

# S3 Architecture Deep Dive

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Senior Solutions Architect

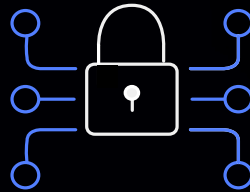


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# Why archive to AWS?



Durability and  
resilience

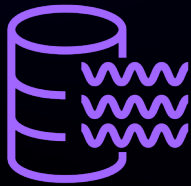


Security and  
compliance



Lowest  
cost

Data lakes



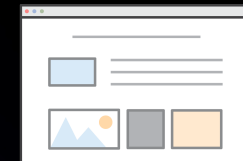
Log data



Infrastructure data



Content/websites



Designed to provide  
99.99999999999999%  
data durability

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# AWS Global infrastructure

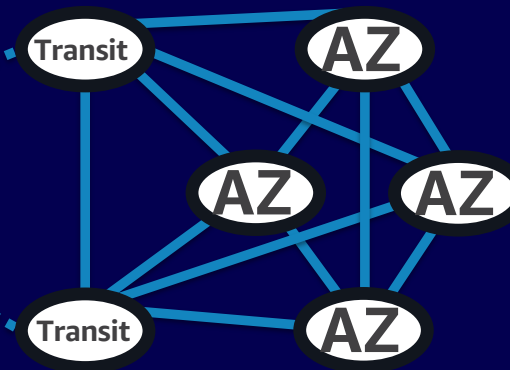
The largest global foot print consistently built with a multi-AZ and multi-datacenter design



26 Regions, 8 Coming soon  
84 Availability Zones  
310 Points of Presence

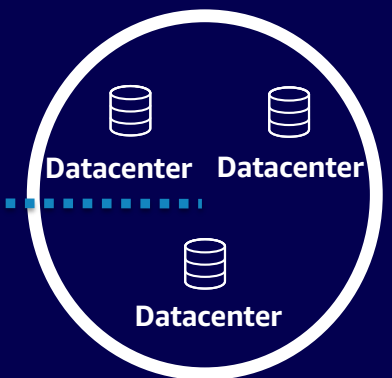
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AWS Region



A Region is a physical location in the world where we have multiple Availability Zones.

AWS Availability Zone (AZ)



Availability Zones consist of one or more discrete data centers, each with redundant power, networking, and connectivity, housed in separate facilities.



