AWS re:Invent

NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

STG303-R

AWS storage for containers and serverless applications

Eric Heinrichs
Storage Specialist SA
Amazon Web Services

Jeramiah Dooley
Sr. Manager, Developer Advocates
Amazon Web Services

Heeki Park
Principal Solutions Architect, Serverless Specialist
Amazon Web Services

Agenda

Overview of serverless and modern applications

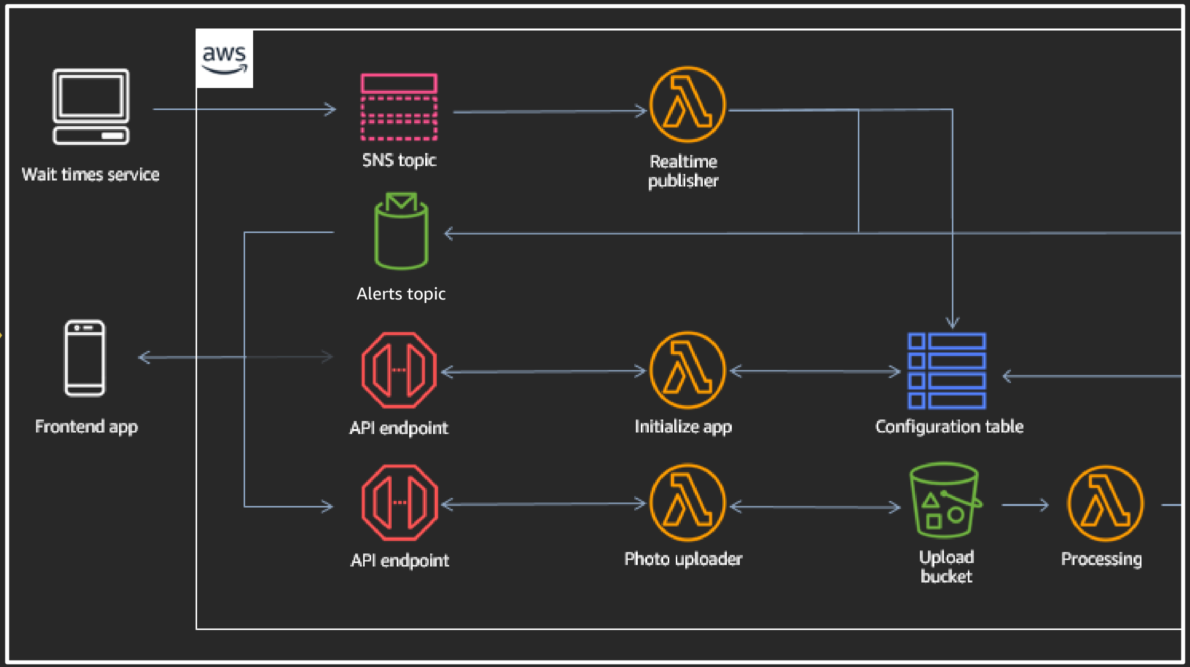
Modernizing applications with Amazon EFS

