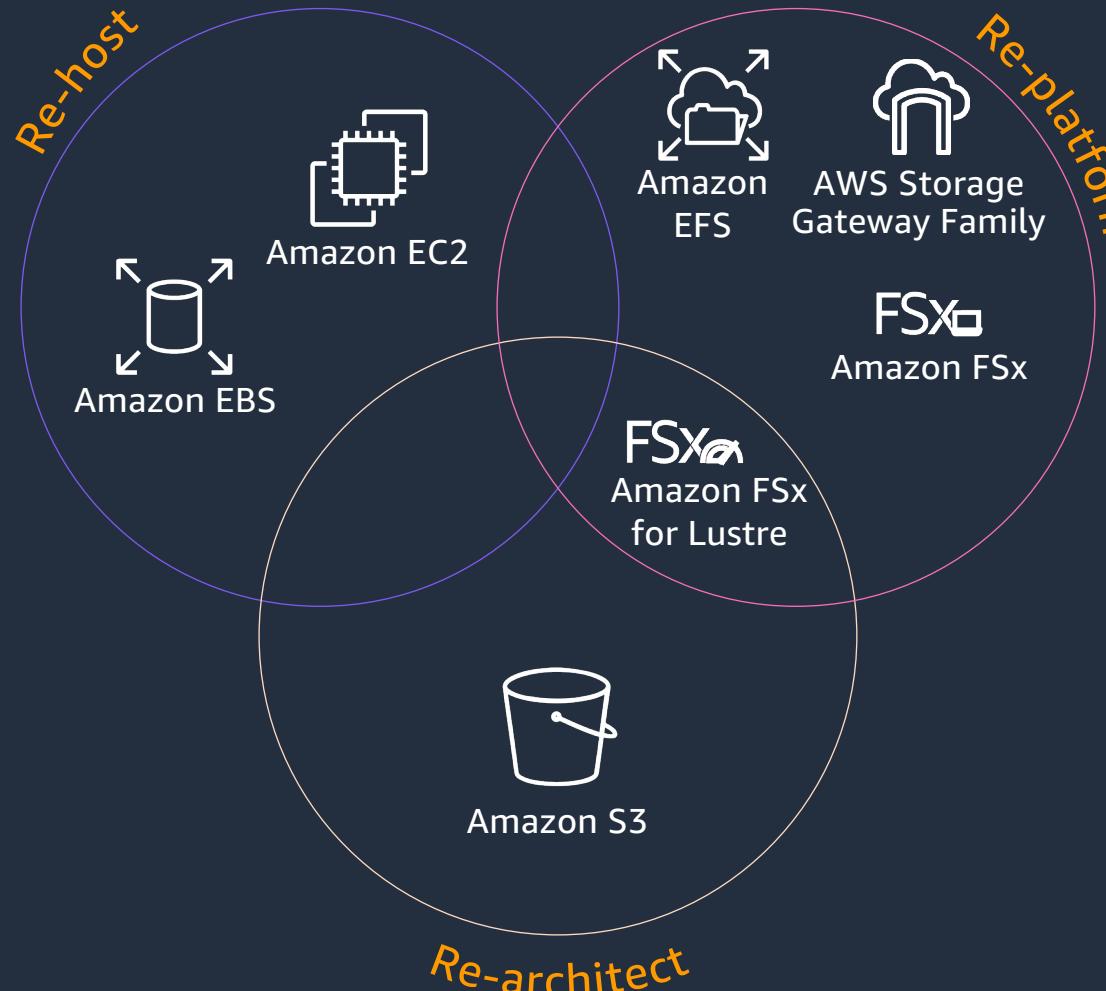
Throughput-Optimized HDD

Cold HDD



## Backup

AWS Backup



## File storage

EFS

FSx for OnTap

FSx for Windows

FSx for Lustre

FSx for OpenZFS



## Object storage

S3 Standard

S3 Standard-IA

S3 One Zone-IA

S3 Intelligent-Tiering

S3 Glacier Instant Retrieval

S3 Glacier Flexible Retrieval

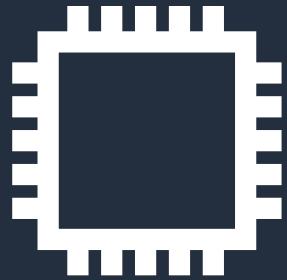
S3 Glacier Deep Archive



# Block Storage

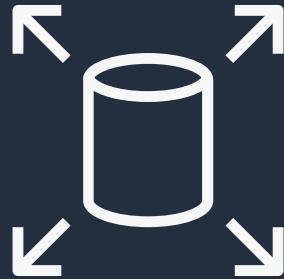


# Block storage portfolio



## Instance storage

Temporary block-level storage attached to host hardware that is ideal for storage of information that frequently changes or is replicated across multiple instances



## Amazon EBS

Easy to use, high performance block storage service designed for use with Amazon Elastic Compute Cloud (EC2) for both throughput and transaction intensive workloads



## Snapshots

Incremental, point-in-time copies of your EBS data that can be used to restore new volumes, expand the size of a volume, or move volumes across Availability Zones

# EBS is designed for a wide range of workloads on EC2

## Enterprise applications



SAP ERP, Oracle ERP,  
Microsoft  
SharePoint,  
Microsoft Exchange

## Relational databases



MySQL, PostgreSQL,  
SQL Server, Oracle DB,  
SAP HANA

## Non-relational/ NoSQL databases



Cassandra,  
MongoDB, CouchDB

## Big data analytics



Kafka, Splunk, Hadoop,  
Data warehousing

## File/media



CIFS/NFS, transcoding,  
encoding, rendering

**LOW LATENCY AND CONSISTENT, HIGH IOPS AND THROUGHPUT**

**SCALABLE WITHOUT DISRUPTION TO YOUR WORKLOAD**

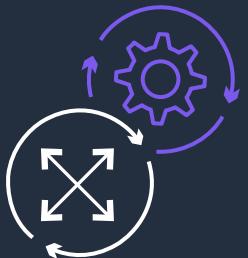
**99.999% AVAILABILITY AND AN ANNUAL FAILURE RATE (AFR) OF BETWEEN 0.1%–0.2%**

# Easy to use, high performance block storage at virtually any scale



## Performance for any workload

Up to 256,000 IOPS, single digit millisecond latency, 4,000 MiB/s Throughput



## Virtually unlimited scale

Use a single gigabyte or less, or scale up to petabytes of data



## Easy to use

Easily add/remove capacity, or change volume types with Elastic Volumes



## Secure

Encrypt all new volumes and data for a region by default with a single setting



## High reliability

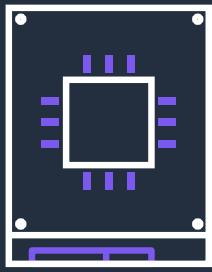
99.999% availability and an annual failure rate of between 0.1%–0.2%



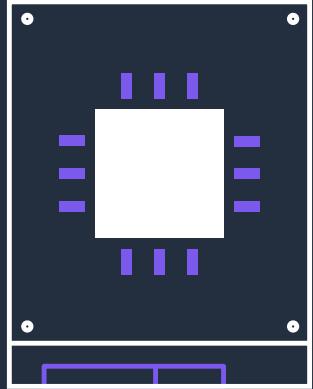
## Cost-effective

Pay as low as \$0.015/GB-month for highly cost-effective dollar per gigabyte block storage

# Six different volume types for optimal use

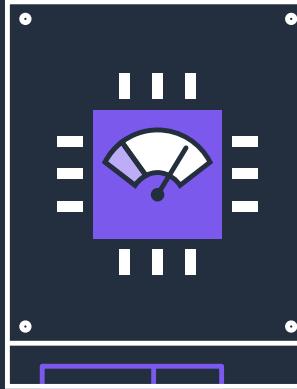


SSD



**gp2 – gp3**

General Purpose  
SSD



**io1 – io2**

Provisioned IOPS  
SSD



HDD



**st1**

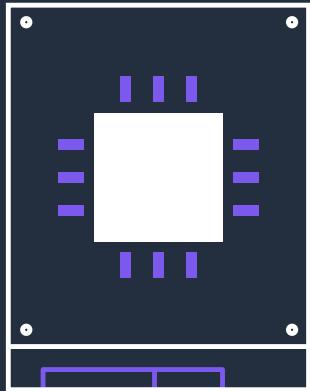
Throughput  
Optimized HDD



**sc1**

Cold  
HDD

# General Purpose SSD - gp2



**gp2**

General Purpose SSD

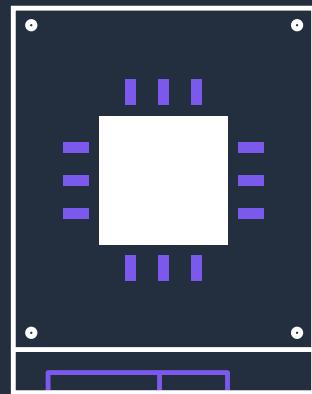
- **Use cases:** Most workloads, relational and non-relational database workloads, boot volumes, development and test environments, virtual desktops
- **Volume size:** 1 GB–16 TB
- **Durability:** 99.8% - 99.9%
- **IOPS/volume\*:** 16,000
- **Max throughput/volume\*:** 250 MB/s
- **Pricing\*\*:** \$0.10 per GB-month of provisioned storage

\*Throughput limit is between 128 MB/s & 250 MB/s, depending on volume size

\*\*Pricing is for US East (N. Virginia) Region



# General Purpose SSD gp3



**gp3**

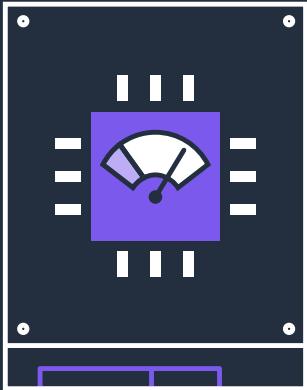
General Purpose SSD

- **Use cases:** Latest generation general-purpose SSD-based EBS volumes. Provision performance independent of storage capacity, while providing up to 20% lower pricing per GB than existing gp2 volumes.
- **Volume size:** 1 GB–16 TB
- **Durability:** 99.8% - 99.9%
- **IOPS/volume\*:** 16,000
- **Throughput/volume\*:** 1,000 MB/s
- **Pricing\*\*:** \$0.08 per GB-month of provisioned storage, 3,000 IOPS free and \$0.005/provisioned IOPS-month over 3,000