# How are customers using S3?

Compliance records

Analytics

Geospatial or lunar imagery

Internet of Things (IoT) sensor data

**Medical images and records**

## Data lakes

Customer call-center records

Digital record preservation

Media master files

**Mobile sync and storage**

Home-recording video

Origin storage for CDN

Seismic and reservoir simulation data

Durable backups

Pharmaceutical study data

DNA sequences

Surveillance video/closed-circuit television



## ML training data

## Media assets

Financial transaction records

Website hosting

Log files

Meteorological and environmental research

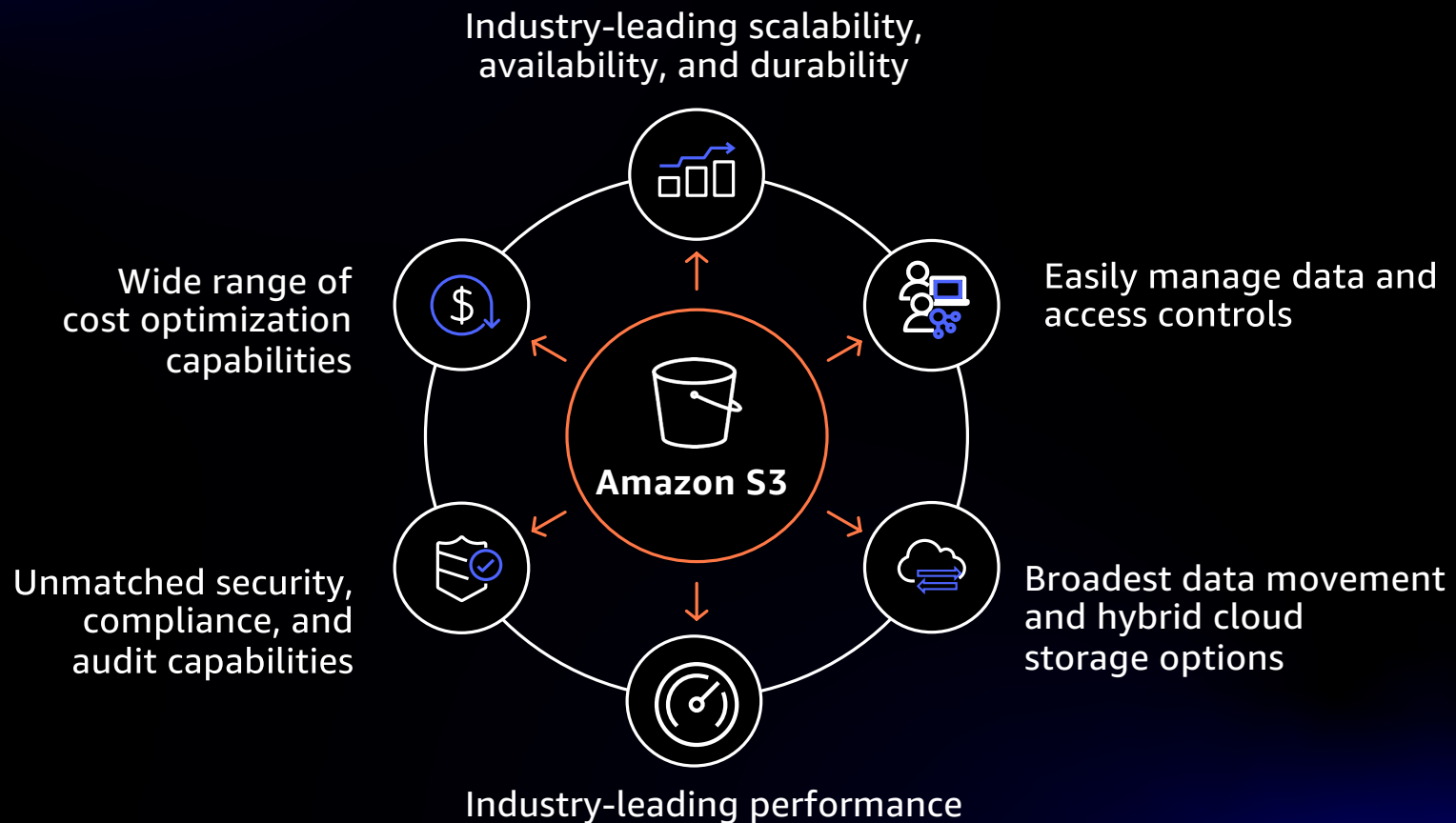
## User-generated content

Autonomous vehicle data

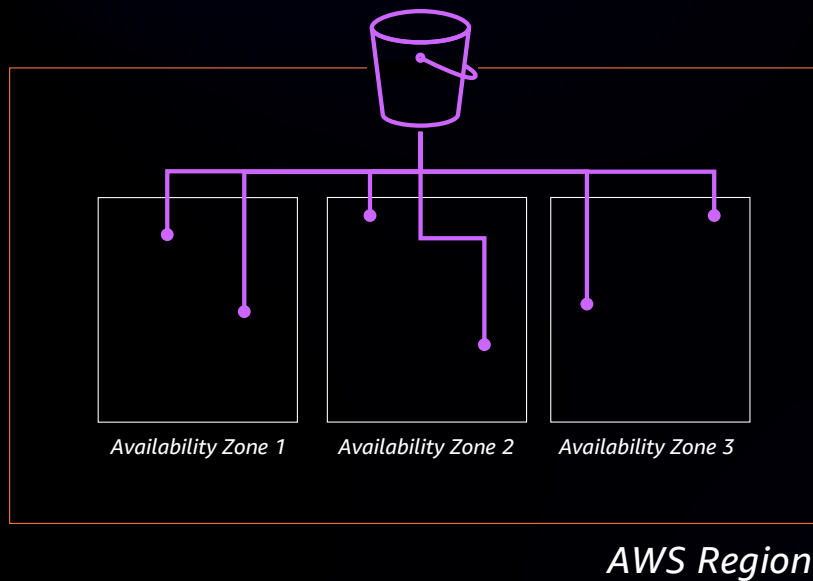
Oil and gas topography



# Operating at scale in Amazon S3



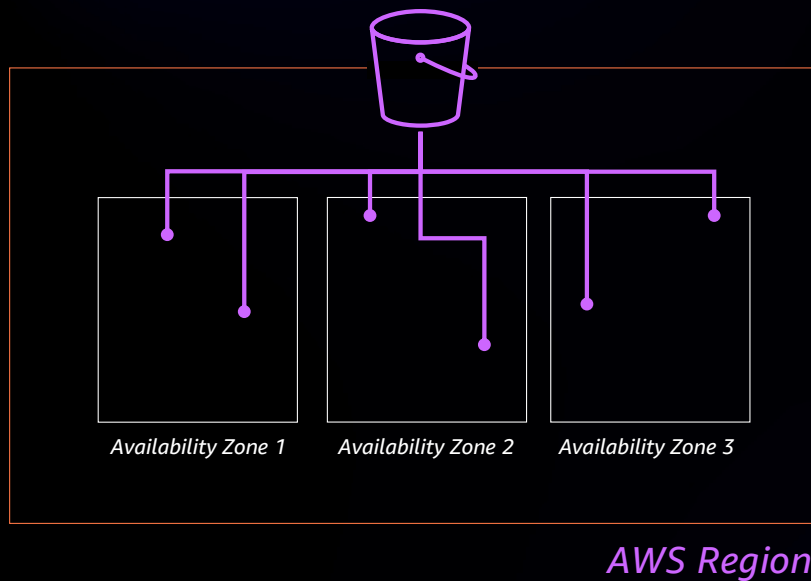
# The unique architecture of Amazon S3



- Stored redundantly across a minimum of three Availability Zones
- Stored redundantly across multiple devices within an Availability Zone
- Designed to sustain concurrent device failures



# A culture of durability



- Durability review and operational safeguards
- Integrity checking to the point of paranoia
- Auditors check and recheck data at rest

At AWS, security is  
Job Zero

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# Amazon S3 features to secure and protect archives



## S3 Block Public Access



## S3 Encryption



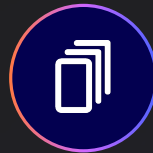
## S3 Access Points

Scale access for hundreds of apps with permissions customized for each app