Amazon S3 for event-driven and serverless architectures

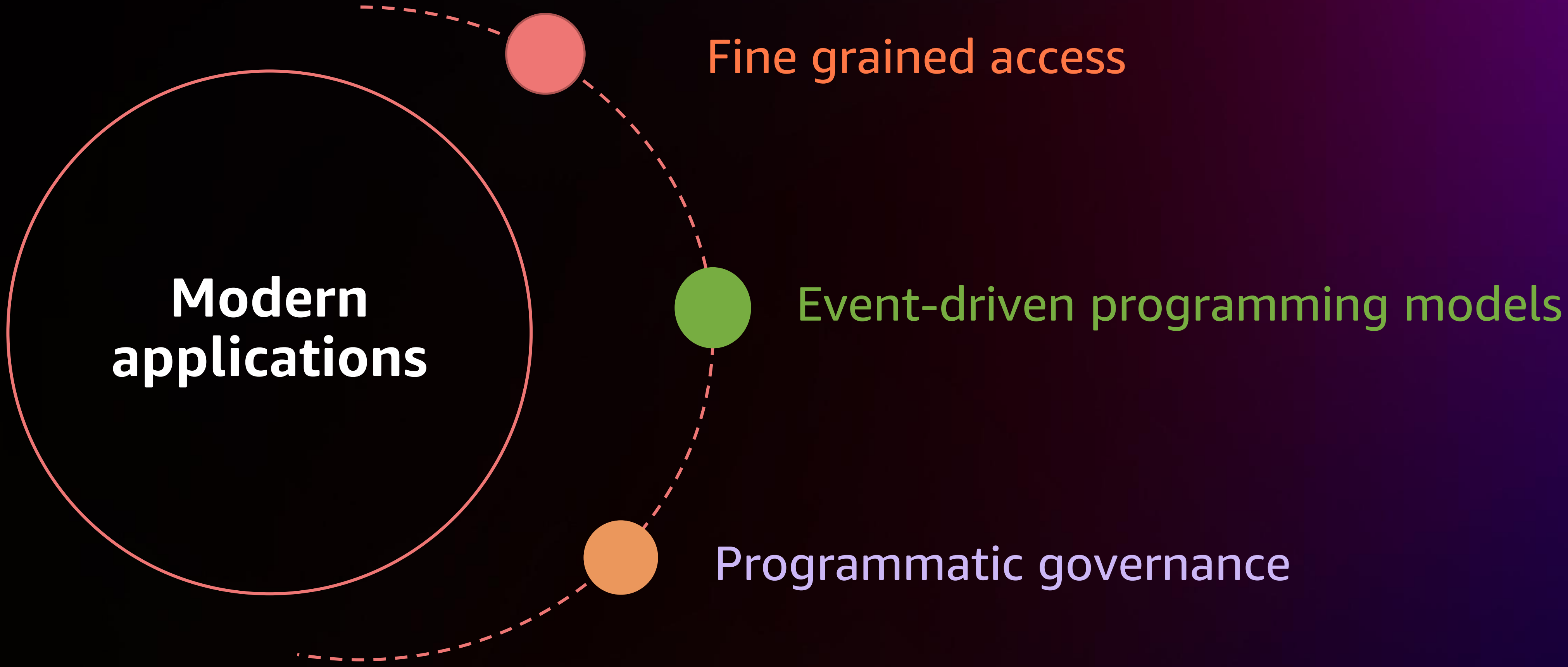
Summary

Overview of serverless and modern applications

Small pieces, loosely joined



Modern applications



Modern applications

Fine grained access

Event-driven programming models

Programmatic governance

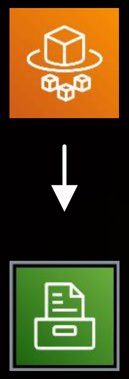
Why modernize applications?

Save cost by reducing operations burden and under-utilization of compute and storage

Increase agility by instantly scaling up according to demand

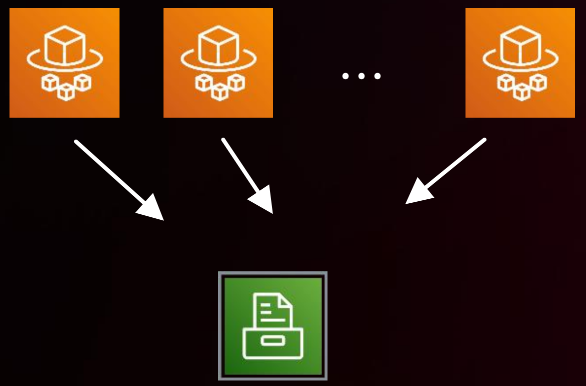
Develop and deploy applications with greater efficiency

Modern applications need durable shared storage



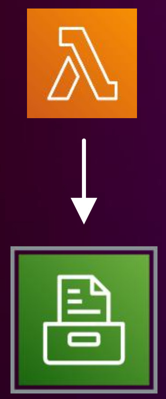
Availability and durability:

Containers and serverless functions are transient in nature; long-running applications can benefit from keeping state in durable storage



Data sharing:

Distributed applications like web serving, machine learning inference, and continuous integration and development benefit from shared storage layer



Scalable:

Modern data-intensive applications like analytics require fast access to large volumes of data

Modernizing applications with Amazon EFS

File storage for AWS Builders

"Just works"

Fully elastic, scalable storage
Highly durable (11x9s)
Highly available

Modern integrations

Fully integrated with services like Amazon ECS, Amazon EKS, and AWS Lambda to support modern applications