\*\*Pricing is for US East (N. Virginia) Region



# Provisioned IOPS SSD io1



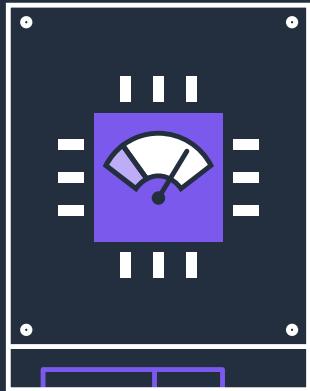
io1

Provisioned IOPS SSD

- **Use cases:** Large database workloads, mission-critical business applications requiring sustained high performance – Supports Multi-Attach
- **Volume size:** 4 GB–16 TB
- **Durability:** 99.8% - 99.9%
- **Max IOPS/volume\*:** 64,000
- **Max throughput/volume\*:** 1,000 MB/s
- **Pricing\*\*:** \$0.125 per GB-month of provisioned storage  
\$0.065 per provisioned IOPS-month

\*\*Pricing is for US East (N. Virginia) Region

# Provisioned IOPS SSD io2



io2

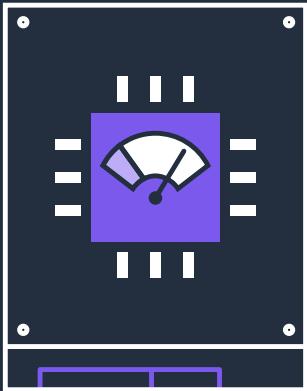
Provisioned IOPS SSD

- **Use cases:** Latest generation of the Provisioned IOPS SSD volumes that is designed to provide 100X durability of 99.999% as well as a 10X higher IOPS to storage ratio of 500 IOPS for every provisioned GB –at the same price as the previous generation (io1) – Supports Multi-Attach
- **Volume size:** 4 GB–16 TB
- **Durability:** 99.999%
- **Max IOPS/volume\*:** 64,000
- **Max throughput/volume\*:** 1,000 MB/s
- **Pricing\*\*:** \$0.125 per GB-month of provisioned storage  
\$0.065 per provisioned IOPS-month up to 32,000 IOPS, \$0.046 per provisioned IOPS-month up to 64,000 IOPS

\*\*Pricing is for US East (N. Virginia) Region



# Provisioned IOPS SSD io2 Block Express



**io2 Block Express**  
Provisioned IOPS SSD

\*Pricing is for US East (N. Virginia) Region

- **Use cases:** io2 Block Express offers the highest performance block storage in the cloud with 4x higher throughput, IOPS, and capacity than io2 volumes, along with sub-millisecond latency. Block Express is the next generation of Amazon EBS storage server architecture purpose-built to meet the performance and latency requirements of the most demanding applications.
- **Volume size:** 4 GB–64 TB
- **Durability:** 99.999%
- **Max IOPS/volume\*:** 256,000
- **Max throughput/volume\*:** 4,000 MB/s
- **Pricing\*:** \$0.125 per GB-month of provisioned storage  
\$0.065 per provisioned IOPS-month up to 32,000 IOPS,  
\$0.046 per provisioned IOPS-month up to 64,000 IOPS,  
\$0.032 per provisioned IOPS-month greater than 64,000 IOPS

# Throughput Optimized HDD for frequently accessed, throughput-intensive workloads



**st1**

Throughput Optimized HDD

- **Use cases:** st1 is backed by hard disk drives (HDDs) and is ideal for frequently accessed, throughput-intensive workloads with large datasets and large I/O sizes, such as MapReduce, Kafka, log processing, data warehouse, and ETL workloads.
- **Volume size:** 125 GB–16 TB
- **Durability:** 99.8% - 99.9%
- **Max IOPS/volume\*:** 500
- **Max throughput/volume\*:** 500 MB/s
- **Pricing\*\*:** \$0.045 per GB-month of provisioned storage

\*\*Pricing is for US East (N. Virginia) Region

# Cold HDD for infrequently accessed workloads



**sc1**  
Cold HDD

- **Use cases:** sc1 is backed by hard disk drives (HDDs) and provides the lowest cost per GB of all EBS volume types. It is ideal for less frequently accessed workloads with large, cold datasets.
- **Volume size:** 125 GB–16 TB
- **Durability:** 99.8% - 99.9%
- **Max IOPS/volume\*:** 250
- **Max throughput/volume\*:** 250 MB/s
- **Pricing\*\*:** \$0.015 per GB-month of provisioned storage