## S3 Object Lock

Prevents an object from being deleted or overwritten for a fixed amount of time or indefinitely



## S3 Versioning

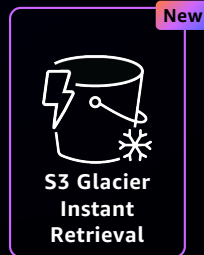
For iterating on projects and protecting content from unintended deletes



## S3 Replication

Protect archives by replicating in-Region or between Regions with different ownership; distribute content to partners

# Your choice of Amazon S3 storage classes



## AWS Region $\geq$ 3 Availability Zones

### Changing access patterns

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

### Frequently accessed data

- Milliseconds access
- No retrieval charge

### Infrequently accessed data

- Milliseconds access
- Per-GB retrieval charge

### Rarely accessed data

- **Milliseconds access**
- **Per-GB retrieval charge**

### Archive data

- Retrieval options from minutes to hours
- **Free bulk retrievals** **New**

### Long term archive data

- Retrieval in hours

## AWS AZ

### Re-creatable, infrequently accessed data

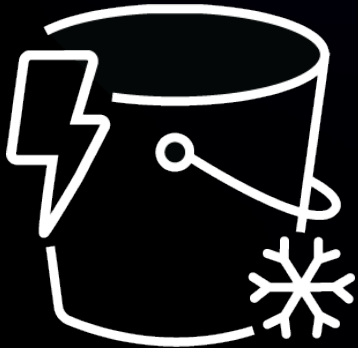
- Milliseconds access
- Per-GB retrieval charge

## AWS Outposts

### On-premises data

- Milliseconds access

# Introducing Amazon S3 Glacier Instant Retrieval



NEW

## What is it?

- For long-lived archive data that requires milliseconds retrieval
- 99.999999999% (11 nines) durability
- Designed for 99.9% availability

## What are the use cases?

- Petabytes of archive data stored for indefinite periods of time
- Only a small percentage of this archive data is accessed each year
- Archive data must be immediately accessible when requested

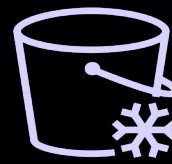
# Which archive storage class is right for me?

