Introduction to Storage on AWS

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Agenda

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

Introduction: Why choose AWS for storage

Compelling Economics

Pay as you go

No risky capacity planning

No need to provision for redundancy or overhead

Easy to Use

Self service administration

SDKs for simple integration

No Commitment

Reduce risk

Durable and Secure

Avoid risks of physical media handling

Speed, Agility, Scale

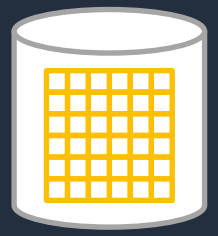
Reduce time to market

Focus on your business, not your infrastructure

Global Scale

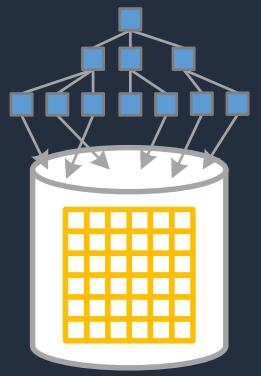
Storage Primer

Block vs File vs Object



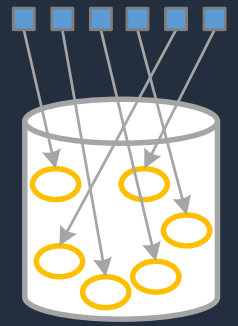
Block Storage

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

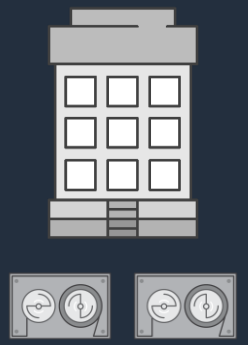
aws

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

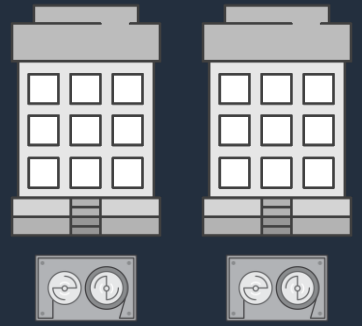


Two copies on one site

designed for

99.99%

durability



Copies on two sites

designed for

99.999%

durability

copies in three AZ

designed for

99.999999999%

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

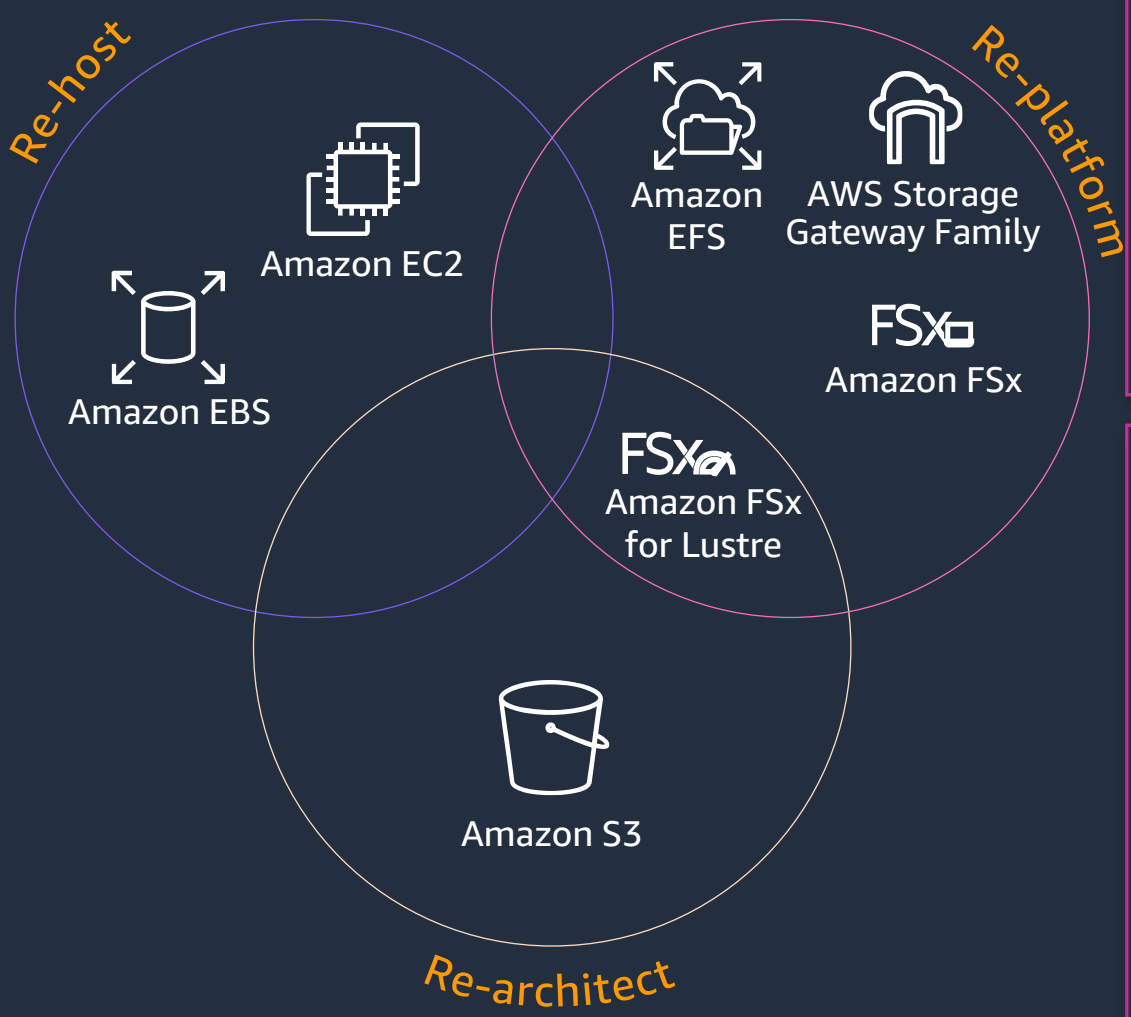
Provisioned IOPS SSD

Throughput-Optimized HDD

Cold HDD

Backup

AWS Backup



File storage

EFS

FSx for NetApp 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 Express One Zone

S3 Glacier Instant Retrieval

S3 Glacier Flexible Retrieval

S3 Glacier Deep Archive

AWS delivers broadest storage portfolio in industry

OBJECT

Amazon S3

BLOCK

Amazon EBS

FILE

Amazon EFS

Amazon FSx for Windows File Server

Amazon FSx for Lustre

Amazon FSx for NetApp ONTAP

Amazon FSx for OpenZFS

Amazon File Cache

BACKUP

AWS Backup

DATA TRANSFER AND EDGE PROCESSING

AWS Storage Gateway

AWS DataSync

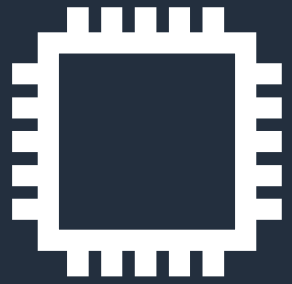
AWS Transfer Family

AWS Snowball Edge

AWS Snowcone

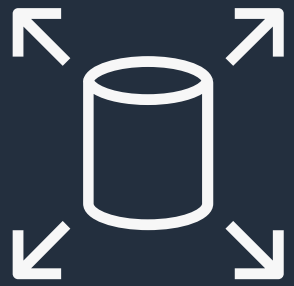
Block Storage

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



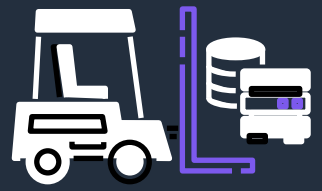
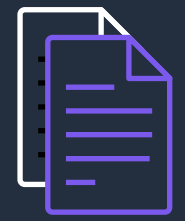
Amazon EBS

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	Relational databases	Non-relational/ NoSQL databases	Big data analytics	File/media
				
SAP ERP, Oracle ERP, Microsoft SharePoint, Microsoft Exchange	MySQL, PostgreSQL, SQL Server, Oracle DB, SAP HANA	Cassandra, MongoDB, CouchDB	Kafka, Splunk, Hadoop, Data warehousing	CIFS/NFS, transcoding, encoding, rendering

LOW LATENCY AND CONSISTENT, HIGH IOPS AND THROUGHPUT

SCALABLE WITHOUT DISRUPTION TO YOUR WORKLOAD

ANNUAL FAILURE RATE (AFR) BETWEEN 0.1%–0.2%

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

Performance for any workload

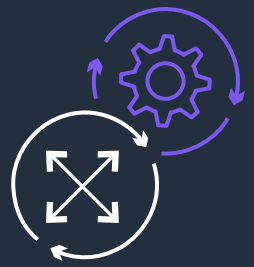
Up to 256,000 IOPS, single digit millisecond latency, 4,000 MiB/s Throughput

Easy to use

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

High reliability

99.8%-99.9% availability and annual failure rate of between 0.1%–0.2%



Virtually unlimited scale

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

Secure

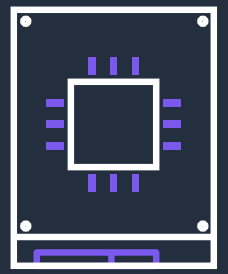
Encrypt all new volumes and data for a region by default with a single setting

Cost-effective

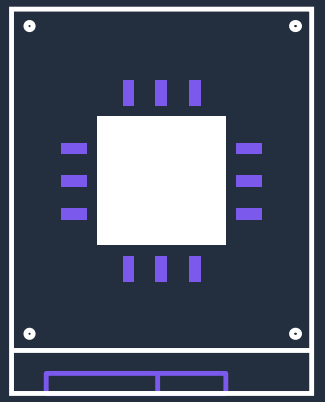
Pay as low as $0.015/GB-month for highly cost-effective dollar per gigabyte block storage

aws

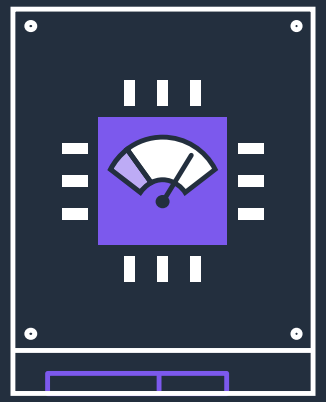
Amazon EBS Volume Types



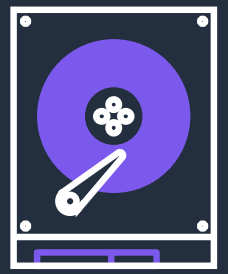
SSD



gp3
General Purpose SSD



io2
Block Express

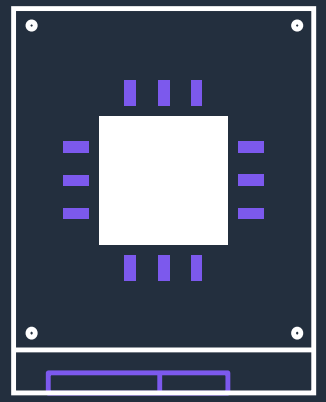


HDD

st1
Throughput Optimized HDD

sc1
Cold HDD

General Purpose SSD gp3



gp3

General Purpose SSD

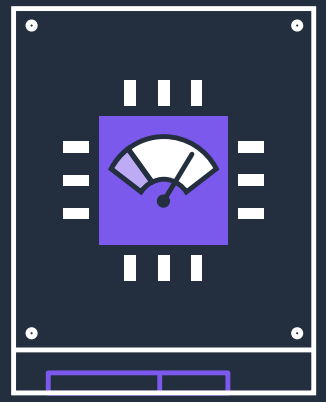
- **Use cases:** Latest generation general-purpose SSD-based EBS volumes. Provision performance independent of storage capacity, while providing up to 20% lower pricing per GB than existing gp2 volumes.