\*\*Pricing is for US East (N. Virginia) Region



# Fully managed backup with EBS Snapshots

**Backup**



**Restore**



## Low cost

Incremental backups do not duplicate data and reduce storage costs

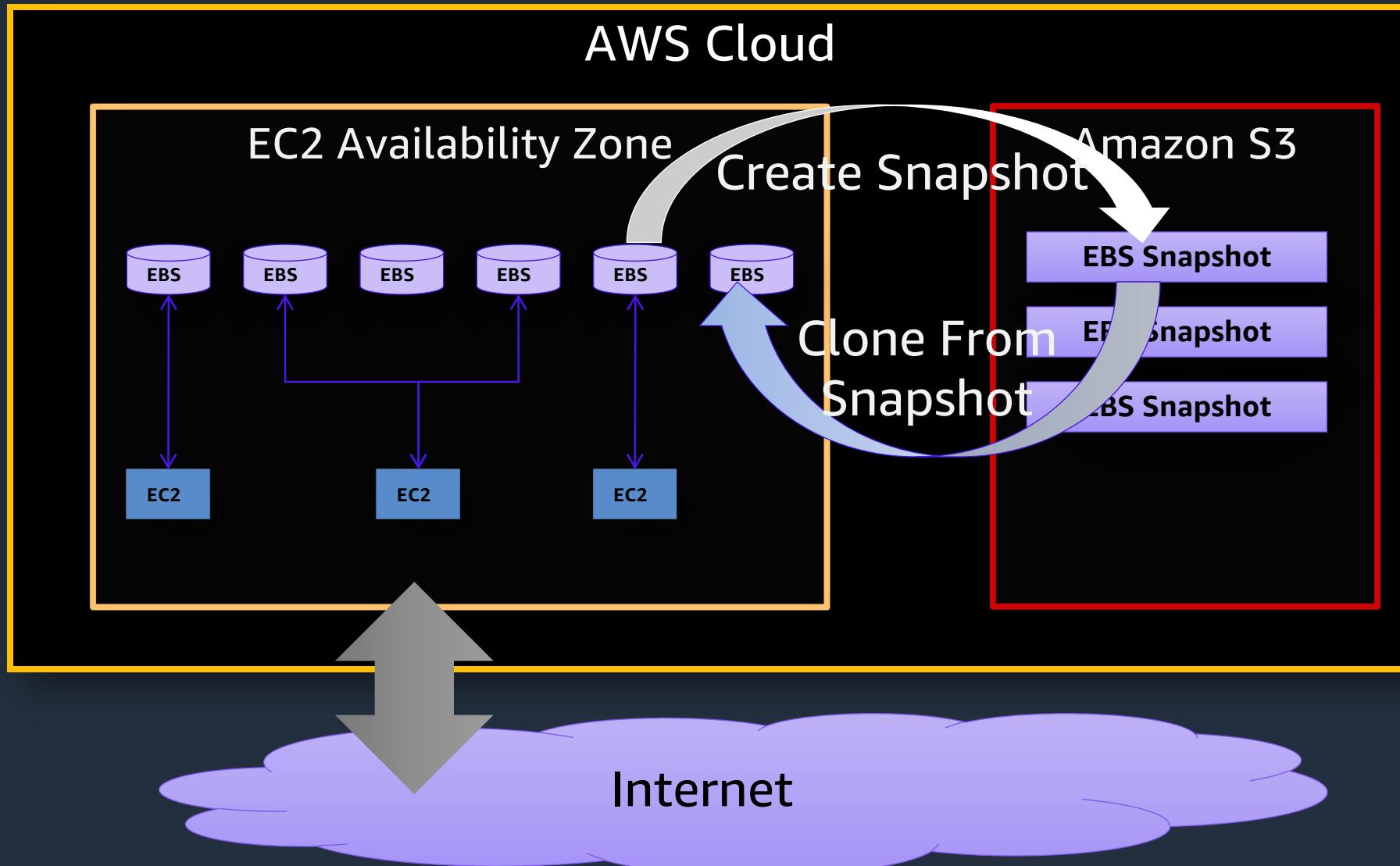
## Protection

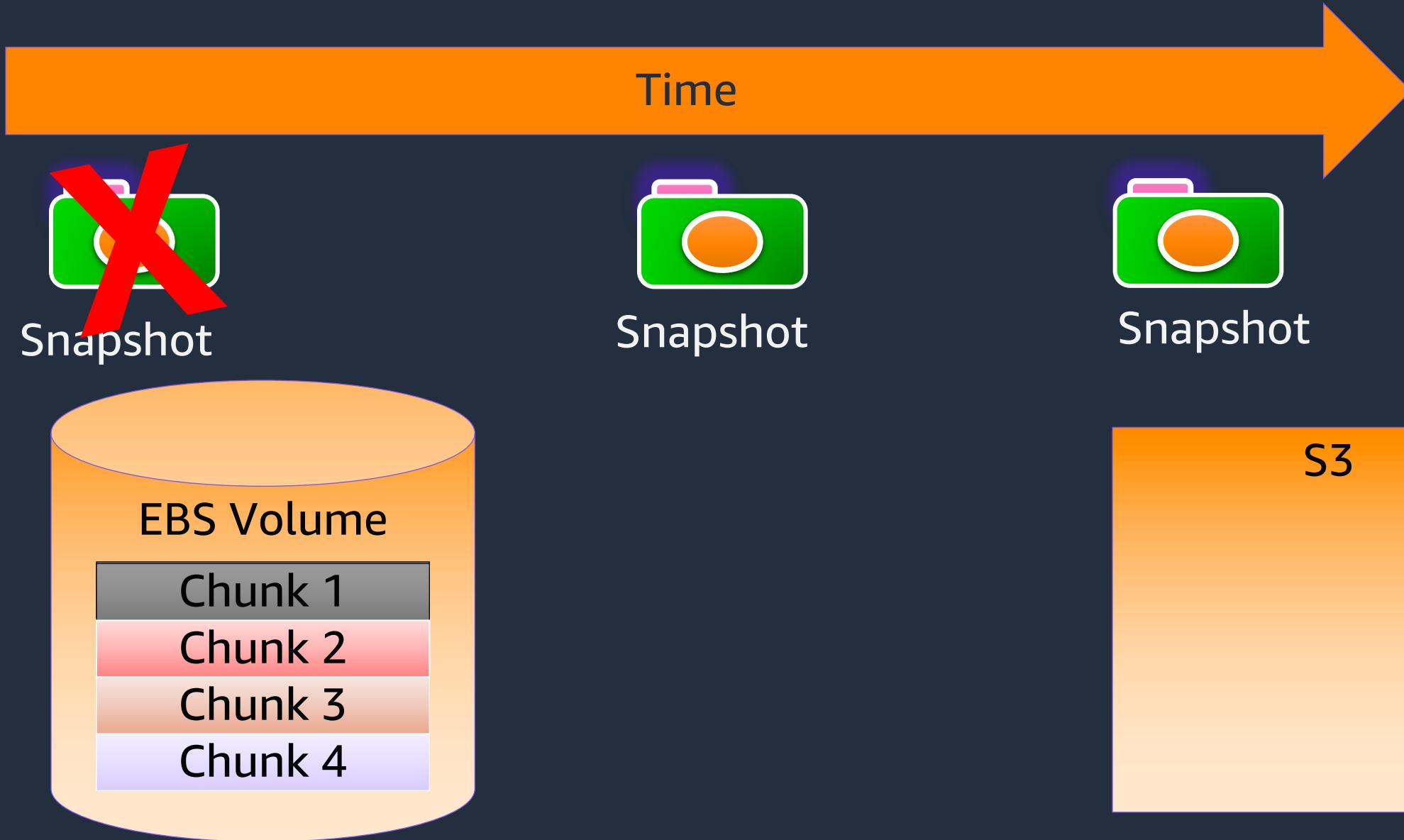
Snapshots are stored in Amazon S3

## Agility

Quickly restore volumes across Availability Zones within a region

# EBS Snapshots – Delta Block Changes





# What is Amazon EC2 instance store?



- Local to instance
- Non-persistent data store
- Available on several EC2 families
- Data is not replicated (by default)
- No snapshot support
- SSD or NVMe
- Pricing is included in instance cost

# Shared file system



# Amazon Elastic File System



# Amazon Elastic File System (Amazon EFS)

Simple, serverless, set-and-forget, elastic file system for AWS compute

## Serverless shared storage



### Serverless and scalable

No provisioning, scale capacity, connections, and IOPS



### Full AWS compute integration

EC2 Instances, containers, and serverless  
Supports 10,000s of connections

## Simple and highly reliable



### Elastic

Pay only for capacity used  
Performance built-in, scales with capacity



### Highly durable and available

Designed for 11 9s of durability  
99.99% availability SLA

## Performant and cost-optimized



### Performant

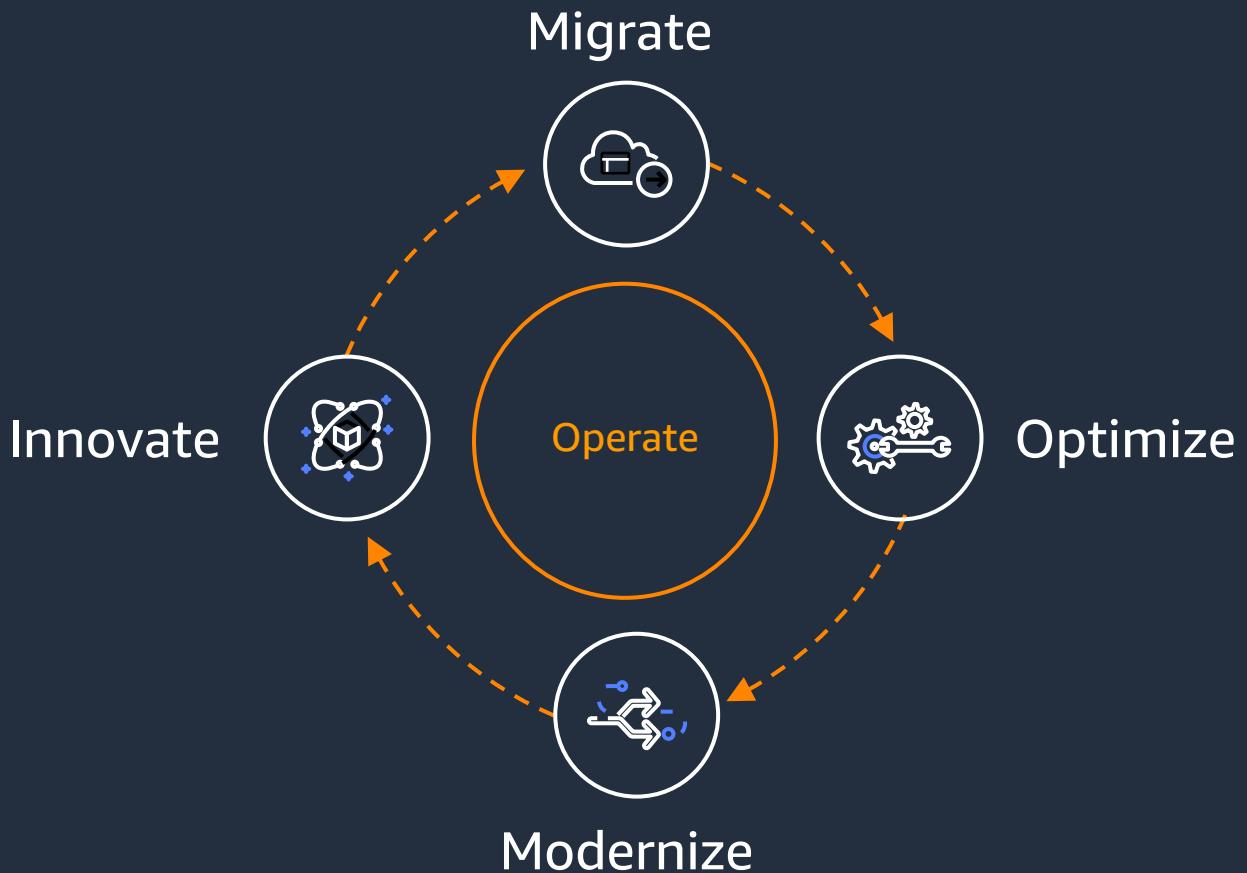
10s of GB/s of throughput and 500,000+ IOPS



### Four storage classes

Automatic lifecycle-based cost optimization

# Amazon EFS meets you where you are today and tomorrow



**Migrate:** lift and shift to AWS cloud without refactoring application

**Optimize:** enable cost efficiency

**Modernize:** build micro-services into application with common data platform

**Innovate:** improve development efficiency, build new features, enter new markets

# Use cases for Amazon EFS



Home directories

DevOps

Application dev. & test

Metadata-intensive jobs



Enterprise apps

Database backups

Web serving & content mgmt.



Analytics

Machine learning

Media workflows

Scale-out jobs

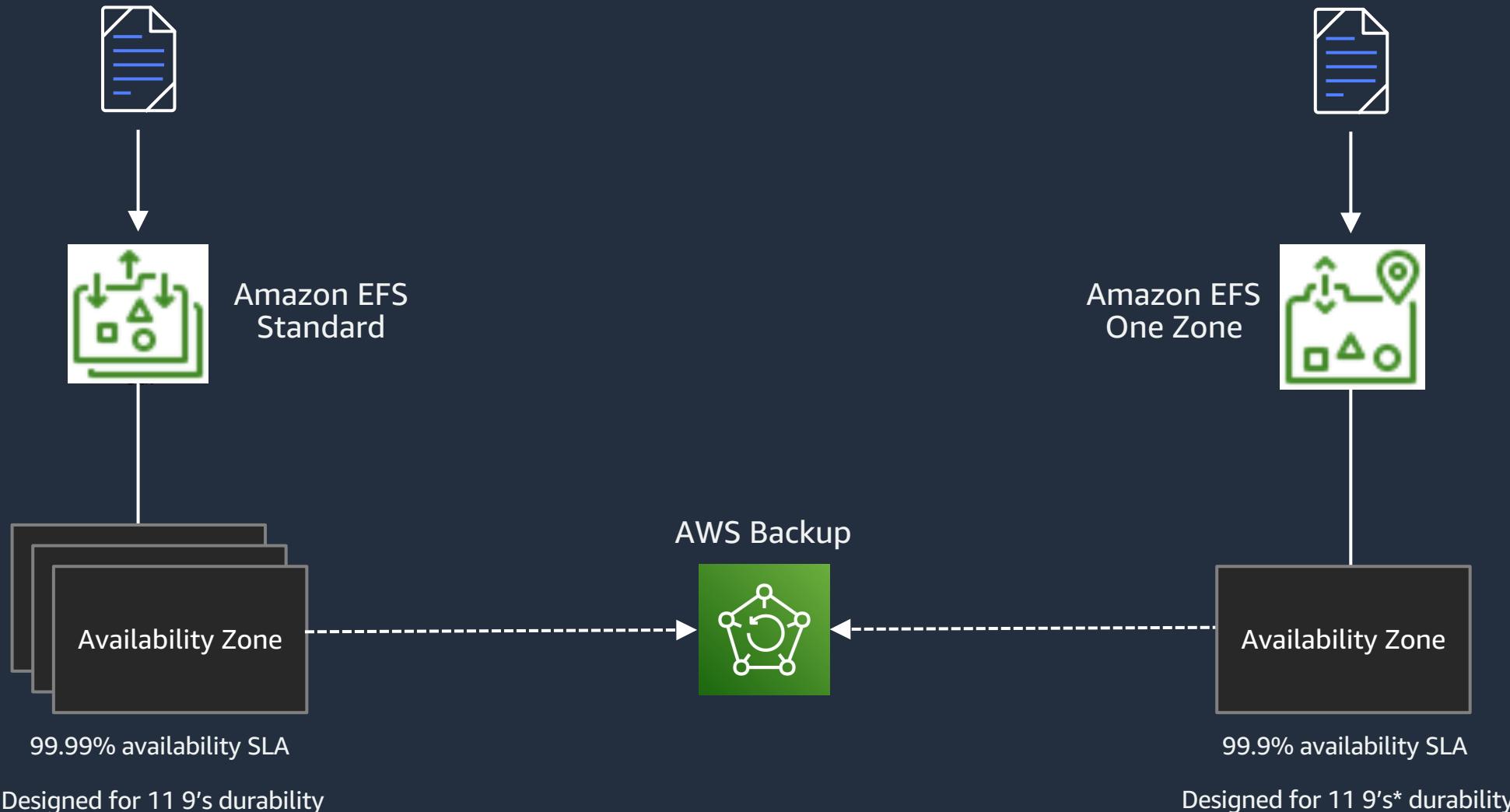
Business Criticality

Low latency and serial I/O

High throughput and parallel I/O

# Build and deploy with confidence

Highly available and durable



\* Data stored in these storage classes may be lost in the event of a disaster or other fault that affects all copies of the data within the Availability Zone (AZ), or in the event of AZ destruction.