1. Storage cost
2. Retrieval speed
3. Data retention

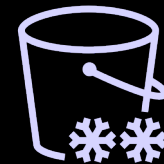
# Choosing between Amazon S3 archive storage classes



S3 Glacier  
Instant Retrieval



S3 Glacier  
Flexible Retrieval



S3 Glacier  
Deep Archive

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## Storage cost

\$0.004 per GB-month

\$0.0036 per GB-month

\$0.00099 per GB-month

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## Data retrieval

Instant

Expedited: 1–5 minutes  
Standard: 3–5 hours  
Bulk: 5–12 hours

Standard: Within 12 hours  
Bulk: Within 48 hours

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## Minimum object duration

90 Days

90 days

180 days

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Bulk retrievals are now FREE!



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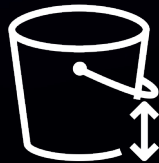
# Tier data to optimize storage costs



S3 Standard



S3 Intelligent-Tiering



S3 Standard-IA



S3 One Zone-IA



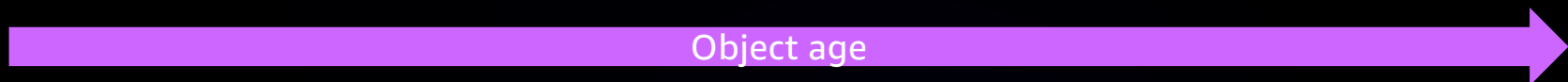
S3 Glacier Instant Retrieval



S3 Glacier



S3 Glacier Deep Archive



Object age



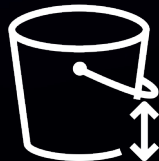
# Amazon S3 Lifecycle tiers data to optimize storage costs