- **Volume size:** 1 GiB–16 TiB
- **Durability:** 99.8% - 99.9%
- **IOPS/volume:** 16,000
- **Throughput/volume*:** 1,000 MiB/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. Virgina) Region

Provisioned IOPS SSD io1



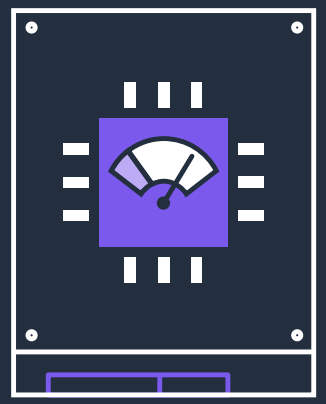
io1

Provisioned IOPS SSD

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

**Pricing is for US East (N. Virgina) Region

Provisioned IOPS SSD io2 Block Express



io2 Block Express

Provisioned IOPS SSD

- **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 GiB–64 TiB
- **Durability:** 99.999%
- **Max IOPS/volume*:** 256,000
- **Max throughput/volume*:** 4,000 MiB/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

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

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 GiB–16 TiB
- **Durability:** 99.8% - 99.9%
- **Max IOPS/volume*:** 500
- **Max throughput/volume*:** 500 MiB/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 GiB–16 TiB
- **Durability:** 99.8% - 99.9%
- **Max IOPS/volume*:** 250
- **Max throughput/volume*:** 250 MiB/s

- **Pricing**:** $0.015 per GB-month of provisioned storage

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

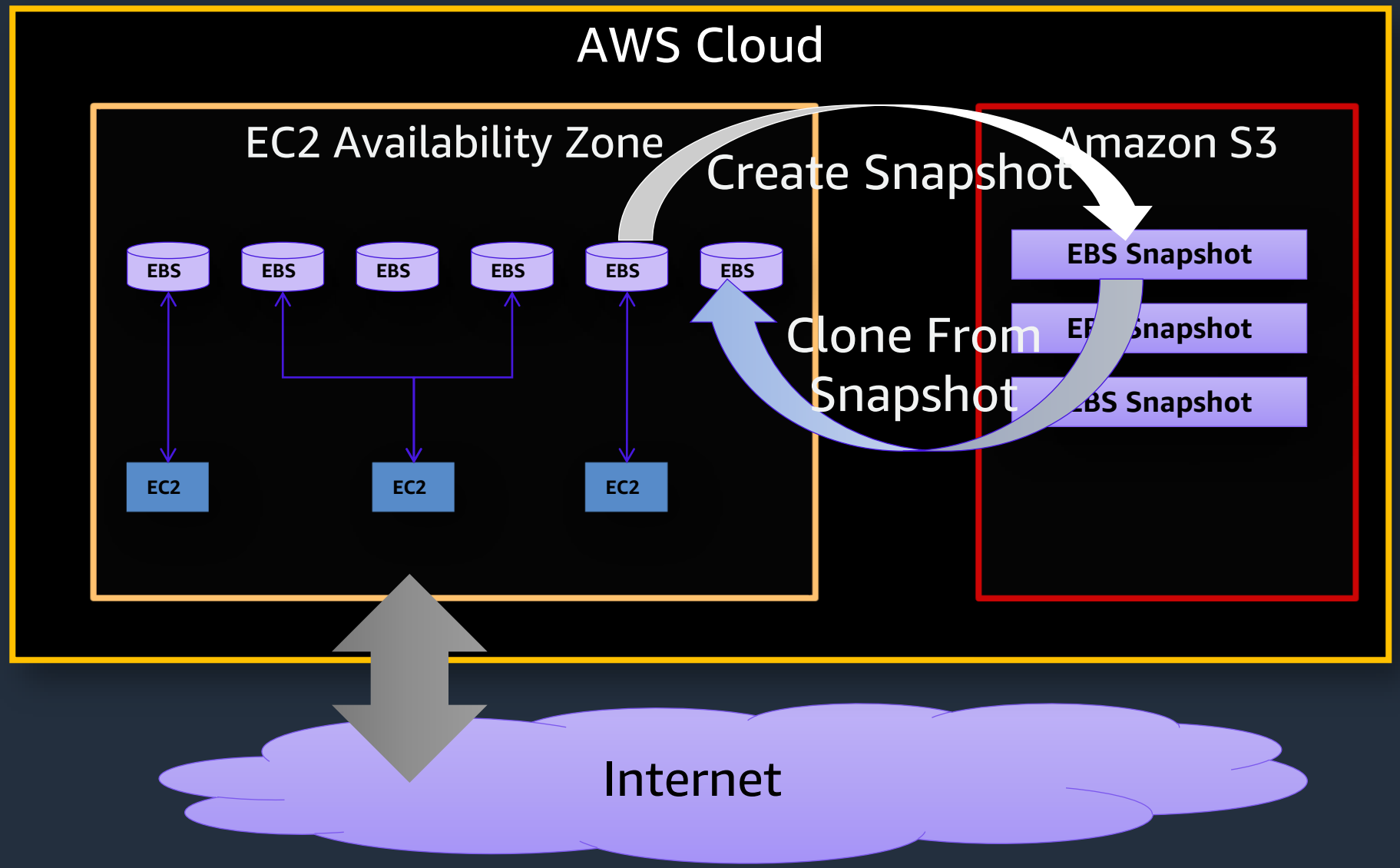
Fully managed backup with EBS Snapshots

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



EBS Snapshots Archive Tier

Long-term snapshot retention

- 90-day minimum retention period

Full, point-in-time backups

Retrieve snapshot before use

- Retrieval time of hours

75% lower storage costs at 1.25c/GB-month

- 3c/GB additional retrieval charges

EBS Snapshots Archive Tier provides low storage cost for long-term retention of rarely accessed EBS Snapshots

Recycle Bin for EBS Snapshots and EBS-backed AMIs

QUICK RECOVERY OF DELETED SNAPSHOTS

Automatically retain deleted snapshots for a retention period you specify

Use Retention Rules to specify retention periods for all or some tagged snapshots in your account

Recover deleted snapshots before retention time expiry

Pay EBS Snapshot price for snapshots in Recycle Bin

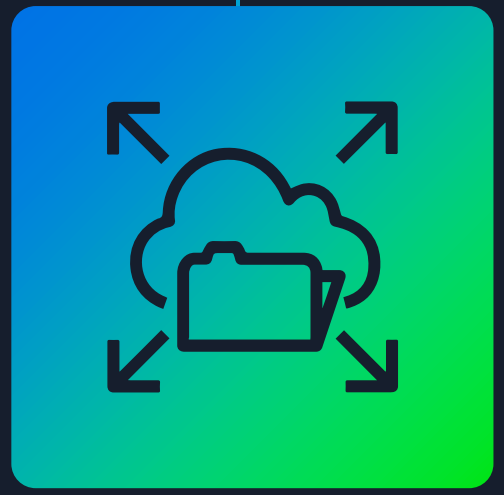
Automatically retain deregistered EBS-backed AMIs

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

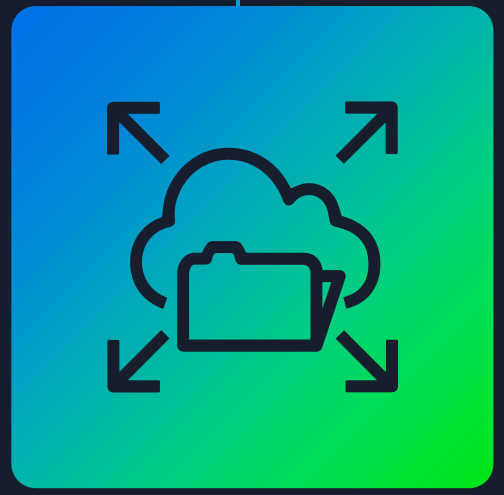
Amazon Elastic File System



Amazon
EFS

Designed to scale with and for your data

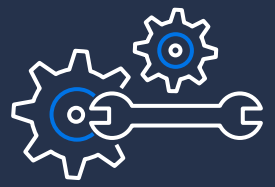
Built from the ground up to deliver super-simple, virtually bottomless file storage that **“just works”**



Amazon
EFS

Amazon Elastic File System (Amazon EFS)

Serverless, fully elastic file storage



Configuration-free

Fully elastic, no provisioning

Accessible from anywhere

Cost optimized without any effort

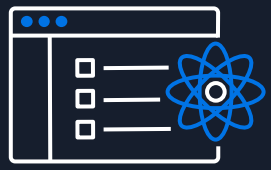
Use cases for Amazon EFS

SaaS applications

Multi-tenet SaaS applications deployed with EC2, Containers, or Serverless based compute where filesystem performance enhances user experience

Modern applications

Containers, AWS Lambda workloads where multiple clients can recall the same data, incurring data accesses per access



Data science & analytics

ML training and analysis where analysis results age over time but can become hot again periodically

Automatic cost optimization for workloads with unpredictable access patterns

No need to think about provisioning infrastructure

Virtually bottomless capacity that automatically scales up and down to fit your changing needs

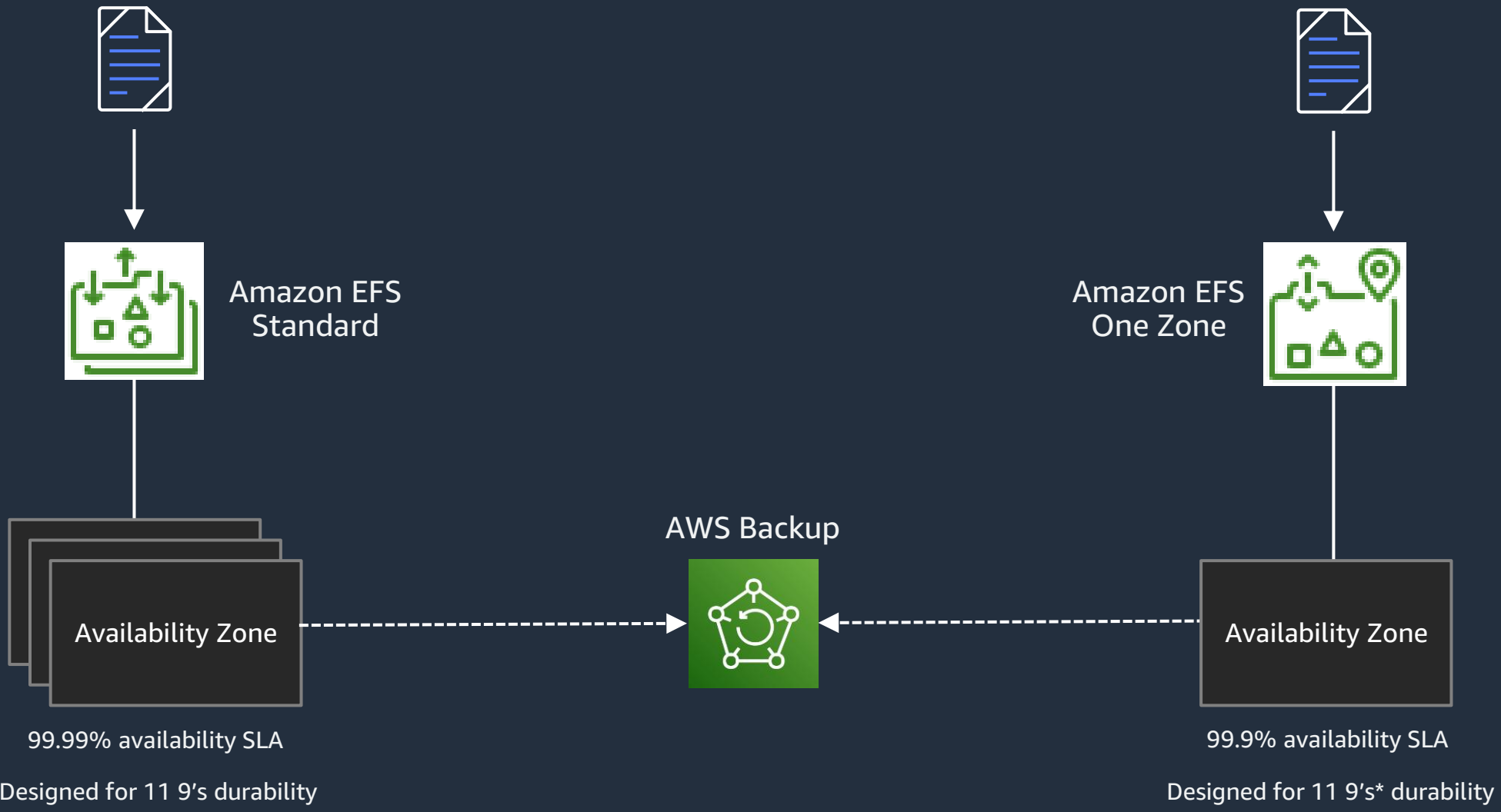
"Just works" performance for throughput-intensive applications, without any planning or provisioning