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# Performance that scales with your application

Amazon EFS can scale up to 10s of GB/s of throughput and unlimited IOPS



## Performance Modes

### General Purpose

Up to 35K read and 7K write IOPS

### Max I/O

Unlimited IOPS (at the file system)



## Throughput Modes

### Bursting Throughput

Auto-scale throughput based on storage

### Provisioned Throughput

User-defined throughput independent of storage.  
Additional charges apply.

# Automatic cost optimization

Using EFS storage classes and lifecycle management

**\$0.043/GB-Month\***

Effective storage cost

**EFS One Zone**

\$0.043/GB-month\*



**EFS One Zone-IA**

Cost-optimized for less accessed files

\$0.01333/GB-month\* for storage

\$0.01/GB\* for access



**\$0.08/GB-Month\***

Effective storage cost

**EFS Standard**

\$0.30/GB-month\*



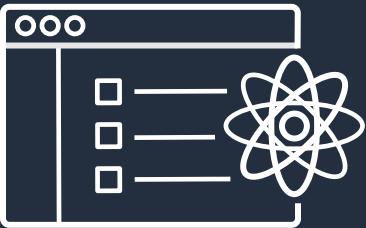
\*Pricing in the US East (N. Virginia) Region. Assumes 80% of the files are infrequently accessed



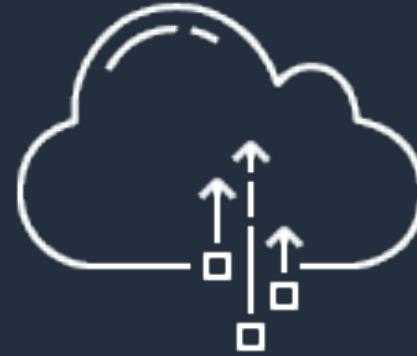
# Amazon FSx



# Amazon FSx for Windows File Server



Fully managed file storage  
built on [Windows Server](#)



Easy [migration](#) to AWS

# Fully managed Windows file storage means you no longer have to ...



## Managed hardware

Plan capacity

Procure and purchase hardware

Set up storage servers and volumes

Detect and address hardware failures

Incur high upfront costs



## Managed software

Install and configure server software

Set up and configure file systems

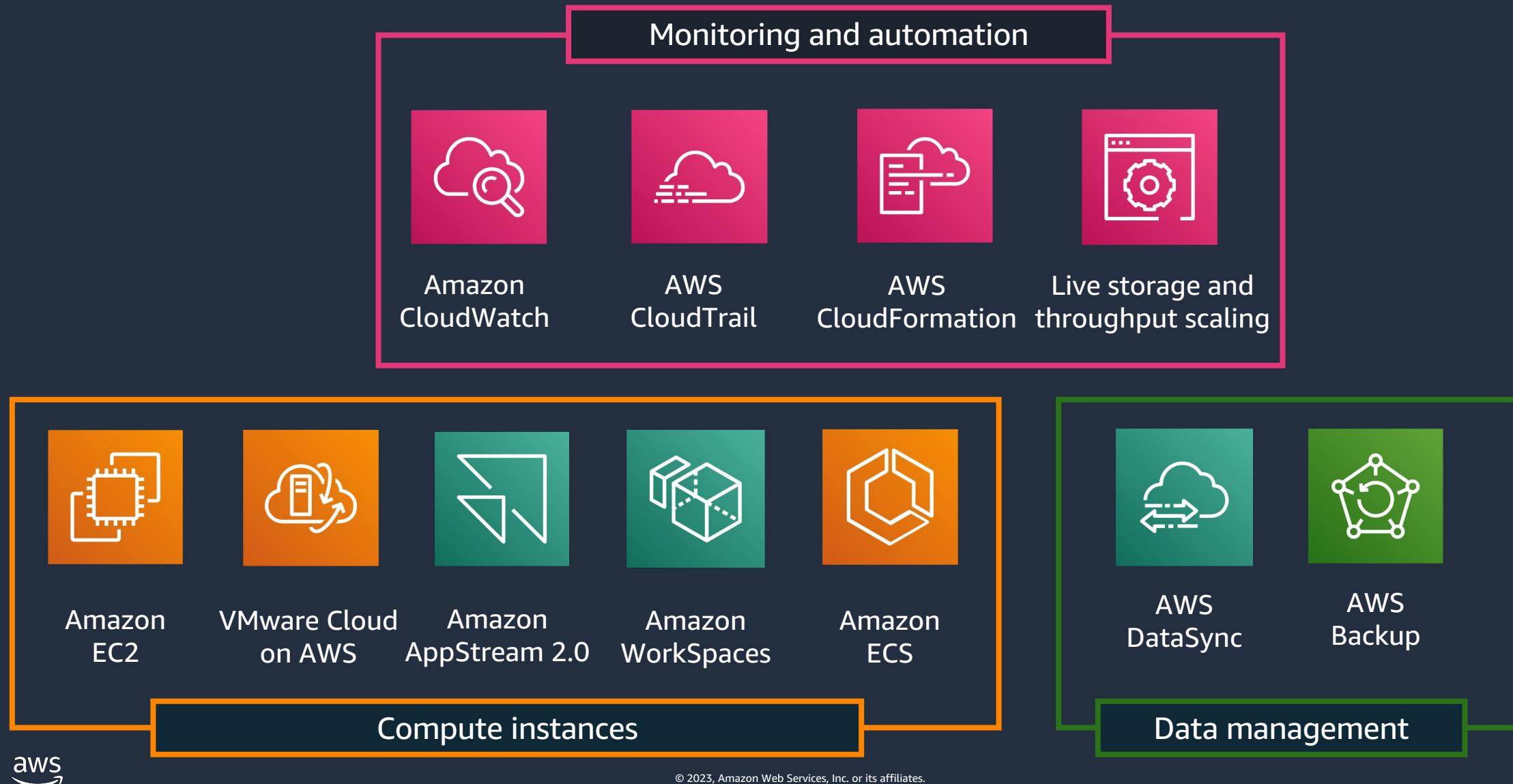
Apply Windows updates

Manage software licenses

Manage backups

Monitor security

# Agile, scalable, and automated



# Flexible price and performance options

- Storage type flexibility (SSD / HDD)
- Deployment type flexibility (Single-AZ / Multi-AZ)
- Select throughput and storage independently
- Choice of in-line snapshots and backups stored in S3
- Data deduplication and compression

# Fully featured, secure, reliable, and scalable

<b>Accessibility</b> <ul style="list-style-type: none"><li>✓ Full SMB protocol support</li><li>✓ Windows Server 2008+, Windows 7+, Linux, and MacOS</li><li>✓ EC2, WorkSpaces and AppStream 2.0</li><li>✓ VMware Cloud on AWS</li><li>✓ Amazon ECS and Amazon EKS containers</li><li>✓ Cross-VPC / Account / Region access</li><li>✓ On-premises access (DirectConnect / VPN)</li></ul>	<b>Availability and durability</b> <ul style="list-style-type: none"><li>✓ High availability – automatic recovery</li><li>✓ High durability – automatic replication</li><li>✓ Multi-AZ deployment option</li><li>✓ SMB continuous availability (CA)</li></ul>	<b>Cost optimization</b> <ul style="list-style-type: none"><li>✓ Storage type flexibility (SSD / HDD)</li><li>✓ Deployment type flexibility (Single-AZ / Multi-AZ)</li><li>✓ Live scaling of storage capacity</li><li>✓ Data deduplication and compression</li></ul>
<b>Administration</b> <ul style="list-style-type: none"><li>✓ Active directory integration</li><li>✓ Managing file shares</li><li>✓ Monitoring user sessions and open files</li><li>✓ Restoring locked files</li><li>✓ User storage quotas</li><li>✓ Monitoring actions via AWS CloudTrail</li></ul>	<b>Performance and scale</b> <ul style="list-style-type: none"><li>✓ Consistent, sub-millisecond latencies</li><li>✓ PB-scale storage scalability</li><li>✓ Tens of GB/s throughput scalability</li><li>✓ Millions of IOPS scalability</li><li>✓ Select throughput and storage independently</li><li>✓ Server-side and client-side caching</li><li>✓ SMB Multichannel</li><li>✓ Performance monitoring via CloudWatch</li><li>✓ Live scaling of throughput capacity</li></ul>	<b>Data protection</b> <ul style="list-style-type: none"><li>✓ Snapshots (with end-user file restore)</li><li>✓ Backups</li></ul> <b>Security and compliance</b> <ul style="list-style-type: none"><li>✓ Encryption at rest and in transit</li><li>✓ Kerberos authentication</li><li>✓ Access controls via NTFS ACLs, share ACLs, VPC, and IAM</li><li>✓ PCI DSS, ISO, SOC, GDPR, IRAP, and HIPAA compliances</li></ul>



# Do more with less and adapt faster to changing business needs



Storage and performance scaling in minutes\*



Zstandard compression  
(reduce storage usage by up to ~50%)



SSD storage  
**\$0.09/GB-month**  
(\$0.045/GB-month w/ compression\*)



Throughput  
**\$0.26/ MBps-month**

\*Pricing assumes average compression savings of ~50% and is an effective price.