S3 Standard



S3 Intelligent-Tiering



S3 Standard-IA



S3 One Zone-IA



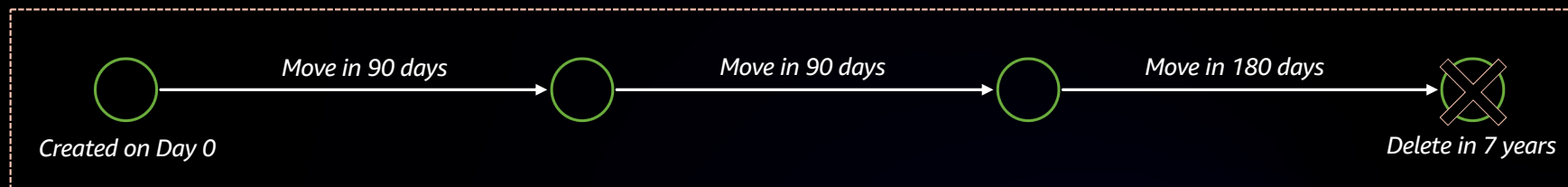
S3 Glacier Instant Retrieval



S3 Glacier

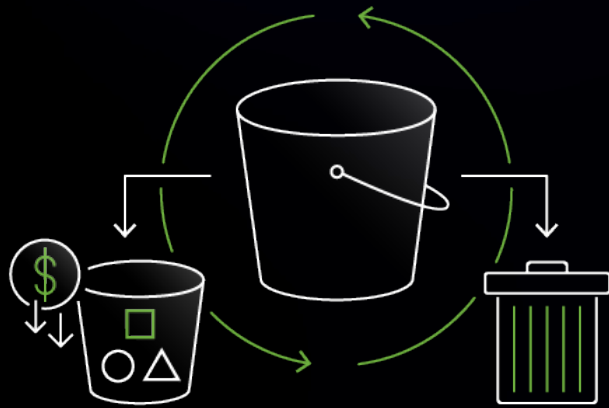


S3 Glacier Deep Archive



*Lifecycle policy*

# Amazon S3 Lifecycle options



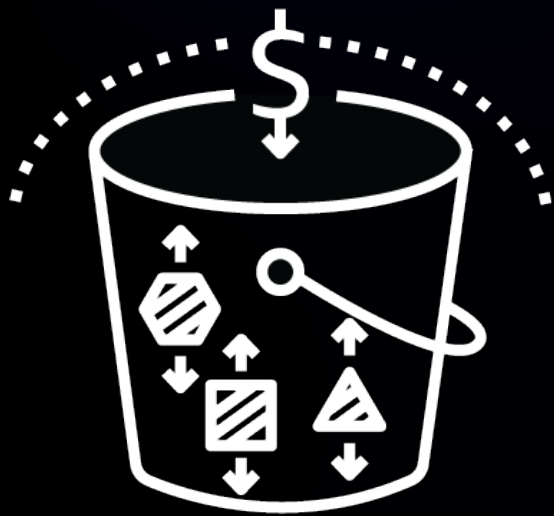
Transition and expire data based on . . .

- Bucket
- Prefix
- Object Tag
- Object Size *NEW*
- Version *NEW*

# What if my access patterns are unpredictable?

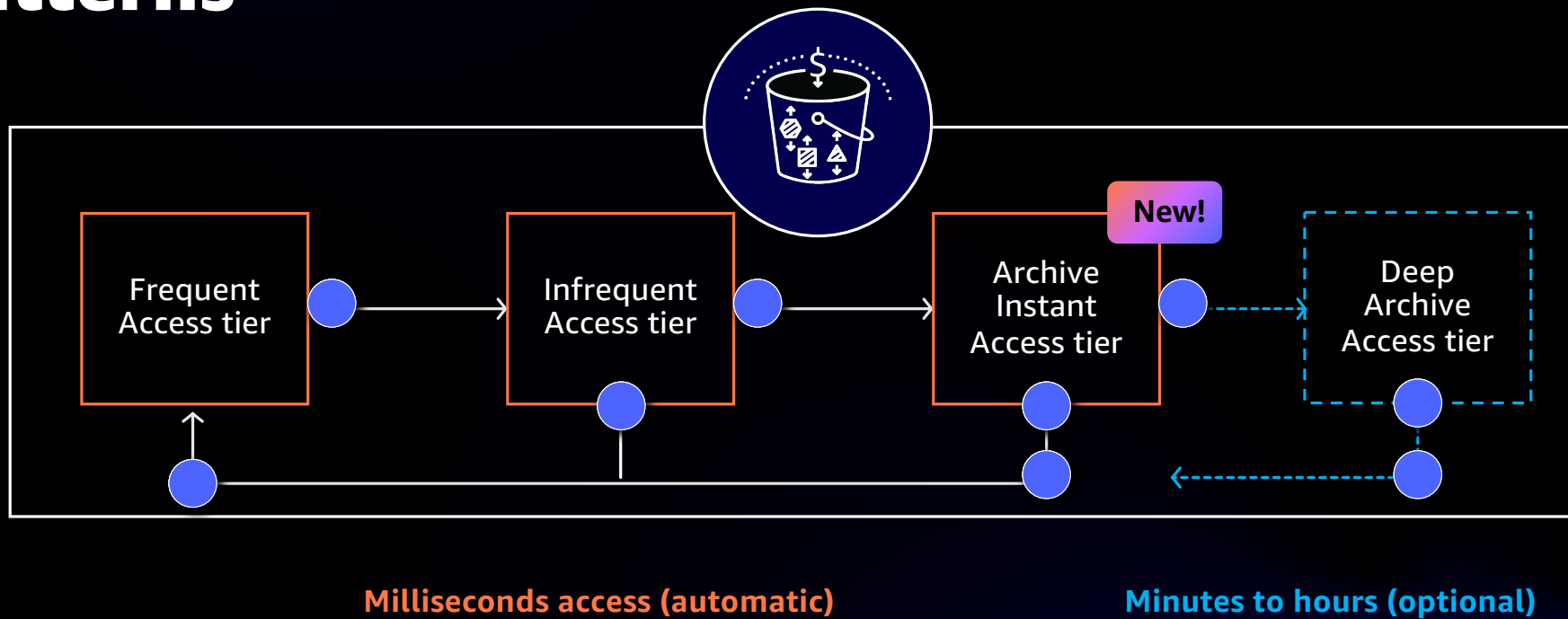
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# Amazon S3 Intelligent-Tiering