Accelerate modernization and innovation

Highly integrated, serverless shared access

Build and deploy with confidence

Highly available and durable

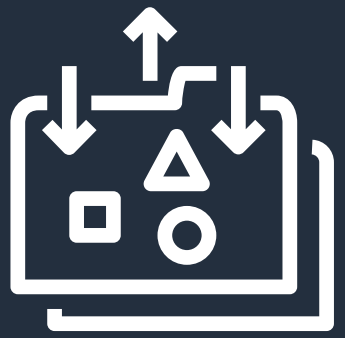


* Data stored in these storage classes may be lost in the event of a disaster or other fault that affects all copies of the data within the Availability Zone (AZ), or in the event of AZ destruction.

EFS Storage Classes

Standard

Fastest performance for ***active data***



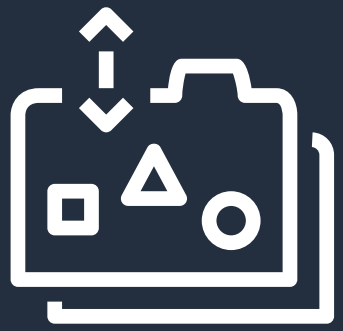
$0.30/GB-mo

Sub-millisecond latencies

Tier inactive data

Infrequent Access (IA)

Cost-optimized for ***inactive data*** (a few times a quarter)



$0.016/GB-mo

95% lower cost than Standard

Tier cold data

Archive

Cost-optimized for ***cold data*** (a few times a year or less)

$0.008c/GB-mo

50% lower cost than IA

Tier back to Standard upon access

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.

Amazon FSx

Amazon FSx for Windows File Server

FULLY MANAGED, HIGHLY RELIABLE AND SCALABLE FILE STORAGE BUILT ON WINDOWS SERVER

Home directory

Content management

Virtual desktops

HA SQL Server databases

Fully managed, and built on Windows Server

- No need to manage hardware infrastructure
- Windows-native SMB access

Flexible price and performance options

- SSD or HDD
- Single-AZ or Multi-AZ
- Scale throughput and storage independently
- Data deduplication

Easy migration to AWS

- SMB to SMB with AWS DataSync
- No need to replatform or rearchitect

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

Deeply integrated with AWS

Security

Amazon VPC

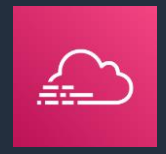
Amazon IAM

Amazon KMS

AWS Directory Service

Monitoring and automation

Amazon CloudWatch



AWS CloudTrail

AWS CloudFormation

Amazon ECS

Amazon EKS

Amazon Kendra

Amazon File Gateway

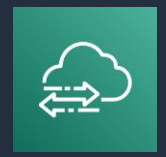
Amazon EC2

VMware Cloud on AWS

Amazon AppStream 2.0

Amazon WorkSpaces

Compute instances



AWS DataSync

AWS Backup

Data management

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

Accessibility

- ✓ Full SMB protocol support
- ✓ Windows Server 2008+, Windows 7+, Linux, and MacOS
- ✓ EC2, WorkSpaces and AppStream 2.0
- ✓ VMware Cloud on AWS
- ✓ ECS and EKS containers
- ✓ Cross-VPC/Account/Region access
- ✓ On-premises access (DirectConnect/VPN)

Administration

- ✓ Active directory integration
- ✓ Managing file shares
- ✓ Monitoring user sessions and open files
- ✓ Restoring locked files
- ✓ User storage quotas
- ✓ Monitoring actions via CloudTrail
- ✓ Enhanced performance metrics

Availability and durability

- ✓ High availability: automatic recovery
- ✓ High durability: automatic replication
- ✓ Multi-AZ deployment option
- ✓ SMB continuous availability (CA)

Performance and scale

- ✓ Consistent, sub-millisecond latencies
- ✓ PB-scale storage scalability
- ✓ Tens of GB/s throughput scalability
- ✓ Millions of IOPS scalability
- ✓ Select throughput and storage independently
- ✓ Server-side and client-side caching
- ✓ SMB Multichannel
- ✓ Perf. monitoring via CloudWatch
- ✓ Live scaling of throughput capacity

Cost optimization

- ✓ Storage type flex. (SSD/HDD)
- ✓ Deployment type flex. (single-AZ/multi-AZ)
- ✓ Live scaling of storage capacity
- ✓ Data deduplication and compression

Data protection

- ✓ Snapshots (with end-user file restore)
- ✓ Backups

Security and compliances

- ✓ Encryption at rest and in transit
- ✓ Kerberos authentication
- ✓ Access controls via NTFS ACLs, share ACLs, VPC, and IAM
- ✓ PCI DSS, ISO, SOC, GDPR, IRAP, DoD SRG IL-2, FedRamp High, and HIPAA compliances

Amazon FSx for Lustre

Fully managed Lustre file system for high performance workloads

Highly scalable performance

Fully POSIX-compliant

Concurrent access for 100,000s of cores

FSx for Lustre: Designed for the most compute-intensive workloads

By industry

Financial services

Life sciences

Media and entertainment

Automotive

Semiconductor

Oil and gas

By application area

Big data analytics

Machine learning

High-performance computing

Storage optimized for price-performance

HDD-based persistent storage

SSD-based persistent storage

HDD-based persistent storage with an SSD cache

SSD-based scratch storage

What is Amazon FSx for NetApp ONTAP?

Complete, fully managed NetApp ONTAP file systems

With the simplicity, agility, and scalability of an AWS service

Amazon FSx for NetApp ONTAP feature summary

Administration

- ✓ AWS Console, CLI, API
- ✓ Amazon CloudFormation, CloudWatch, CloudTrail
- ✓ ONTAP CLI, API
- ✓ NetApp Cloud Manager, Cloud Insights

Performance & Scalability

- ✓ GBs/s of throughput, 100K+ IOPs, sub-ms latencies
- ✓ PiB capacity scale
- ✓ FlexGroups
- ✓ FlexCache

Resilience & Protection

- ✓ SAZ & MAZ options
- ✓ Snapshot, SnapRestore
- ✓ SnapCenter
- ✓ SnapMirror, SnapVault

Accessibility

- ✓ NFS – v3, v4, v4.1, v4.2
- ✓ SMB – v1, v2, v3
- ✓ iSCSI

Efficiencies

- ✓ Data tiering
- ✓ Deduplication, compression
- ✓ Thin provisioning
- ✓ FlexClones

Security and Compliance

- ✓ Active Directory integration
- ✓ Encryption
- ✓ Anti-virus integration
- ✓ File access auditing
- ✓ ISO, PCI DSS, SOC, HIPAA, FedRAMP

Capacity pool tiering

OPTIMIZE COST AND PERFORMANCE

SSD

- Sub-ms latencies
- Optimized for active data

Capacity pool

- Fully elastic (automatically grows/shrinks)
- Cost-optimized for infrequently accessed data

~20% of data

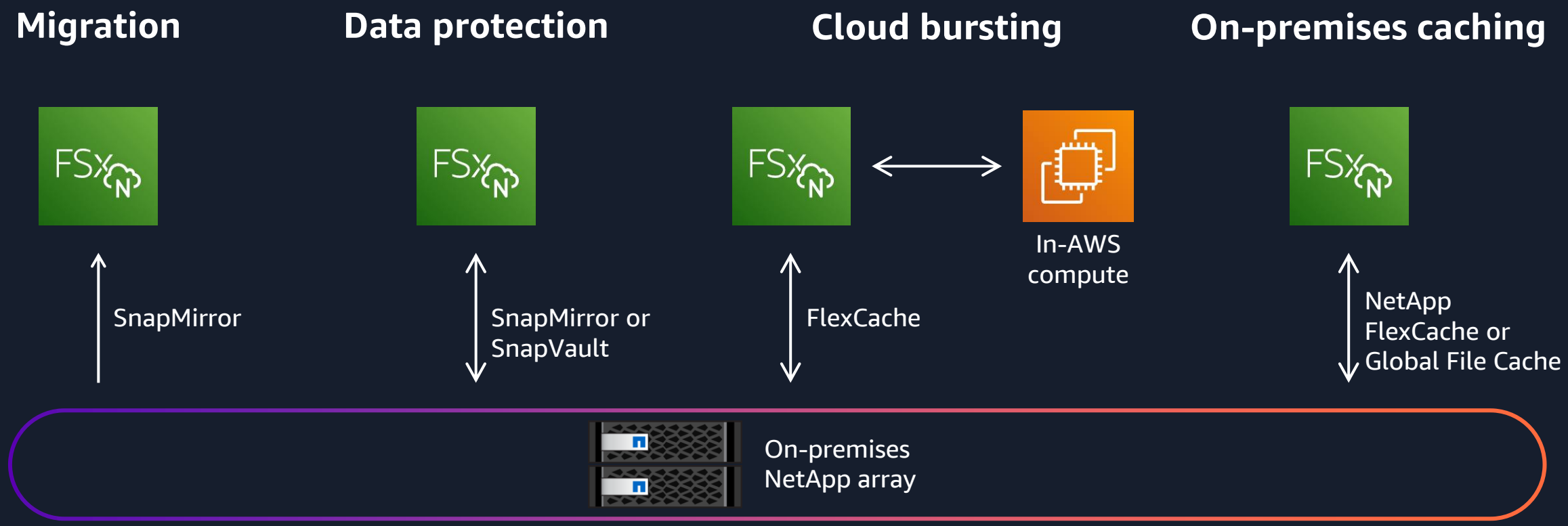
ONTAP's built-in, automatic data tiering