\*Pricing is for Single-AZ

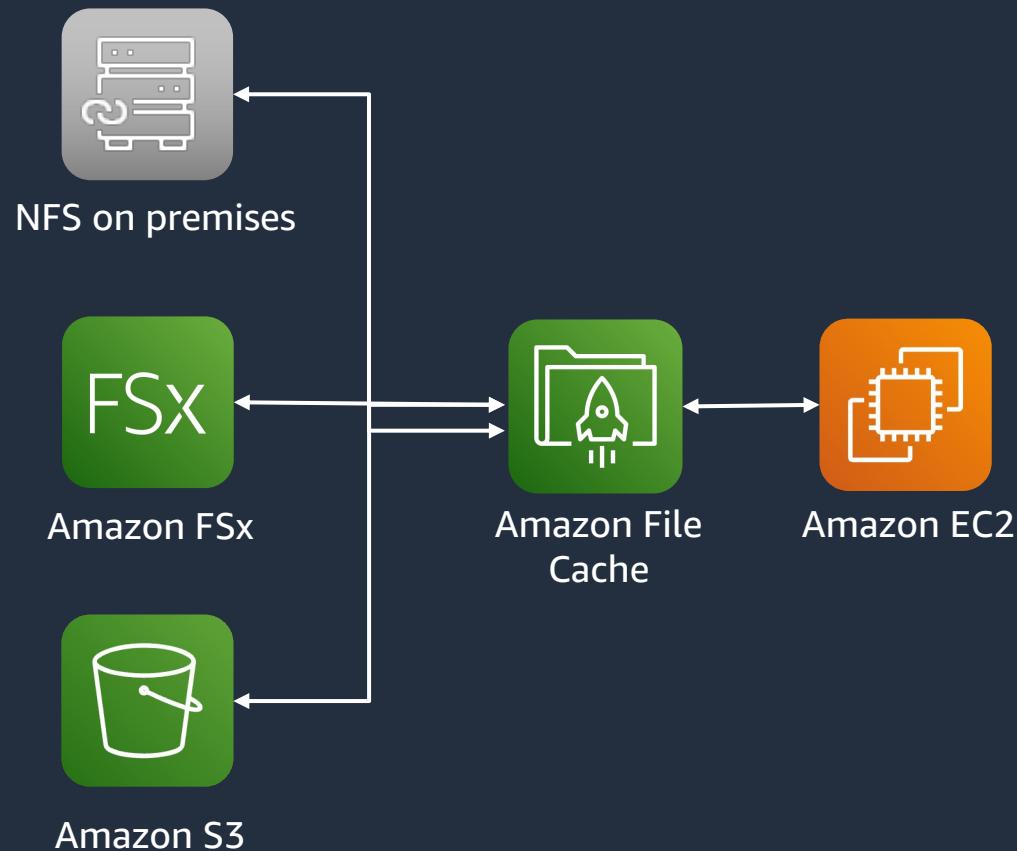


# Amazon File Cache



# Amazon File Cache

HIGH-SPEED CACHE FOR FILE SYSTEMS



**Fast** – highly scalable performance

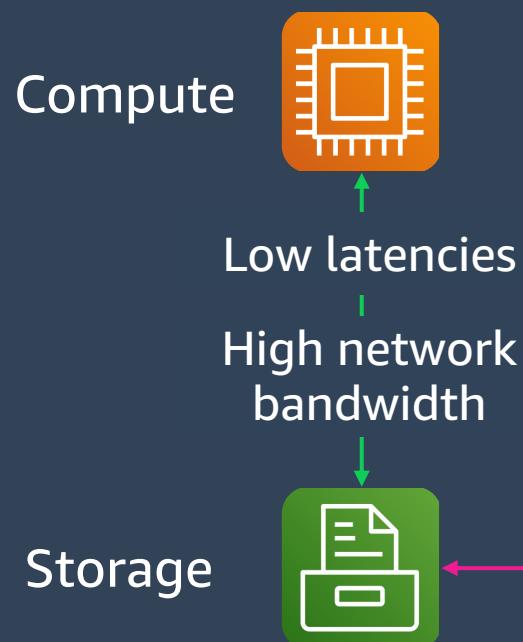
**Agile** – flexible data access across on-premises, AWS file, and Amazon S3 datasets

**Simplified** – fully managed, cost effective

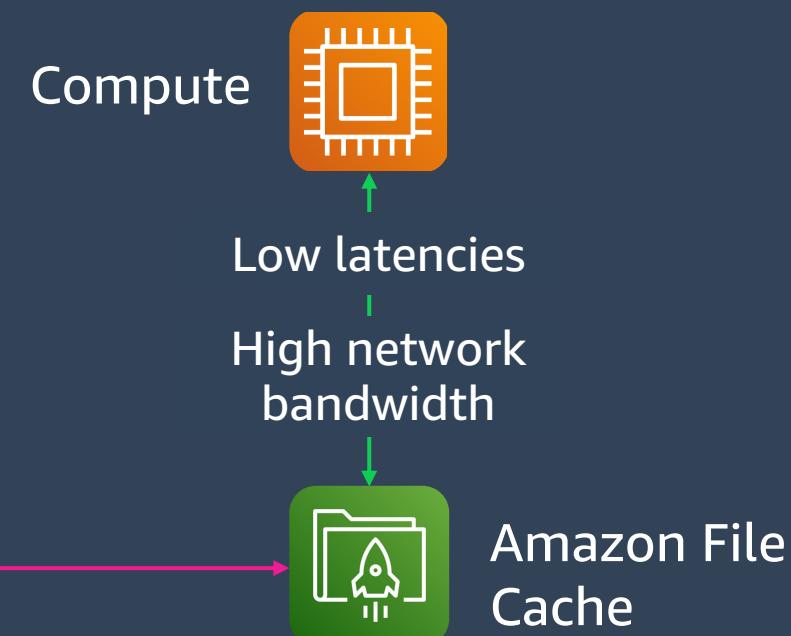
# Amazon File Cache

FAST ACCESS REGARDLESS OF WHERE YOUR DATASETS ARE STORED

On premises



On AWS



# Benefits



## Fast Accelerate workloads

Sub-millisecond latency,  
millions of IOPS, and hundreds  
of GB/s of throughput



## Agile Use anywhere

Seamless data access regardless  
of where your datasets are  
stored (cloud or on premises)



## Simplified Unify datasets

Link network file systems  
(NFS) or Amazon S3 buckets  
for a single view of multiple  
datasets

# Use case: unify disperse datasets in a single view

ACCESS MULTIPLE DATASETS IN A SINGLE PANE OF GLASS AS A FAST FILE INTERFACE



# File Cache Pricing

## Storage

1000 MB/s/TiB - \$1.330 per GB-month\*

## Data transfer within the same AWS Region

Data transferred "in" to and "out" from Amazon File Cache across Availability Zones or VPC Peering connections in the same AWS Region is charged at \$0.01/GB in each direction.\*

## Data transfer across regions

Data transfer across regions is \$0.02\*\*

\*Pricing is for US East (N. Virginia) Region

\*\* Prices vary by region



# Object Stores



# Amazon S3



# Amazon S3 (Simple Storage Service)

- Web accessible object store (through API or HTTPS)
- Highly durable (99.99999999% design)
- Limitlessly scalable
- Multiple Tiers to match your workload
- Data Lifecycle Rules
- Static Website Hosting
- Security, Compliance, and Audit capabilities
- Standard Storage Pricing (us-east-1) - \$0.023 per GB



# Your choice of object storage classes



## S3 Standard

*Frequent*

- Active, frequently accessed data
- Milliseconds access
- $\geq 3$  AZ
- \$0.023/GB
- Data with changing access patterns
- Milliseconds access
- $\geq 3$  AZ
- \$0.023 to \$0.0125/GB (\$0.004 to \$0.00099/GB Archive)
- No retrieval fees
- Monitoring fee per Obj.
- Min storage duration
- Min object size

## S3 Intelligent-Tiering

*Frequent*

- Milliseconds access
- $\geq 3$  AZ
- \$0.023 to \$0.0125/GB (\$0.004 to \$0.00099/GB Archive)
- Data with changing access patterns
- Milliseconds access
- $\geq 3$  AZ
- \$0.0125/GB
- Retrieval fee per GB
- Min object size

## S3 Standard-IA

*Access Frequency*

- Infrequently accessed data
- Milliseconds access
- $\geq 3$  AZ
- \$0.0125/GB
- Min storage duration
- Min object size

## S3 One Zone-IA

*Access Frequency*

- Re-creatable, less accessed data
- Milliseconds access
- 1 AZ
- \$0.0100/GB
- Retrieval fee per GB
- Min storage duration
- Min object size

## S3 Glacier Instant Retrieval

*Access Frequency*

- Archive data instant retrieval
- Milliseconds access
- $\geq 3$  AZ
- \$0.0040/GB
- Retrieval fee per GB
- Min storage duration
- Min object size

## S3 Glacier Flexible Retrieval

*Access Frequency*

- Archive data
- Select minutes or hours
- $\geq 3$  AZ
- \$0.0036/GB – (\$4.10/TB)
- Retrieval fee per GB
- Min storage duration
- Min object size

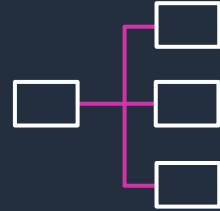
## S3 Glacier Deep Archive

*Access Frequency*

- Archive data
- Select 12 or 48 hours
- $\geq 3$  AZ
- \$0.00099/GB – (\$1.01/TB)
- Retrieval fee per GB
- Min storage duration
- Min object size