- Automatically moves objects between **three access tiers**
- Optional asynchronous archiving to **realize lowest storage cost in the cloud**
- **No performance impact**, operational overhead, lifecycle fees, or retrieval fees
- Designed for **99.9% availability** and **99.9999999999% durability**

# Use Amazon S3 Intelligent-Tiering by default for data with unknown or changing access patterns



# Choosing between Amazon S3 archive storage classes

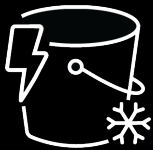


## S3 Intelligent-Tiering

Optimizes storage costs by moving objects between different access tiers

Archive Instant Access tier **NEW**

**NEW**



## S3 Glacier Instant Retrieval

Milliseconds retrieval



## S3 Glacier Flexible Retrieval (formerly S3 Glacier)

Minutes to 12-hour retrieval  
Free bulk retrievals

**NEW**



## S3 Glacier Deep Archive

12–48 hour retrieval



# Archive data when you are ready

## ☒ Archive Access tier

When enabled, Intelligent-Tiering will automatically move objects that haven't been accessed for a minimum of 90 days to the Archive Access tier.



### Retrieval time compatibility

To access objects that have moved to the Intelligent-Tiering Archive Access tier, you must move them back to the Frequent Access tier which can take 3 - 5 hours. An expedited option is available. Ensure that this retrieval time is compatible with your application.

### Days until transition to the Archive Access tier

The number of consecutive days without access before tiering down to the Archive Access tier.

90

Whole number greater than or equal to 90 and up to 730 days. When both are selected, the Deep Archive Access tier value must be larger than or equal to the Archive Access tier value.

## ☒ Deep Archive Access tier

When enabled, Intelligent-Tiering will automatically move objects that haven't been accessed for a minimum of 180 days to the Deep Archive Access tier.



### Retrieval time compatibility

To access objects that have moved to the Intelligent-Tiering Deep Archive Access tier, you must restore them back to the Frequent Access tier which can take up to 12 hours. Ensure that this retrieval time is compatible with your application.

### Days until transition to the Deep Archive Access tier

The number of consecutive days without access before tiering down to the Deep Archive Access tier can be extended for up to 2 years.

180

Whole number greater than or equal to 180 and up to 730 days. When both are selected, the Deep Archive Access tier value must be larger than or equal to the Archive Access tier value.

Configure the Archive Access or Deep Archive Access tiers, or both

**90-day minimum** days of consecutive no access to Archive Access tier

**180-day minimum** days of consecutive no access to Deep Archive Access tier

**Extend** the last access time for archiving up to two years

# Fundamentally changes archive storage



**Data is there  
when you need it**

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**MILLISECONDS  
RETRIEVAL**

S3 Glacier Instant  
Retrieval



**Data is  
put to work**

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**ACCESSING IN  
DATA LAKE**

Archive Instant Access  
tier in S3 Intelligent-  
Tiering



**Data  
Backup**

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**FREE BULK  
RETRIEVALS**

S3 Glacier Flexible  
Retrievals



**Dynamically  
cost optimized**

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**THE LOWEST  
COST**

S3 Glacier Deep  
Archive



# Introducing AWS Backup for Amazon S3 (Preview)

ENABLES CUSTOMERS TO CENTRALIZE AND AUTOMATE S3 BACKUPS ALONGSIDE 11 AWS SERVICES



Centrally back up application data stored across Amazon S3 and other AWS services



Easily restore application data stored in Amazon S3 to a point in time with a single click