- Optimized for file workloads
- Intelligent and bidirectional

~80% of data

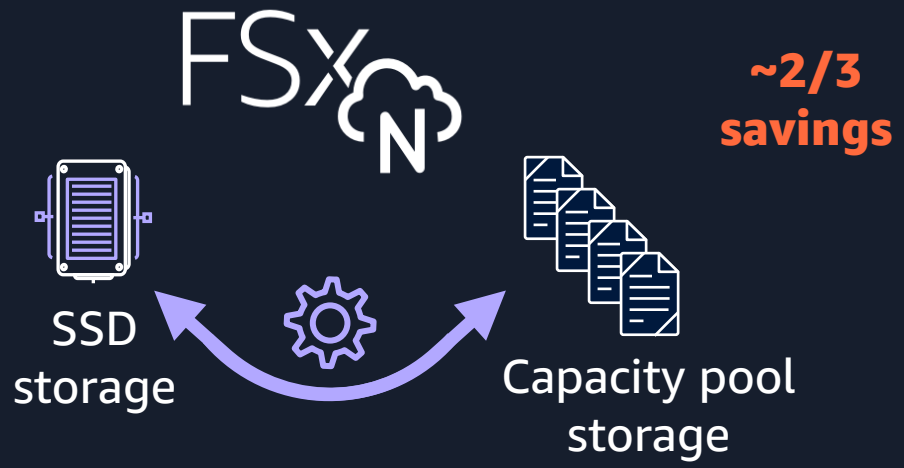
SSD performance for **a fraction** of the cost

Easily extend ONTAP to the cloud



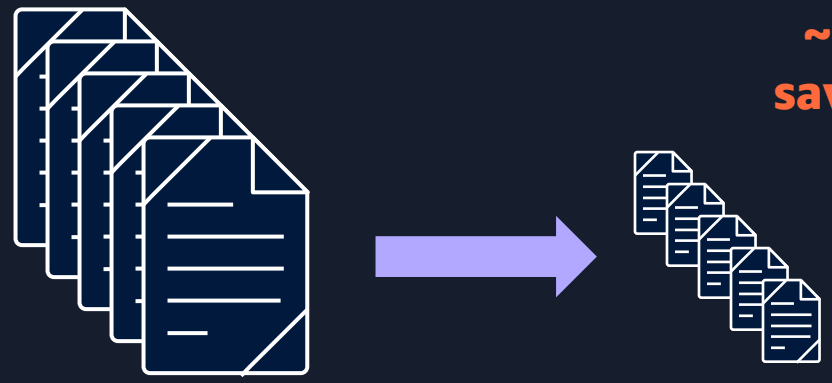
Cost-effective ONTAP storage in the cloud

Intelligent data tiering



~2/3 savings

Data compression & deduplication



~2/3 savings

For a typical dataset

88% cost savings

$0.022/GB-mo storage cost (single-AZ)
$0.042/GB-mo storage cost (multi-AZ)

Note: Based on FSx for ONTAP pricing in US East (N. Virginia)

Introducing Amazon FSx for OpenZFS

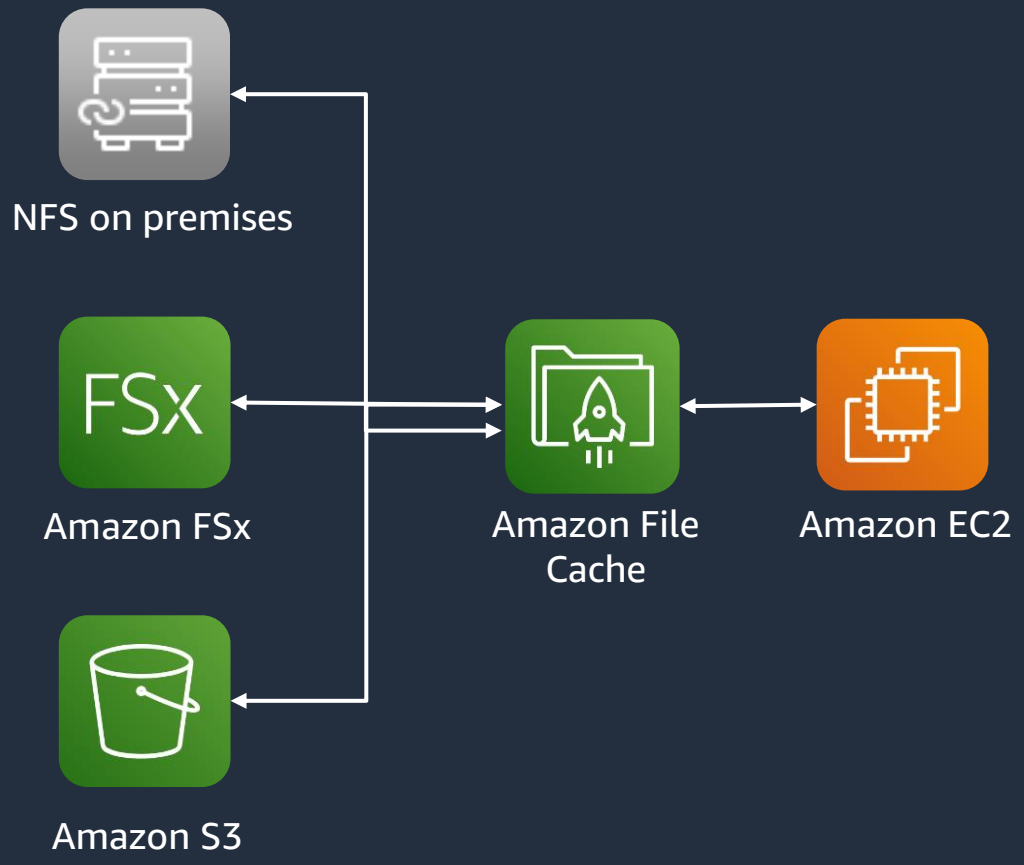
Simple and powerful shared **NFS file storage** that delivers **leading price/performance** on AWS

Built on the **latest AWS technologies** and the popular open-source **OpenZFS** file system

Amazon File Cache

Amazon File Cache

HIGH-SPEED CACHE FOR FILE SYSTEMS



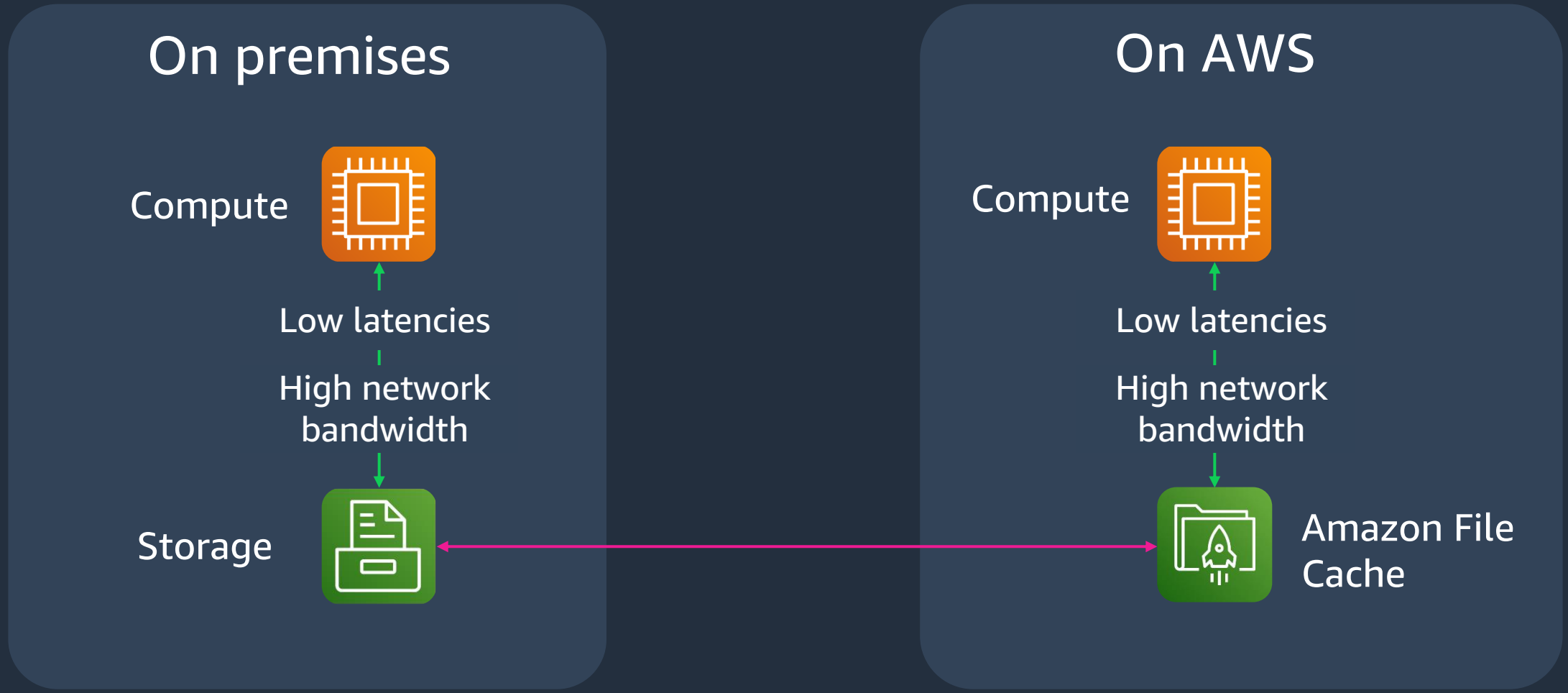
Fast – highly scalable performance

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



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. Virgina) Region

** Prices vary by region

aws

Object Stores

Amazon S3

Amazon S3 (Simple Storage Service)

- Web accessible object store (through API or HTTPS)
- Highly durable (99.999999999% 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

Amazon S3 storage class choice matters at scale

PURPOSE-BUILT TO DELIVER THE MOST COST-EFFECTIVE STORAGE FOR VARIOUS ACCESS PATTERNS AND PERFORMANCE REQUIREMENTS

S3 Express One Zone	S3 Intelligent-Tiering	S3 Standard	S3 Standard-IA	S3 One Zone-IA	S3 Glacier Instant Retrieval	S3 Glacier Flexible Retrieval	S3 Glacier Deep Archive
							
Most frequently accessed data	Changing access patterns	Frequently accessed data	Infrequently accessed data	Re-creatable, less accessed data	Rarely accessed data	Archive data	Long-term archive data
Single-digit millisecond access	Milliseconds access					Minutes to hours	

The newest Amazon S3 storage class

NEW

S3 Express One Zone

Most frequently accessed data

Single Availability Zone

Re-creatable, latency sensitive, frequently accessed data

- Single-digit millisecond access
- Uses directory buckets
- Co-locate storage and compute resources to further reduce latency