# S3 Management Features



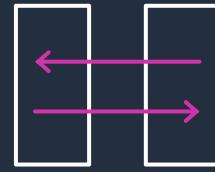
## Organize

S3 Tagging  
S3 Prefixes  
S3 Versioning



## Monitor

CloudWatch  
CloudTrail  
S3 Event Notifications  
S3 Inventory  
S3 Glacier Restore Notifications  
S3 Storage Lens



## Replicate & Tier

S3 Lifecycle  
S3 Storage Class Analysis  
S3 Intelligent-Tiering  
Cross-Region Replication  
Replication Time Control (RTC)



## Modify

S3 Event Notifications + Lambda  
S3 Batch Operations  
S3 Object Lock  
S3 Object Lambda

# S3 Access Management & Security

- Deep integration with AWS Identity and Access Management (IAM)
- Access Control Lists (ACLs), S3 bucket policies, and S3 Access Points
- Query String Authentication
- Audit Logs
- S3 supports both server-side & client-side encryption
- S3 Block Public Access to ensure S3 buckets and objects do not have public access
- Amazon Macie to discover, classify, and protect sensitive data stored in Amazon S3
- Access Analyzer for S3
- Amazon S3 Object Lock
- AWS PrivateLink for S3
- Amazon GuardDuty for S3



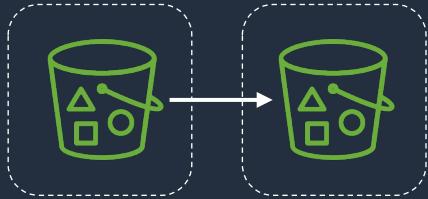
# New S3 Features



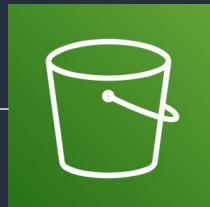
- S3 Mountpoint (**Alpha**)
- Object Replication Status Visibility
- Data Exchange for S3
- Automatic Encryption of New Objects
- VPC Interface Endpoints for S3
- Automatic enabling of S3 Block Public Access on new Buckets
- Automatic disabling of S3 Access Control Lists (ACL's) on new Buckets

# S3 Replication

Replicate within the **same AWS Region**



Replication Time Control (RTC) **15 minute replication SLA**

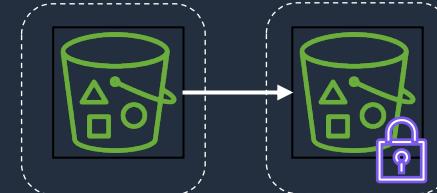


Amazon Simple Storage Service

Replicate to a different AWS Region



Replicate to a bucket with **retention controls** (in the same or different AWS Region)



Replicate faster to a different AWS Region, backed by an **SLA + replication metrics**



# Data Transfer and Edge Processing



# Many Options for Data Transfer



AWS  
Direct Connect



Amazon  
Kinesis  
Firehose



Amazon Kinesis  
Data Streams



Amazon Kinesis  
Video Streams



Amazon S3  
Transfer  
Acceleration



AWS  
Storage  
Gateway



AWS  
Database  
Migration  
Service



AWS  
Snowcone



AWS  
Snowball Edge



AWS  
Snowmobile



AWS  
DataSync



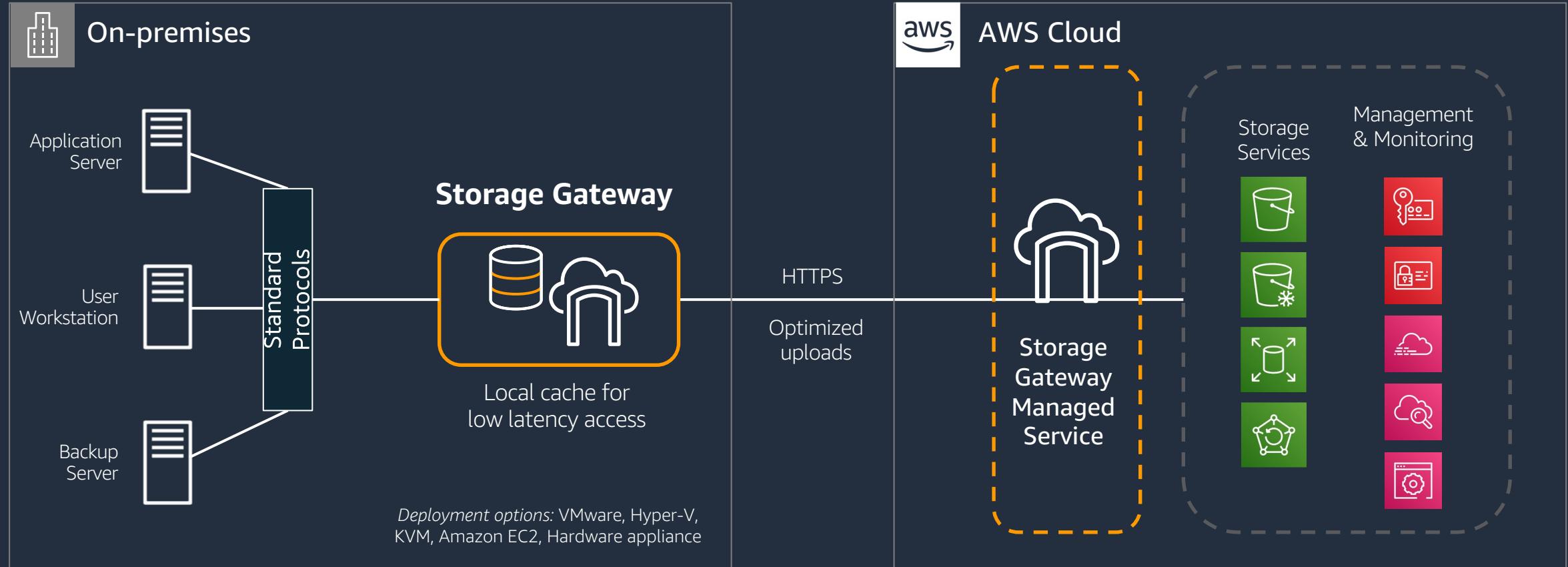
AWS  
Transfer  
Family

# AWS Storage Gateway



# AWS Storage Gateway

On-premises access to virtually unlimited cloud storage



# Hybrid storage use cases with Storage Gateway



**Enabling cloud workloads**



**Backup, archive, and disaster recovery**



**Tiered cloud storage**

# Storage Gateway Family



## Amazon S3 File Gateway

Store and access objects in Amazon S3 from file-based applications with local caching

File-based applications work without change



## Amazon FSx File Gateway

Native access to Amazon FSx for on-premises group file shares and home directories

Access FSx for Windows File Server from on-premises



## Tape Gateway

Drop-in replacement for physical tape infrastructure backed by cloud storage with local caching

Easily switch tape backups to AWS



## Volume Gateway

Block storage on-premises backed by cloud storage with local caching, Amazon EBS snapshots, and clones, integrated with AWS Backup

SAN-like with cloud recovery

# AWS DataSync



# AWS DataSync

Online transfer service that simplifies, automates, and accelerates moving data between on-premises storage and AWS



Fast data transfer



Easy to use



Secure and reliable



Cloud integrated

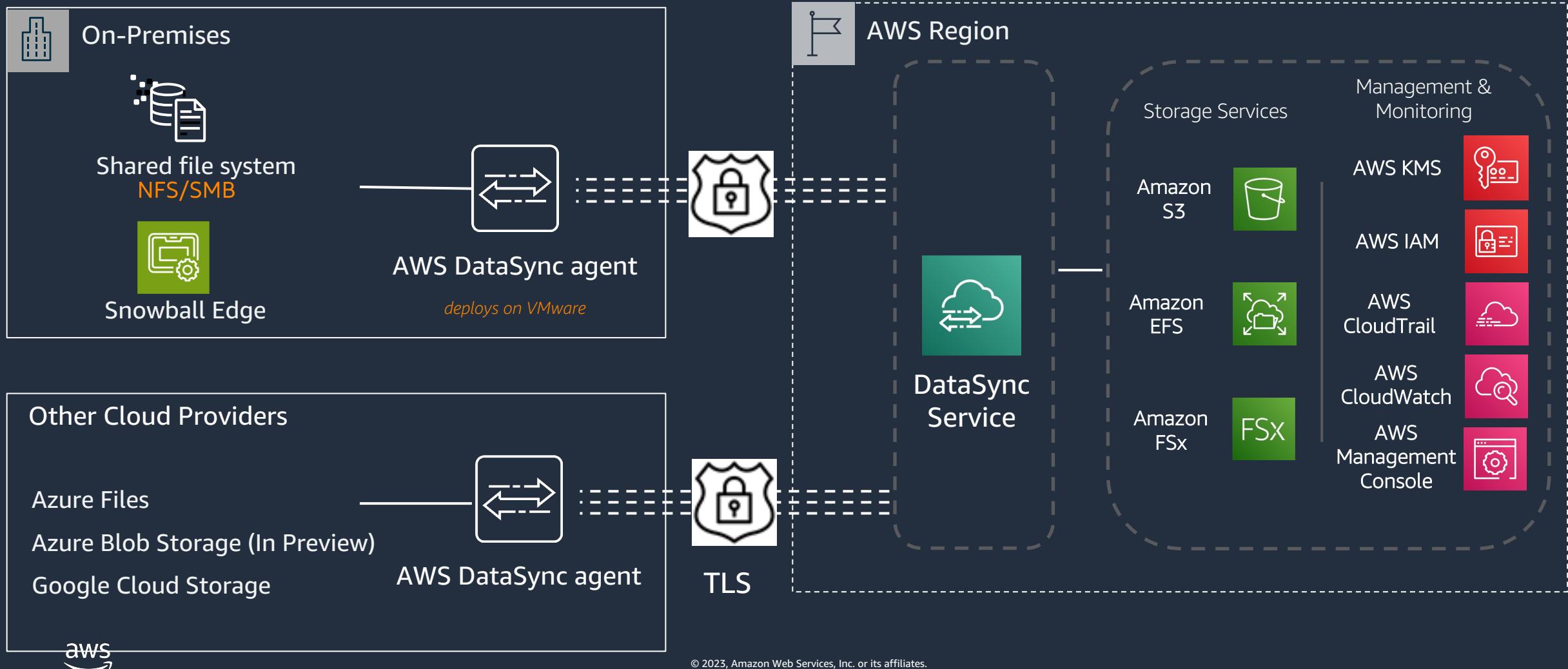


Cost-effective

Combines the speed and reliability of *network acceleration* software with the cost-effectiveness of *open source tools*