Simplify compliance monitoring of your data protection policies

# When should I use AWS Backup for Amazon S3 (Preview)?



Backup Admin



AWS Backup

Centrally manages backup and restore of compute, storage, and database services using AWS Backup



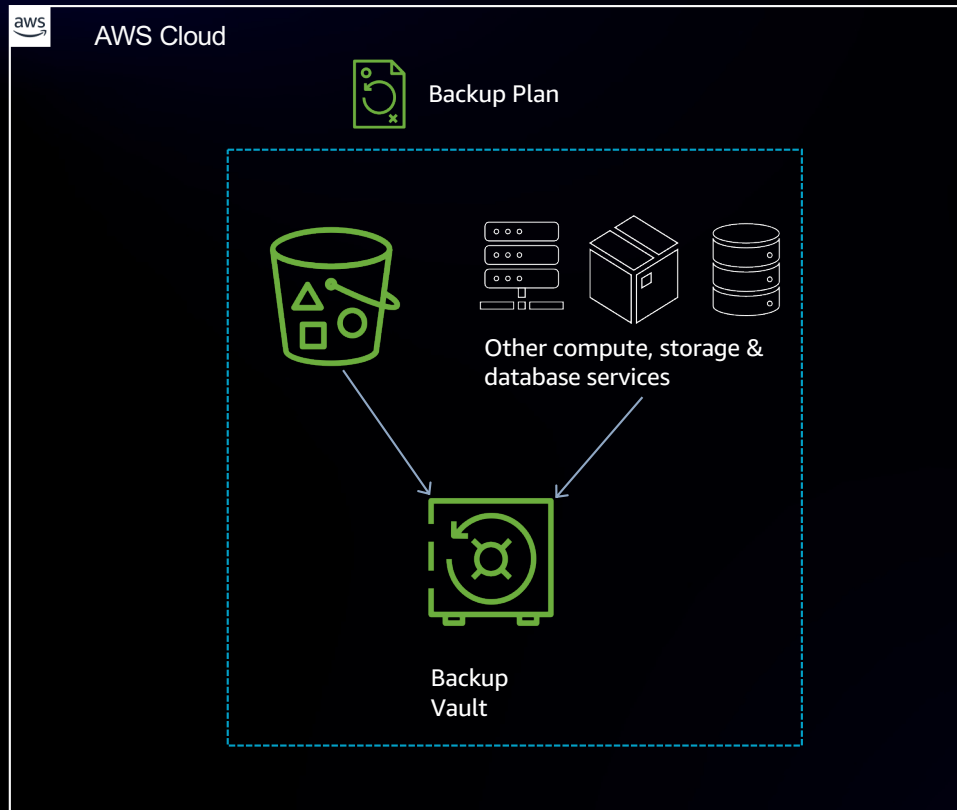
Storage Admin/Application Developer



Amazon S3

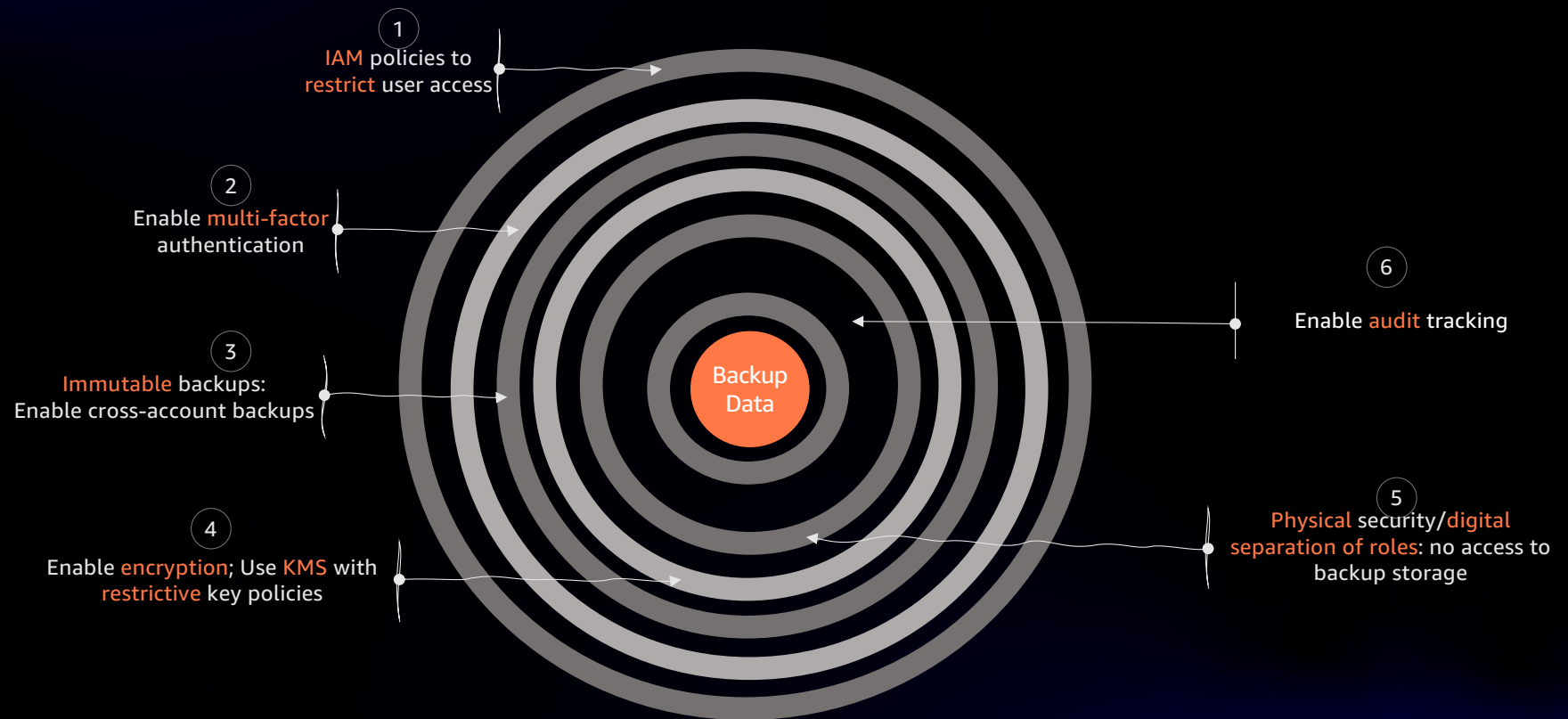
Creates and manages backup/restore of S3 using industry-leading solutions provided by S3

# Backup S3 data and metadata



- Back up object data, tags, Access Control Lists (ACLs), and user-defined metadata
- The first backup is a full snapshot, and the subsequent backups are incremental at object level

# Protect backups with multiple layers of security



# Restore your backups with a single click



Restore S3 bucket or object to a point in time with a single click



Restore to source S3 bucket, another existing bucket, or a new bucket



Restore object data, tags, ACLs, and user-defined metadata