S3 Intelligent-Tiering

Changing access patterns

AWS Region ≥ 3 Availability Zones

Changing access patterns

- Milliseconds access
- No retrieval charge
- Archive Instant Access tier

S3 Standard

Frequently accessed data

Frequently accessed data

- Milliseconds access
- No retrieval charge

S3 Standard-IA

Infrequently accessed data

Infrequently accessed data

- Milliseconds access
- Per-GB retrieval charge

S3 Glacier Instant Retrieval

Rarely accessed data

Rarely accessed data

- Milliseconds access
- Per-GB retrieval charge

S3 Glacier Flexible Retrieval

Archive data

Archive data

- Retrieval options from minutes to hours
- Free bulk retrievals

S3 Glacier Deep Archive

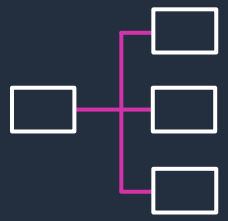
Long-term archive data

Long term archive data

- Retrieval in hours

Purpose built for fastest data processing for performance-critical applications

S3 Management Features



Organize

S3 Tagging

S3 Prefixes

S3 Versioning

Monitor

CloudWatch

CloudTrail

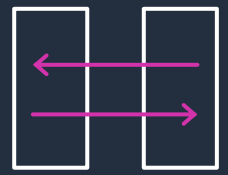
S3 Event Notifications

S3 Inventory

S3 Glacier Restore Notifications

S3 Storage Lens

AWS Config



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

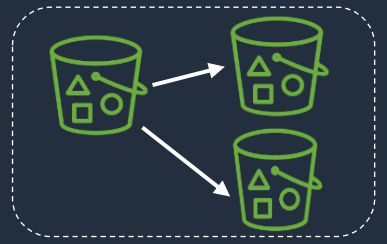
- Deep integration with AWS Identity and Access Management (IAM)
- Access Control Lists (ACLs), S3 bucket policies, and S3 Access Points
- Query String Authentication
- Audit Logs
- S3 supports both server-side & client-side encryption
- S3 Block Public Access to ensure S3 buckets and objects do not 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
- 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

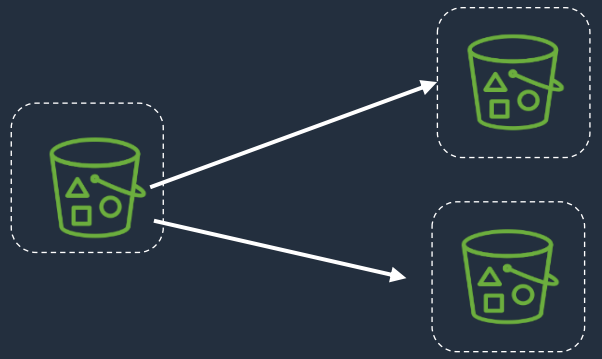
Replicate to 1 or more buckets within the same AWS Region



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

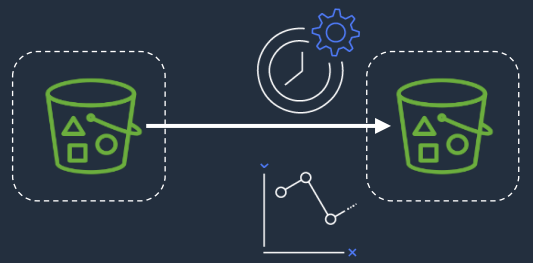
Amazon Simple Storage Service

Replicate to one or more bucket in different AWS Regions



Bi-Directional Replication (in the same of 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

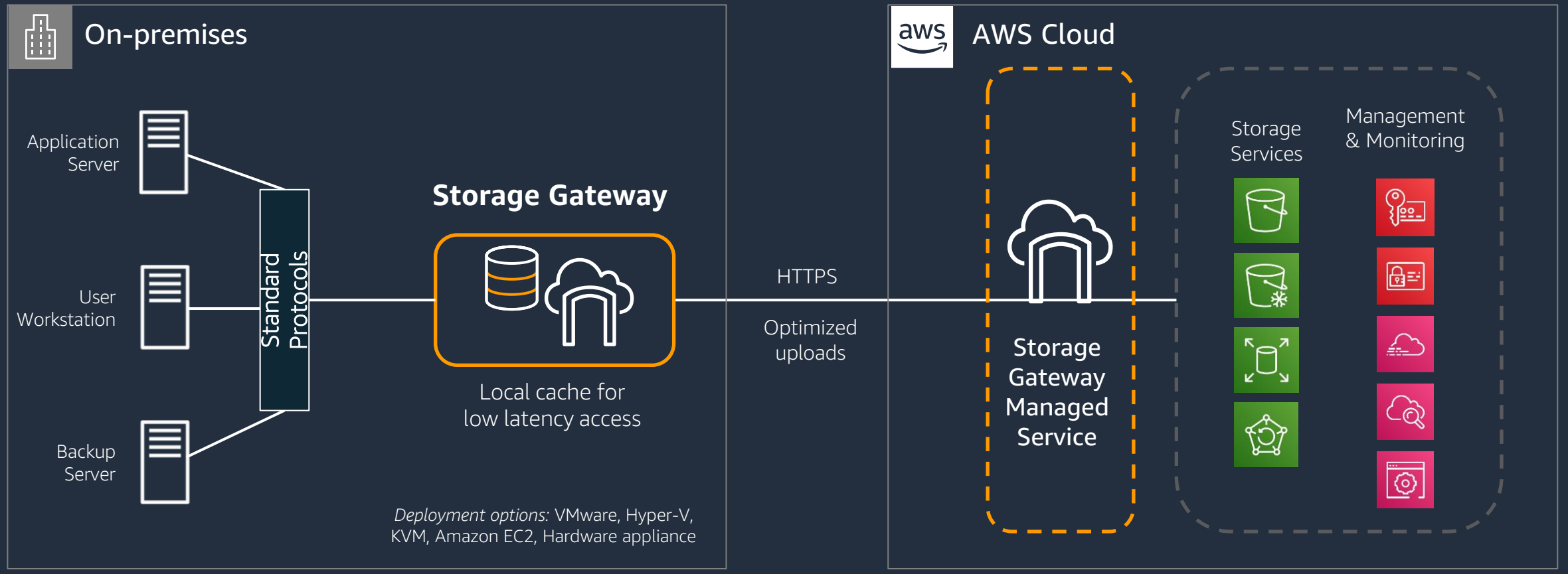
AWS DataSync

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

Amazon S3 File Gateway

Native file access, SMB or NFS, to Amazon S3 for backups, archives, and ingest for data lakes

Amazon FSx File Gateway

Replace on-premises Windows file shares with efficient, low-latency Amazon FSx for Windows based group file shares and home directories

Tape Gateway

Replace physical tape infrastructure leveraging Amazon S3 archive tiers for long-term retention

Volume Gateway

Block storage volumes with snapshots, AWS Backup integration, and cloud recovery

aws

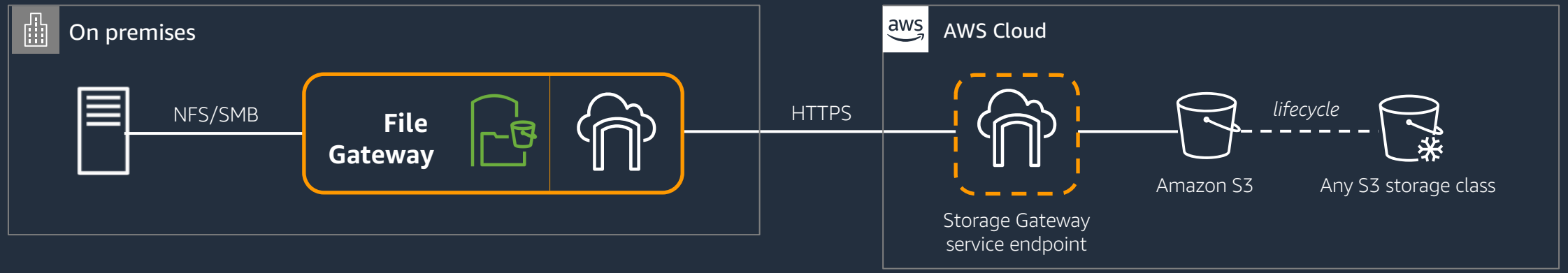
Amazon S3 File Gateway

- Connect using NFS v3/v4 or SMB v2/v3 protocols
  - Files stored as native S3 objects
  - Metadata is preserved as object user metadata
- Object-level encryption with SSE-S3 or SSE-KMS
- Fully managed local cache
  - Read-through, write-back, LRU managed
- Notifications through Amazon CloudWatch (e.g., upload complete)
- Optimized data transfers
  - Uploads only sends changes, downloads retrieve file parts needed
- Automated cache refresh
  - Optimizes content distribution workloads

aws

Amazon S3 File Gateway

STORE AND ACCESS OBJECTS IN AMAZON S3 FROM FILE-BASED APPLICATIONS WITH LOCAL CACHING



Use cases:

- Database Backups
- Archives
- Data Lakes

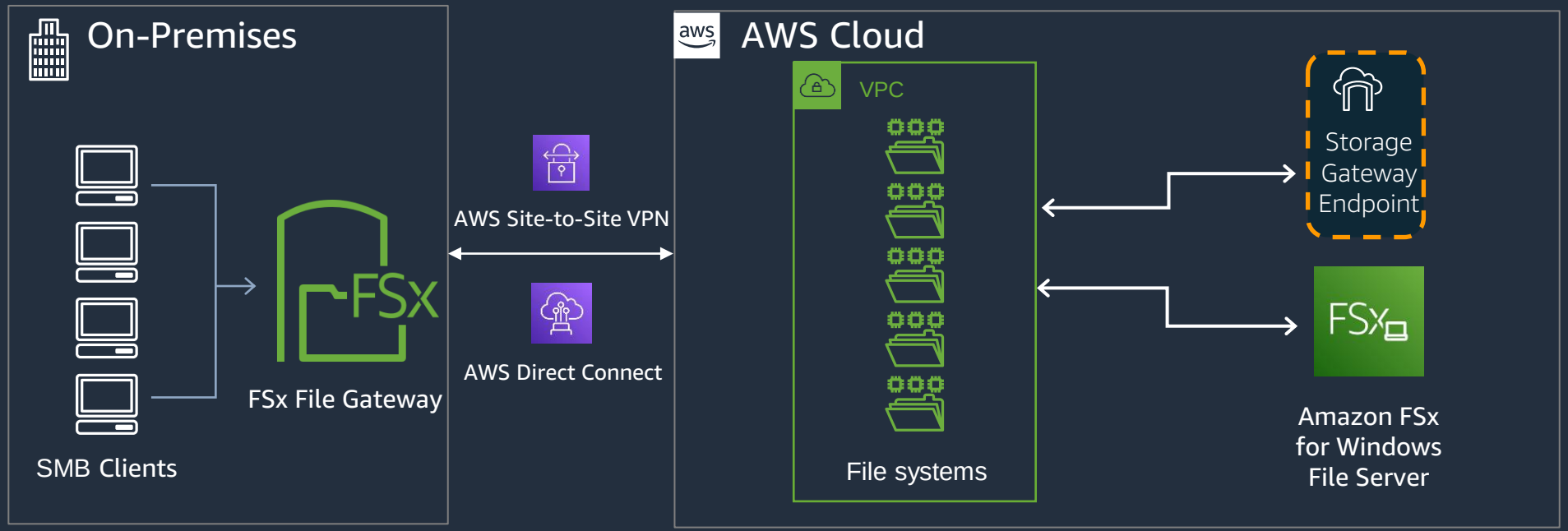
Amazon FSx File Gateway

Amazon FSx File Gateway

- Extend FSx for Windows File Server into your datacenter and remote locations
- Deployed as a VM, hardware appliance, or in EC2
- Local cache of recently used files to improve performance and reduce latency
- Optimized cloud connectivity
- Centrally managed from a single pane of glass in the AWS console

Amazon FSx File Gateway architecture

Low-latency access to Amazon FSx File Shares



Features

- On-premises cache of commonly accessed files backed by Amazon FSx for Windows File Server
- Deploy multiple FSx File Gateways in multiple offices or remote sites
- Up to 64TB cache and up to 500 clients per gateway
- High availability with on-premises cache on VMware