# How does AWS DataSync work?

Simplifies, automates, and accelerates data transfer to or from AWS



# The benefits of AWS DataSync



## Fast data transfer

- 10x faster than open-source tools
- Highly optimized network transfer
- Up to 10 Gbps per/s per agent



## Easy to Use

- No in-cloud infrastructure
- Schedule transfers
- Throttle bandwidth



## Secure and Reliable

- Securely transfer to any storage tier
- End-to-end encryption
- End-to-end data verification



## Fully managed

- Integrates with AWS Management and monitoring services



## Cost-effective

- Pay only for data transferred
- \$0.0125/GB or \$12.50/TB

# AWS DataSync Discovery



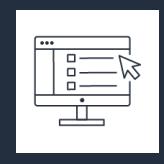
## Gain insights into storage utilization

- ✓ Automated data collection
- ✓ Dashboards for aggregated views of data
- ✓ Find underutilized resources



## Receive recommendations for AWS Storage services

- ✓ Select the right storage for your use case
- ✓ Optimize your AWS storage configuration
- ✓ Meet your performance needs while minimizing costs



## Simplify migration planning

- ✓ Minimize time, effort, and costs
- ✓ Use estimated costs to inform your budget
- ✓ Validate assumptions before migrating

# Amazon Snow Family



# Amazon Snowball Edge and Snowcone

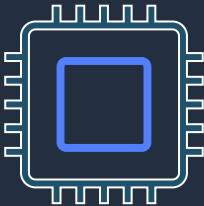
- Terabyte scale data transport
- Uses secure appliances
- Faster than Internet for significant data sets
- Import into S3
- HIPAA Compliant



# Terabyte scale data transport



# 2 Snowball Edge options



## Compute optimized

- 28 TB usable S3 compatible storage
- 104 vCPUs, 416 GB of memory
- Optional NVIDIA Tesla V100 GPU
- sbe-c and sbe-g instances  
(equivalent to C5, M5a, G3, P3)



## Storage optimized

- 80 TB usable S3-compatible storage
- sbe1 instances (equivalent to C5)
- Up to 40 vCPUs, 80 GiB of memory, 1 TB SATA SSD
- Object storage clustering available

**Long-term deployment options: 1- and 3-year discounted pricing**

# Introducing AWS Snowcone

Small, portable, rugged, and secure edge computing and data transfer device



- Military-grade security
- 4.5 pounds (2.1 kg)
- Portable computing, anywhere
- Withstands harsh environments
- Offline & online data transfer
- Snowcone HDD 8 TB of storage
- Snowcone SSD 14 TB of storage
- 2 CPU, 4 GB compute

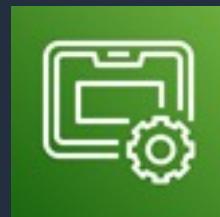
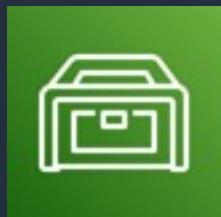
## Use cases

Industrial IoT, healthcare IoT, content distribution, content aggregation, data migration, logistics, autonomous vehicles, and transportation

- Less than 1 day to transfer 250TB via 5x10G connections with 5 Snowballs, less than 1 week including shipping
- Number of days to transfer 250TB via the Internet at typical utilizations

	Internet Connection Speed			
Utilization	1Gbps	500Mbps	300Mbps	150Mbps
25%	95	190	316	632
50%	47	95	158	316
75%	32	63	105	211

# AWS Snow Family for data collection & data movement



	Snowcone	Snowball Edge Storage Optimized	Snowmobile
<b>Migration size</b>	Up to 24 TB, online and offline	Up to petabytes, offline	Up to exabytes offline
<b>Form factor</b>	Rugged 8.5 G impact cases that are rain and dust resistant, E Ink label for shipping automation		45-foot container, scheduled delivery
<b>Security</b>	256-bit encryption, tamper detection		Encryption, security staff, GPS tracking, video surveillance, alarms
<b>Storage capacity</b>	8, 14 TB usable	210 TB usable	<100 PB
<b>DataSync agent</b>	Pre-installed	-	-
<b>Compute</b>	2 vCPU, 4 GB RAM usable	40 vCPU, 80 GB RAM, 1 TB SSD usable	-
<b>Onboard computing options</b>	AWS IoT Greengrass functions Amazon EC2 AMIs		
<b>Wireless</b>	Wi-Fi	-	-
<b>Portable or Mobile use</b>	Battery based operation	-	-
<b>Clustering</b>	-	Up to 15 nodes	-



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[Visit the AWS Snow Family page for a more detailed comparison »](#)



# Amazon Snowmobile

<https://www.youtube.com/watch?v=8vQmTZTq7nw>



# AWS Transfer Family



# Managed file transfer – what is it?

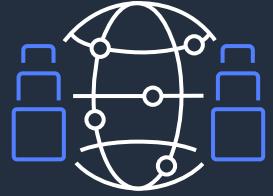


Managed file transfer (MFT) provides **secure and reliable transfer of data** between systems through a network (e.g., the Internet), enabling exchange of data to meet business critical needs

## Attributes

- Focused on secure and flexible file transfers
- Support 3<sup>rd</sup> party integrations and connectors
- Provide pre-processing for data filtering and encryption
- May support additional protocols (AS2/HTTPS)

# AWS Transfer Family benefits



## Fully Managed

- Highly available across 3 Availability Zones
- Scales on demand
- Supports thousands of concurrent users



## Seamless Migration

- Import host keys
- Use your own IP addresses and hostnames
- Use existing authentication systems



## Secure & Compliant

- IP filtering
- Support for VPC endpoints and shared VPC environments
- Data encryption options via SSE-S3 and AWS KMS
- PCI, HIPAA, SOC3, FIPS compliance

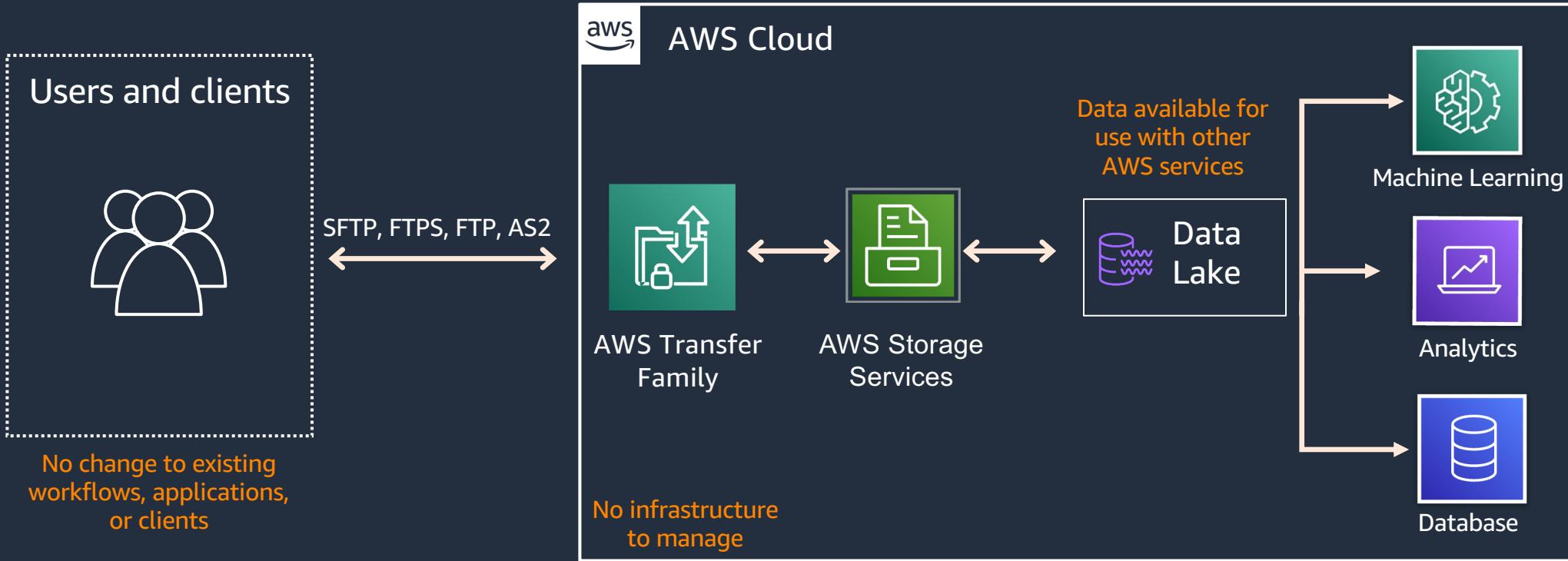


## AWS Integrated

- Store and access data natively using AWS services
- AWS CloudTrail and Amazon CloudWatch for auditing/logging
- Custom authentication using Amazon API Gateway and AWS Lambda

# AWS Transfer Family Value

Seamlessly migrate without impacting your workflows



# Common use cases



Data lakes and  
analytics platforms



Customer relationship  
management applications



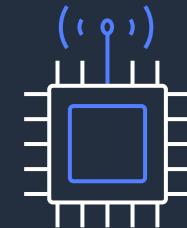
Subscription based data  
products



Digital media content  
aggregation and distribution



Enterprise resource  
planning and electronic  
data interchange for  
supply chain logistics



IoT services used in  
remote locations for  
monitoring

# Get started with AWS Transfer Family

① Launch a server endpoint



② Select your target S3 bucket(s) or EFS file share(s)



③ Configure your users



Visit [console.aws.amazon.com/transfer](https://console.aws.amazon.com/transfer) to get started today!