# Scenario

- Board of Directors insists that all data be replicated to multiple AWS Regions within a given time
- Additionally, you want to leverage this multi-Region architecture to provide the fastest access to your clients globally

**S3 Replication**

**S3 Replication Time Control**

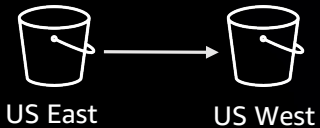
**S3 Multi-Region Access Points**

# S3 Replication

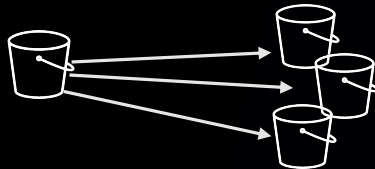
Replicate within the **same AWS Region**



Replicate to a **different AWS Region**



Replicate to **more than one destination bucket**



Amazon S3

Replicate to a bucket with S3  
Object Lock **retention controls**



Replicate using Replication Time  
Control for predictable  
replication **backed by an SLA**



# S3 Replication Time Control (S3 RTC)

PREDICTABLE REPLICATION TIME, BACKED BY SLAS

Designed to replicate 99.99% of objects within 15 minutes of upload

Backed by SLA with commitment to replicate 99.9% of objects within 15 minutes

Entire bucket or filtered set of objects





# Thank you!



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