Tape Gateway

- Emulates physical tape library through iSCSI VTL protocol
- Fully managed local cache for recent backups
  Read-through, write-back, LRU managed
- Virtual tapes stored in Amazon S3
- Exported virtual tapes archived read-only in Amazon S3 Glacier or Amazon S3 Glacier Deep Archive
- Configurable encryption SSE-S3 or SSE-KMS
- Compatible with all leading backup software

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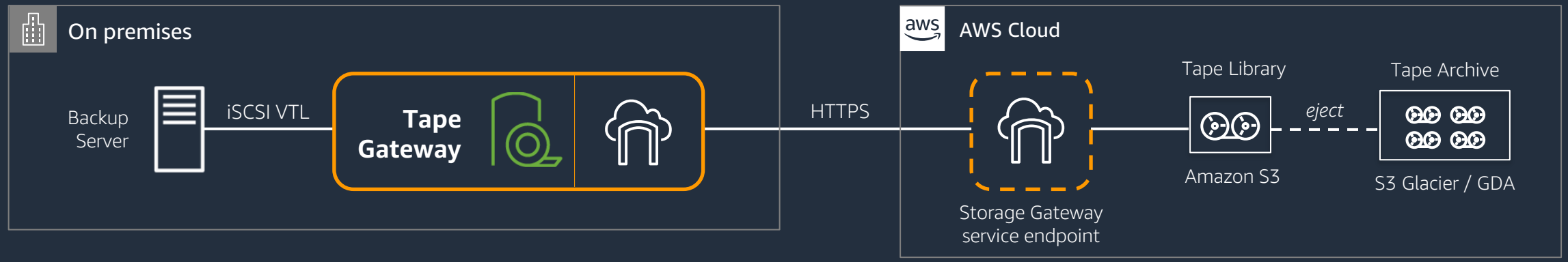
Tape Gateway

VIRTUAL TAPES PRESENTED TO ON-PREMISES BACKUP APPLICATIONS



Use cases

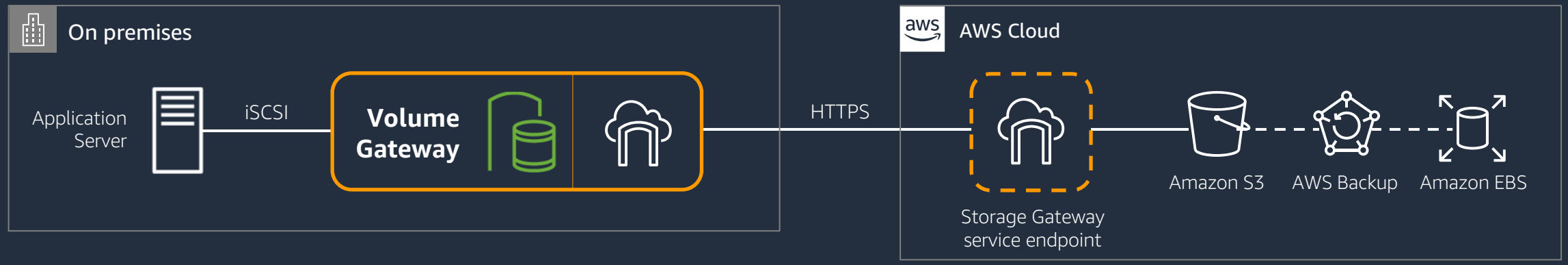
- On-premises backup to cloud
- Drop-in replacement for physical tape libraries
- Archive to Glacier or Glacier Deep Archive

Volume Gateway

- Connect using the iSCSI block protocol
  - Volumes stored in AWS reducing on-premises SAN footprint
  - Thin-provisioned (cached) or local (stored) volume types
- Fully managed local cache
  - Read-through, write-back, LRU managed
- Configurable encryption with SSE-S3 or SSE-KMS
- Volume snapshots stored in Amazon EBS
- Volume Gateway support for AWS Backup
- Volume detach/attach

Volume Gateway

BLOCK STORAGE ON-PREMISES BACKED BY CLOUD STORAGE



Use cases:

- Backup on-premises data to the cloud
- Migration of volumes to the cloud
- DR to the cloud

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

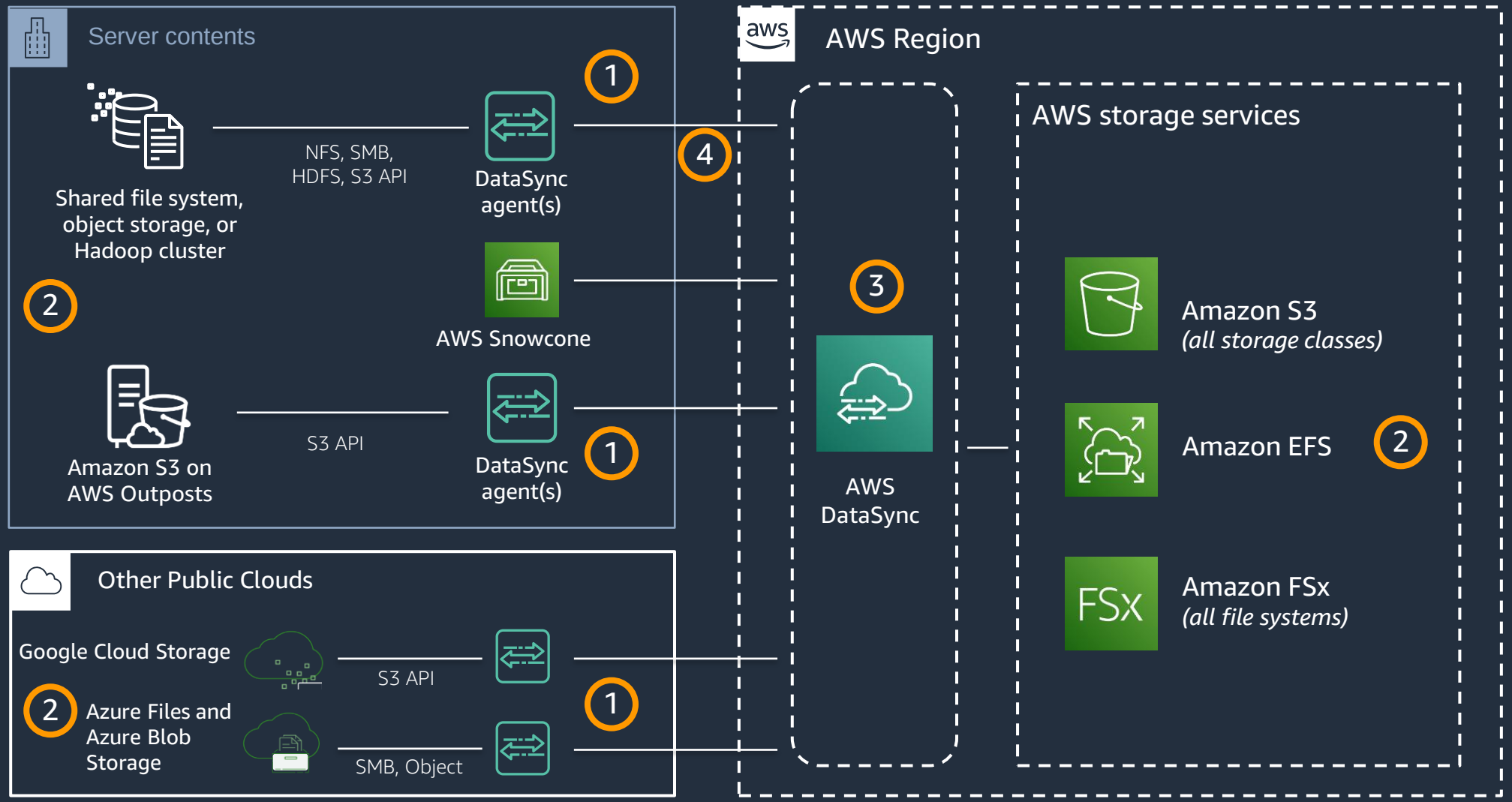
Secure and reliable

Cloud integrated

Cost-effective

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

AWS DataSync: How it works



1. Agents are deployed to connect to on-premises storage, edge locations, or storage in other clouds
2. Create location resources for source and destination storage
3. AWS DataSync managed service connects to AWS storage and coordinates the transfer
4. For transfers between on premises and AWS, internet, AWS Direct Connect, and AWS Virtual Private Network (VPN) are supported

The benefits of AWS DataSync

Online data migration service
that simplifies, automates, and accelerates
copying file and object data to and from AWS storage

Fast data transfer

- Highly optimized, parallel network transfer (up to 100 TB/day)
- Transfers only incremental changes

Easy to use

- Schedule transfers
- Throttle bandwidth
- Filter by file name patterns

Secure and reliable

- End-to-end encryption
- End-to-end data verification
- VPC endpoints with AWS PrivateLink

Fully managed

- Integrates with AWS management and monitoring services
- Direct transfer into AWS storage services

Cost effective

- $0.0125/GB transferred
- No minimums

aws

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

Accelerate your data migration

Discover

AWS DataSync Discovery gives you insights about your storage and generates recommendations for moving to AWS

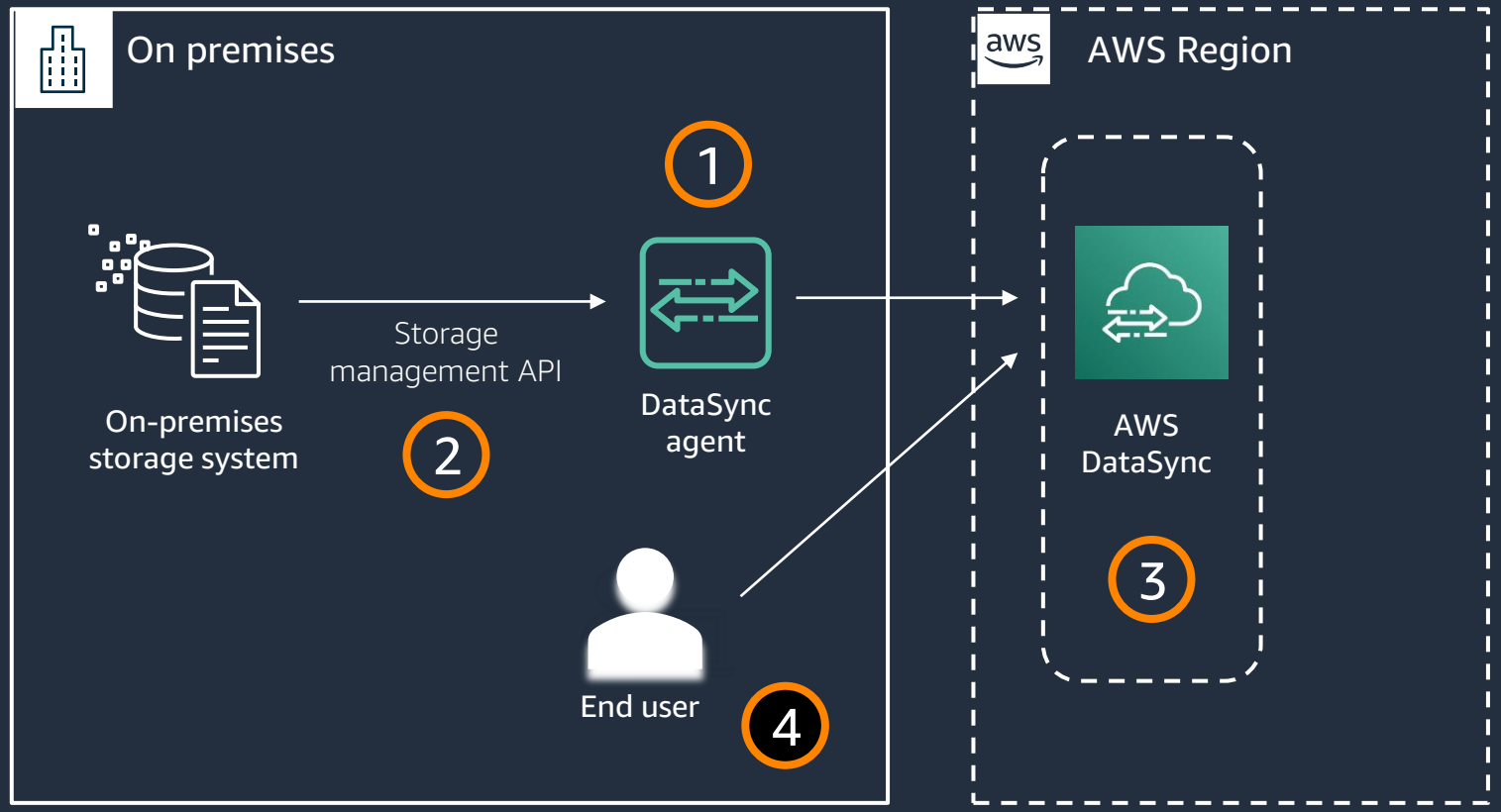
Plan

Evaluate recommended AWS Storage services for your data migration plan

Migrate

AWS DataSync moves your data to AWS quickly and securely

AWS DataSync Discovery: How it works



1. DataSync agent connects to your on-premises storage
2. DataSync Discovery uses management APIs provided by your storage system
3. Run discovery jobs to collect information about your storage
4. View collected data and recommendations in the DataSync console or by using the CLI/SDK