## Pricing

Server endpoint time:  
\$0.30/protocol/hour

Data uploads and downloads: \$0.04/GB

Learn more: [aws.amazon.com/aws-transfer-family/pricing/](https://aws.amazon.com/aws-transfer-family/pricing/)

## Examples:

- 10 GB/day costs \$2.7K/year
- 100 GB/day costs \$3.6K/year

# Backup



# AWS Backup



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# AWS Backup – meeting the challenges

Backup operations unified across AWS services



Complexity

Simple & Performant



Policy- and tag-based backup solution



Automated backup scheduling



Compliance



Reliable & Secure  
Centralized backup activity monitoring and logs



Backup encryption



Backup access policies



Cost

Cost Effective



Automated backup retention management



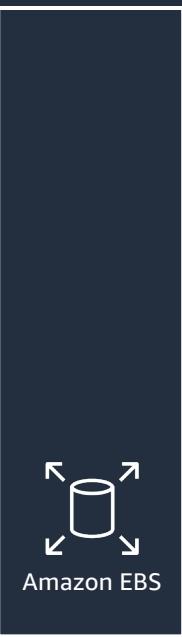
No added cost for orchestration

# AWS Backup

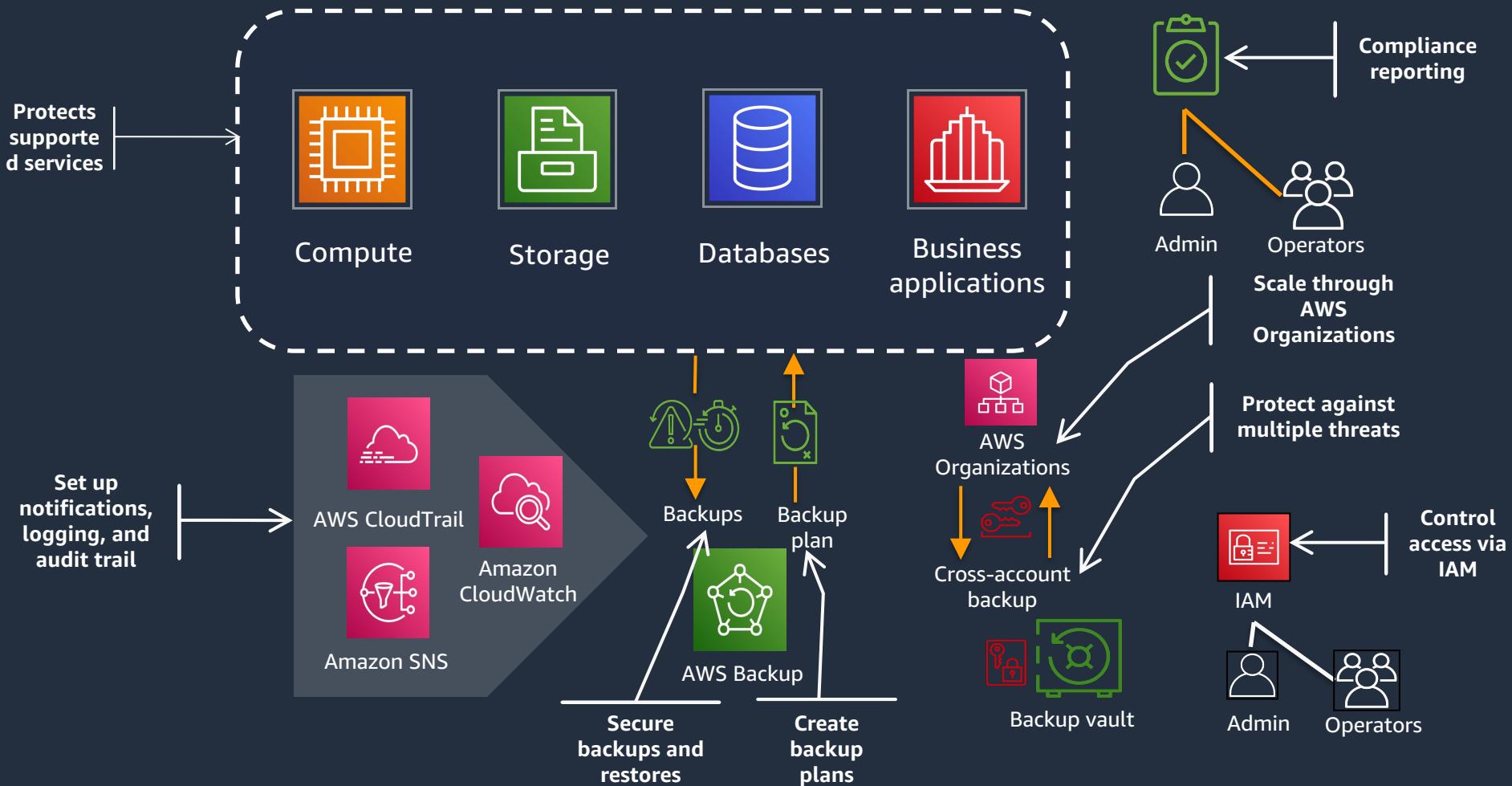


## AWS Backup

A fully managed, policy-based backup service that makes it easy to centrally manage and automate the backup of data across multiple AWS services and hybrid workloads



# How AWS Backup works



# DR & Ransomware Recovery with AWS Backup



- Vault characteristics:
- Backups are highly efficient incremental forever
- Backup copies cannot be changed or encrypted
- Manage with vault specific CMK/KMS best practices
- Air-gapped backups using vault access policies
- Prescriptive guidance for vault account access provided

- Recovery options:
- Supports 1-to-many, many-to-many, many-to-1, etc.
- Recover from same account locally or from across region
- Recover from cross-account locally or across region
- Recover from RPOs that are hours, days, weeks or months old
- Simple workflow to apply any forensic analysis

# Notable Recent AWS Backup launches

## Cloud-native and hybrid support

Amazon S3 backup

Amazon S3 cross-Region, cross-account backup

Amazon FSx for NetApp ONTAP backup

Amazon FSx for OpenZFS backup

VMware Cloud on AWS Outposts backup

Amazon Privatelink integration for VMware backup



## Compliance and governance support

AWS Backup Audit Manager controls

Last recovery point created  
Backups protected by AWS Backup Vault Lock

Cross-account copy scheduled  
Cross-Region copy scheduled

AWS Backup Vault Lock retention modes

Governance mode  
Compliance mode

# AWS Backup re:Invent 2022 announcements

## Application-aware Backups



AWS CloudFormation

## Data and Analytics

Preview SAP HANA on EC2 backup



Amazon Redshift

## Compliance

Cross-Region, cross-account support for AWS Backup Audit Manager

Legal holds for AWS Backup

## Organization-level



AWS Organizations  
delegated admin support  
for AWS Backup!

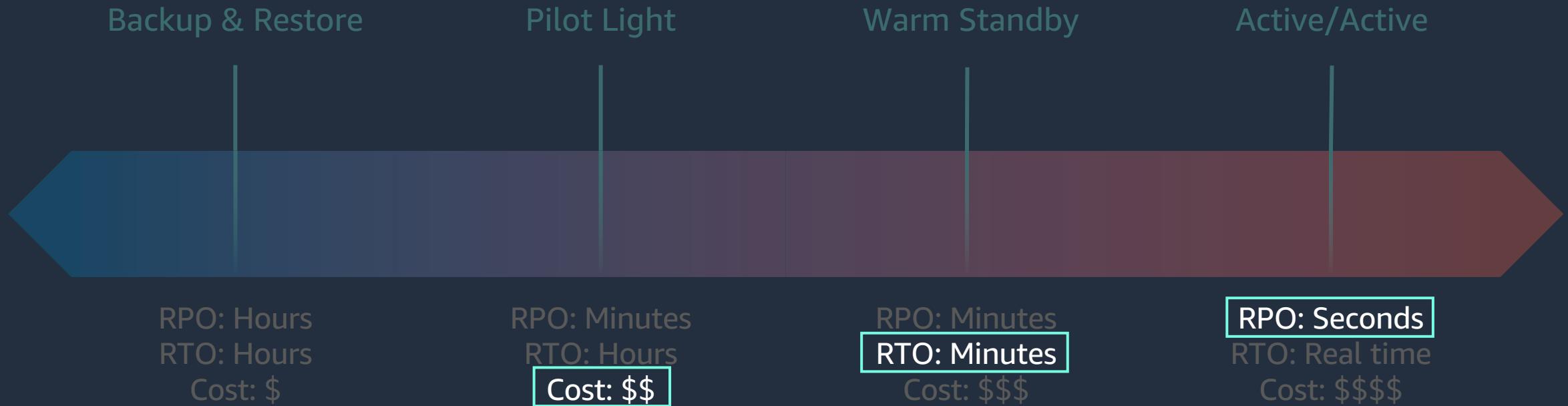
Cohasset certifies Vault Lock for Sec-17a, FINRA 4511(c), and CFTC 1.31(c).

# AWS Elastic Disaster Recovery



# AWS Elastic Disaster Recovery

Get the RPOs of Active/Active and the RTOs of Warm Standby at the cost of Pilot Light



# AWS Elastic Disaster Recovery

## High-performance, cost-effective application recovery



AWS Elastic Disaster Recovery selected as the DRaaS market leader for both innovation and growth in Frost & Sullivan's *2022 Frost Radar: Disaster Recovery as a Service*.

# AWS Elastic Disaster Recovery key benefits



## Faster recovery

Recovery time objectives (RTOs) of minutes



## Easy testing

Conduct non-disruptive drills to verify readiness



## Lower costs

No need to pay for idle recovery site resources



## Data protection

Recovery point objectives (RPOs) of seconds



## Ransomware recovery

Launch unlocked and unencrypted versions of your applications

# Ransomware mitigation

Use AWS Elastic Disaster Recovery for ransomware protection, detection, response, and recovery



## Account isolation

Protect your workloads by isolating your staging account from your production and recovery accounts.



## Immutable snapshots

Keep your data safe with immutable snapshots that can't be altered or overwritten.



## Endpoint detection and response (EDR)

Detect and eliminate threats using integrated solutions from AWS Partners CrowdStrike and SentinelOne.



## Point-in-time recovery

Recover your servers by using unlocked and unencrypted point-in-time snapshots.

# Elastic Disaster Recovery deployment patterns



On-premises to AWS



Other cloud to AWS



AWS Region to AWS Region



AWS Availability Zone to  
AWS Availability Zone