Amazon Snow Family

AWS Snow Family

PHYSICAL DEVICES FOR WORKLOADS AT THE EDGE

AWS Snowcone

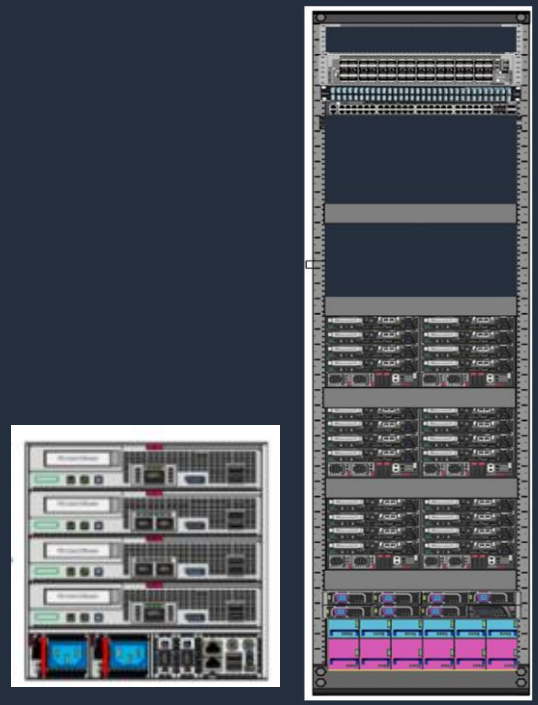
Ultra-portable edge compute device, for use outside a data center

Rugged edge data capture and movement to AWS

AWS Snowball Edge

Compute-optimized or storage-optimized device for rugged environments

Multi-petabyte data migration from on-premises



AWS Snowblade

Dense compute and networking device for tactical edge and telco 5G Packet Core

Full integrated Snowman rack level solution

Available for clustering, scaling, and connectivity

AWS Snowball Edge for Rugged and Tactical Edge

BRINGS AWS TO RUGGED EDGE AND LOCATIONS WITH NO OR LIMITED NETWORK CONNECTIVTY

Edge Compute and Edge Storage use cases:
32 - 104 vCPU, 208 - 416 GB RAM
28 – 210 TB Storage
Up to 100G Networking

Tamper-resistant
Tamper-evident

Operates on unconditioned power and in non-datacenter environments (0° to 45°C)

- Handles up to **200G impact**
- Airdrop-able
- MIL-S-901D
- Meets FISMA High, FedRAMP ITAR, CJIS, and DoD SRG Impact Level 6 requirements

- Data secured with 256-bit encryption
- Designed to be operated by non-technical personnel

Weighs 49 lbs, can be handled by a single person

AWS Snowcone for mobile workloads

SMALL, ULTRA-PORTABLE, RUGGED, AND SECURE EDGE COMPUTING AND DATA TRANSFER DEVICE

Capabilities:
2vCPU, 4 GB RAM
8 TB HDD or 14 TB SSD
1 or 10G Networking

Tamper-resistant
Tamper-evident

Operates on unconditioned power and in non-datacenter environments (0° to 45°C)

Handles vibration up to 50G RMS

Data secured with 256-bit encryption

Designed to be operated by non-technical personnel

Weighs 4 lbs and can be carried in a backpack

AWS Snowblade Specifications

Physical Specifications: 35.5” X 19” X 23”, 50 lbs. without enclosure, 80 lbs. with enclosure

Electrical Specifications: 110v/15amp

Operating Temp Range: 0 – 55C

- 2 10GbE SFP+ chassis networking switches
- 2 Power supplies
- 1 GbE RJ45 management interface
- 4 dual-port 10 GbE interfaces
- 4 server blades with Intel Xeon processors
- 52 vCPU per server blade
- 208 GB RAM per server blade
- 16 TB NVMe SSD storage per server blade

Compliance: Designed to meet MIL-STD-810H with ruggedized enclosure

Only Available for JWCC

Snowblade in optional MIL-STD-810H enclosure

Operates on unconditioned power and in non-datacenter environments

Data secured with 256-bit encryption

FIPS compliance, NEBS-3 certification

FedRamp-Moderate and FedRamp-High

IL5 and IL6 certification

Weighs 50 lbs. (without enclosure), can be handled by a single person

aws

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 3rd party integrations and connectors
- Provide pre-processing for data filtering and encryption
- Supports additional protocols (AS2/HTTPS)

AWS Transfer Family benefits

Reduce Costs

Scales with business

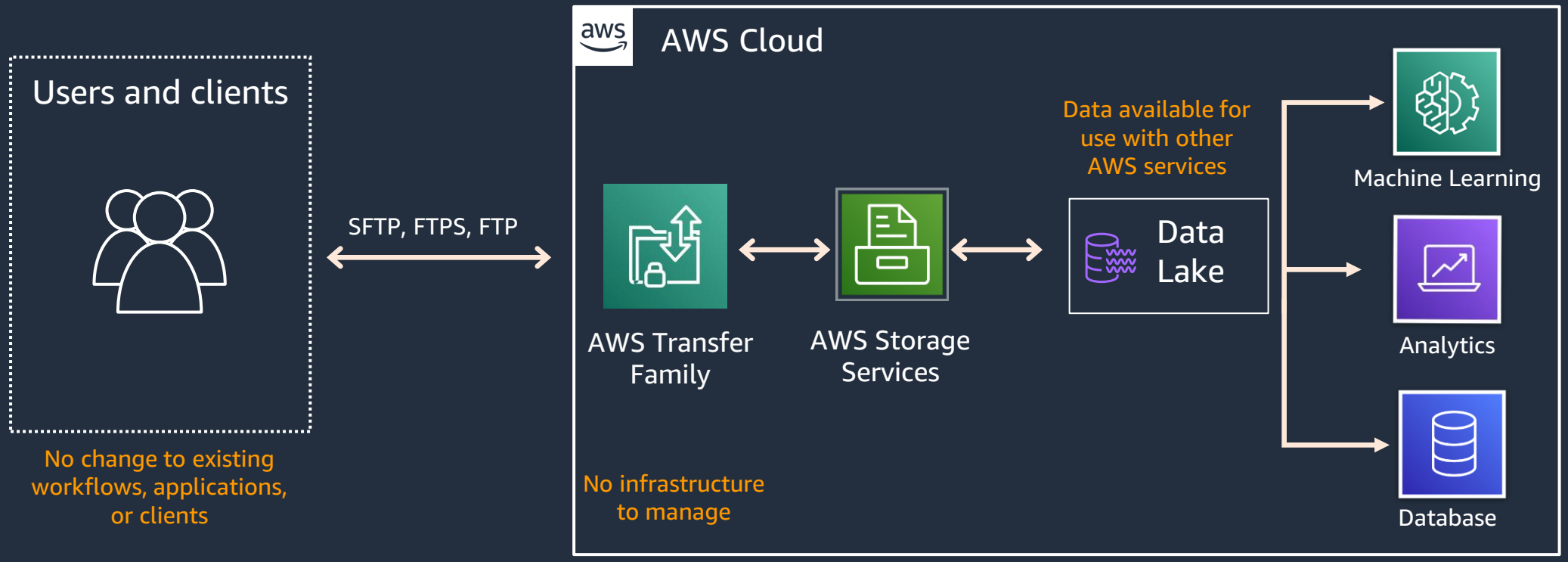
Operational Visibility

Secure and Compliant

AWS Integrated

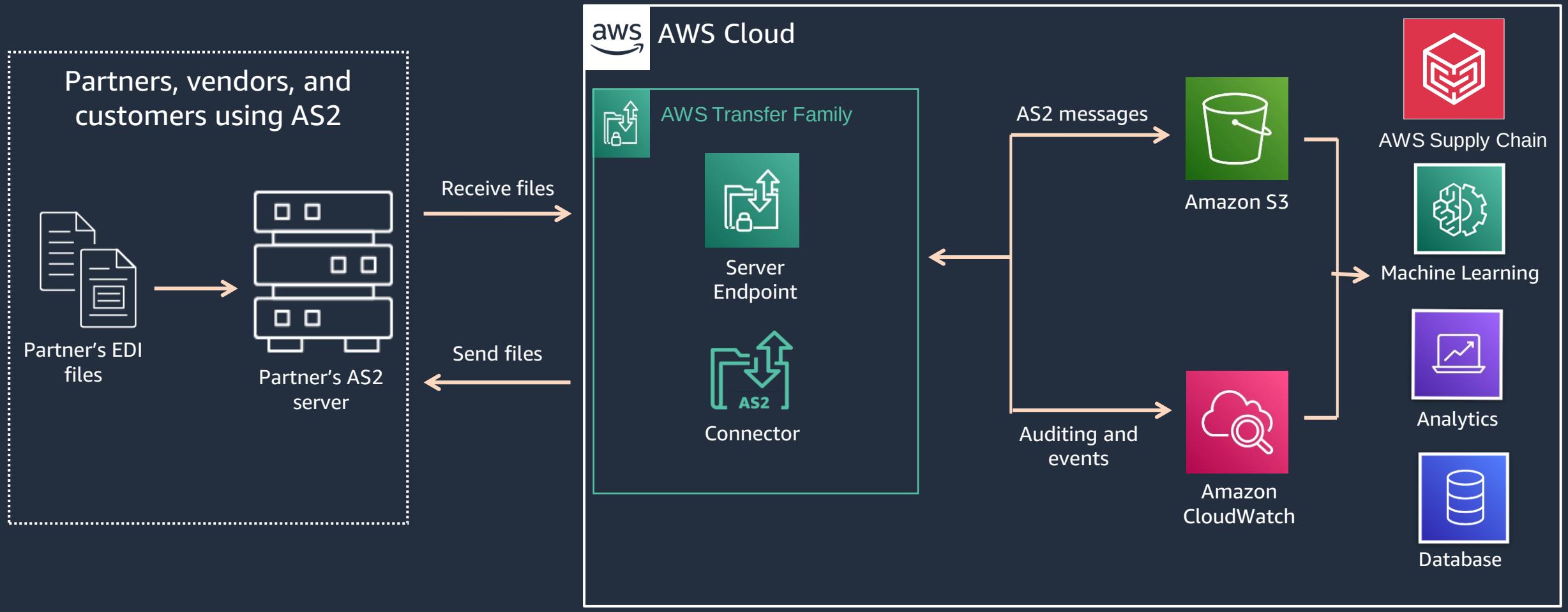
AWS Transfer Family (SFTP/FTPS/FTP)

Seamlessly migrate without impacting your workflows



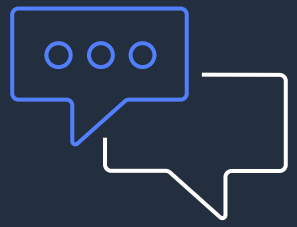
AWS Transfer Family (AS2)

Seamlessly migrate without impacting your workflows



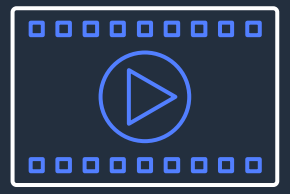
Common use cases

Data lakes and analytics platforms

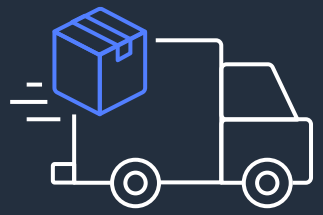


Customer relationship management applications

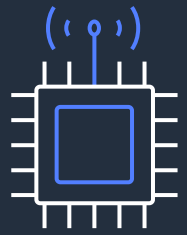
Subscription based data products



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

SFTP/FTPS/FTP Pricing

Server endpoint time:	$0.30/protocol/hour
Data uploads and downloads:	$0.04/GB

AS2 (only available for S3) Pricing

Server endpoint time:	$0.30/protocol/hour
Cost per message sent/received:	$0.01/per message

Learn more: aws.amazon.com/aws-transfer-family/pricing/

SFTP/FTPS/FTP Examples:

20 end users download data from S3 over SFTP at 1 GB/day

- Monthly estimate: $217.20

or

1000 end users, upload 100 GB/day of data and download 50 GB/day over SFTP, and upload 200 GB/day of data and download 100 GB/day over FTPS

- Monthly estimate: $972

AS2 Pricing

At $0.01/messages, your 30 day charge for receiving 500 messages over AS2

- Monthly estimate added to above SFTP/FTPS/FTP costs: $150

Backup

AWS Backup

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

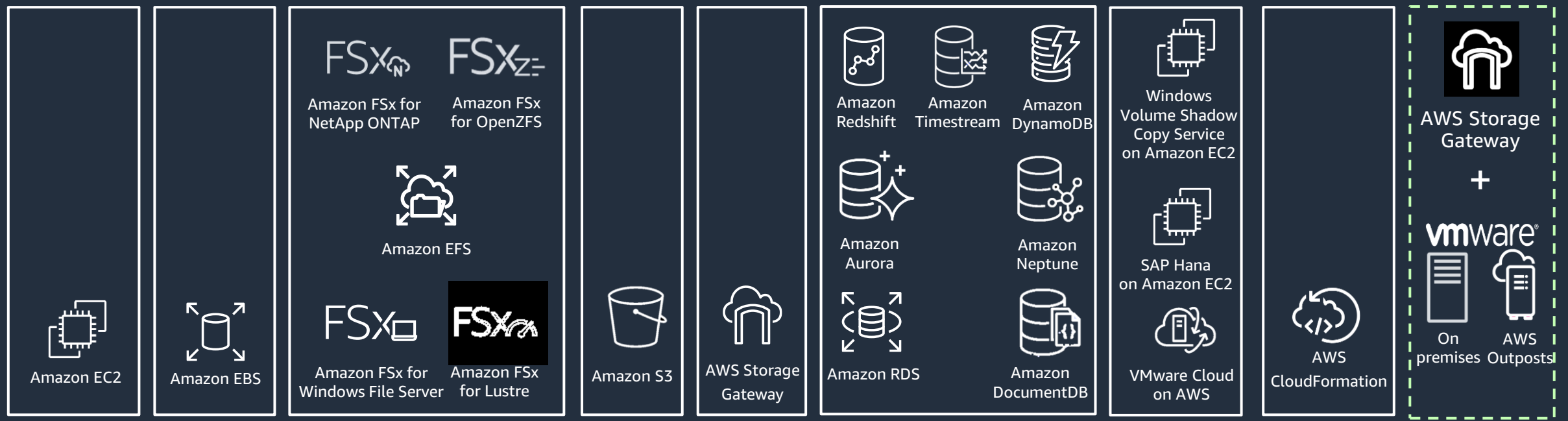
Automated backup retention management

No added cost for orchestration

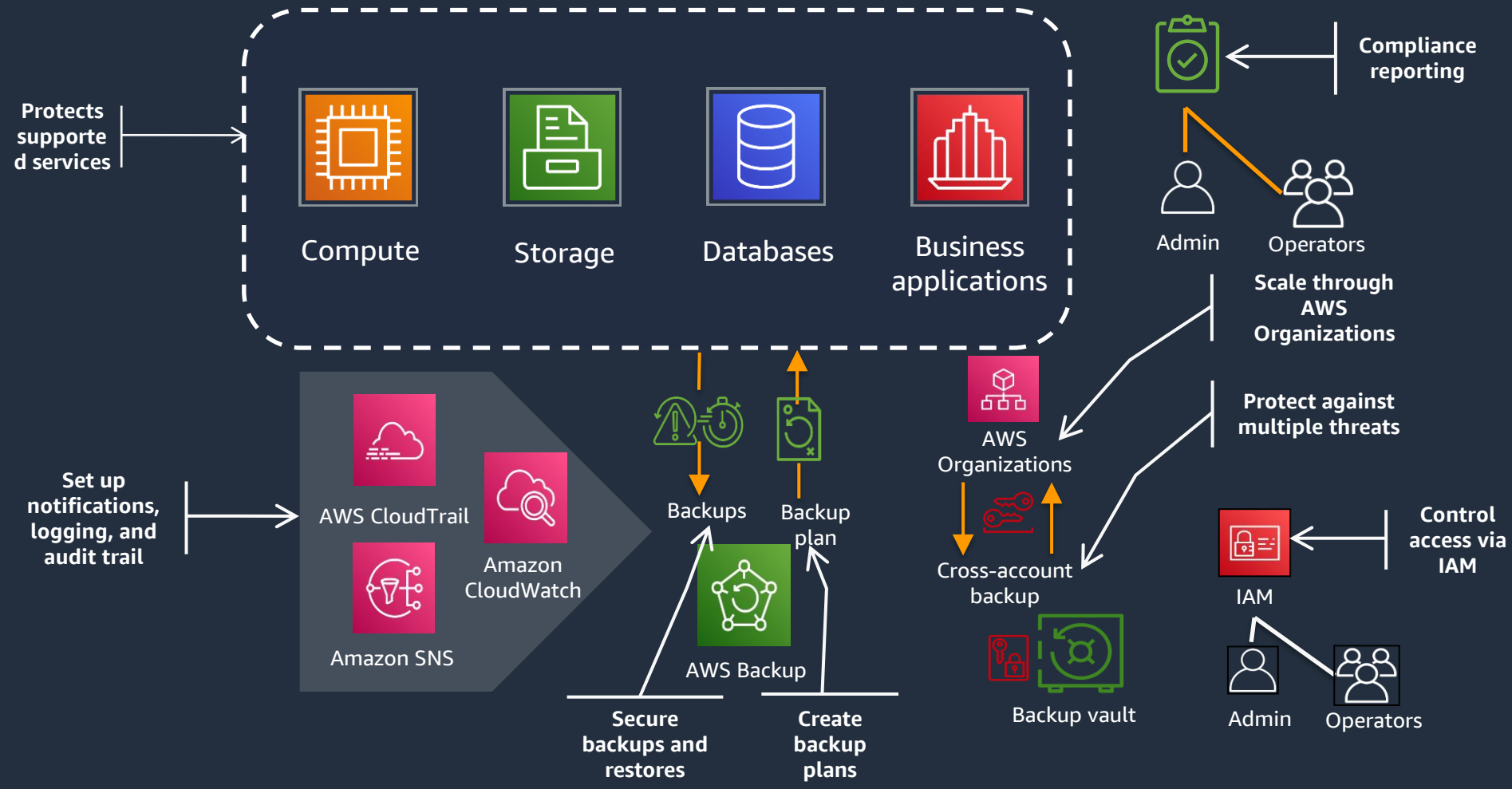
Overview of AWS Backup

AWS Backup

A fully **managed, policy-based** service that **centralizes and automates** data protection across multiple **AWS services and hybrid workloads** with data protection **compliance analytics and insights**



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
Support for Amazon Aurora continuous backups
Support for SAP HANA on EC2
Scalability and performance improvements for S3 backup
VMware vSphere 8 support and multiple vNIC support

Compliance and governance support
Backup Audit Manager support for delegated administrator
Logical Air Gapped Vault (Preview)

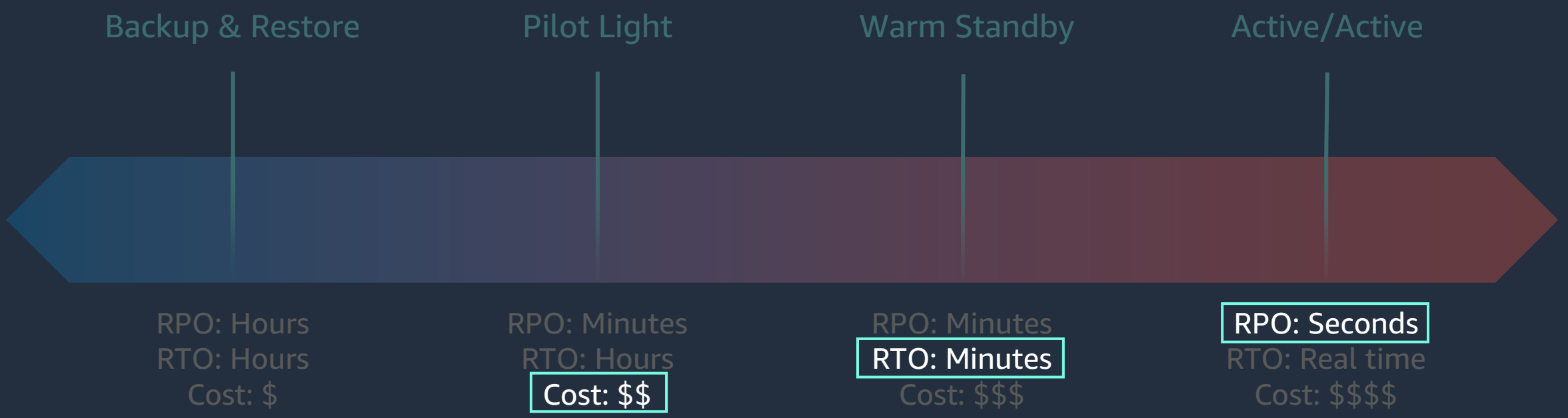
Platform improvements
Tag on restore
Support for local time zone selection
Automated Restore Testing

aws

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

Ransomware recovery

Launch unlocked and unencrypted versions of your applications

Data protection

Recovery point objectives (RPOs) of seconds

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

Q&A

Thank you!