Amazon EFS

Serverless, elastic file system

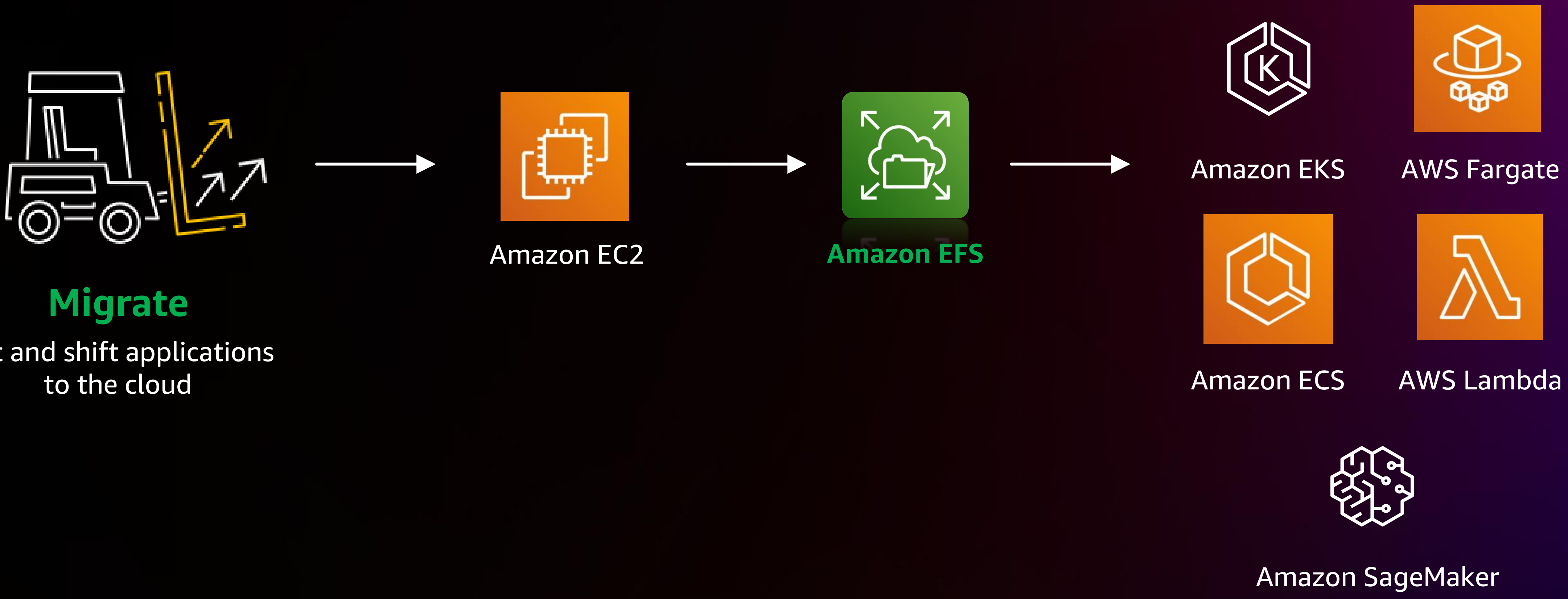
High performance

Latencies as low as 0.6 ms
Up to 35K IOPS
Up to 3 GB/s of throughput

Cost optimized

Pay for what you use model
Automatically tier infrequently accessed data to colder storage

Lift and shift today, accelerate modernization



Migrate

Lift and shift applications
to the cloud

Amazon EC2

Amazon EFS

Amazon EKS

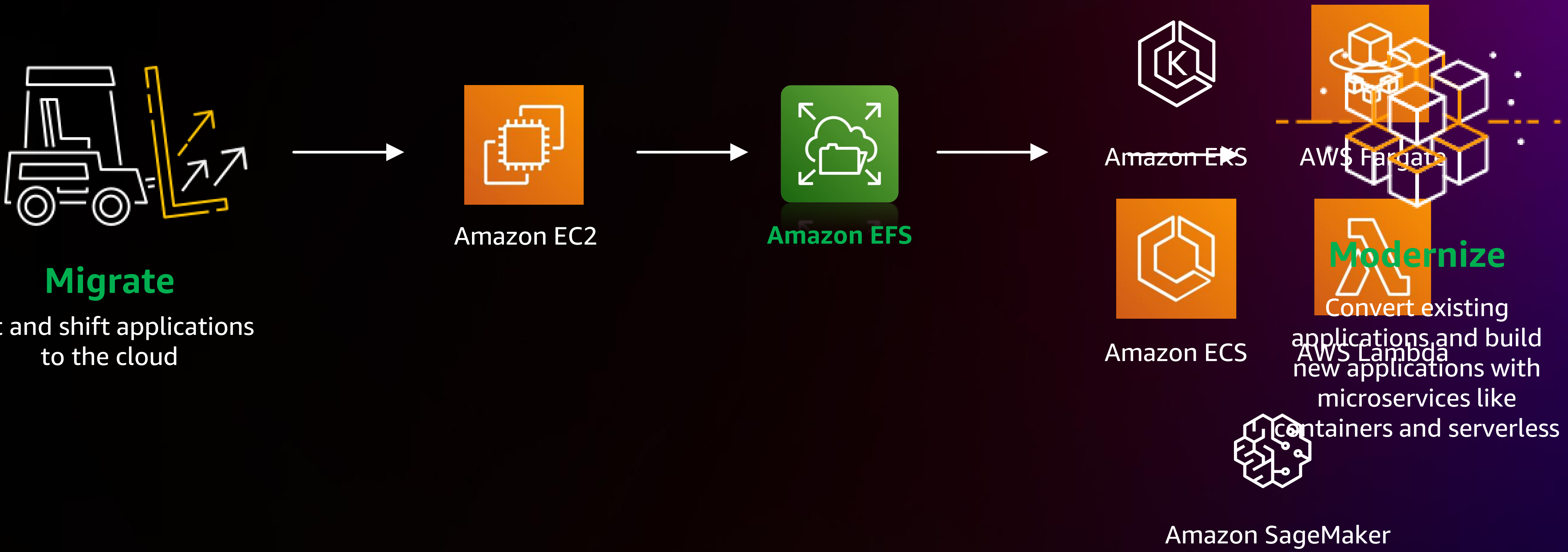
AWS Fargate

Amazon ECS

AWS Lambda

Amazon SageMaker

Lift and shift today, accelerate modernization



Migrate

Lift and shift applications to the cloud

Amazon EC2

Amazon EFS

Amazon EKS

AWS Fargate

Amazon ECS

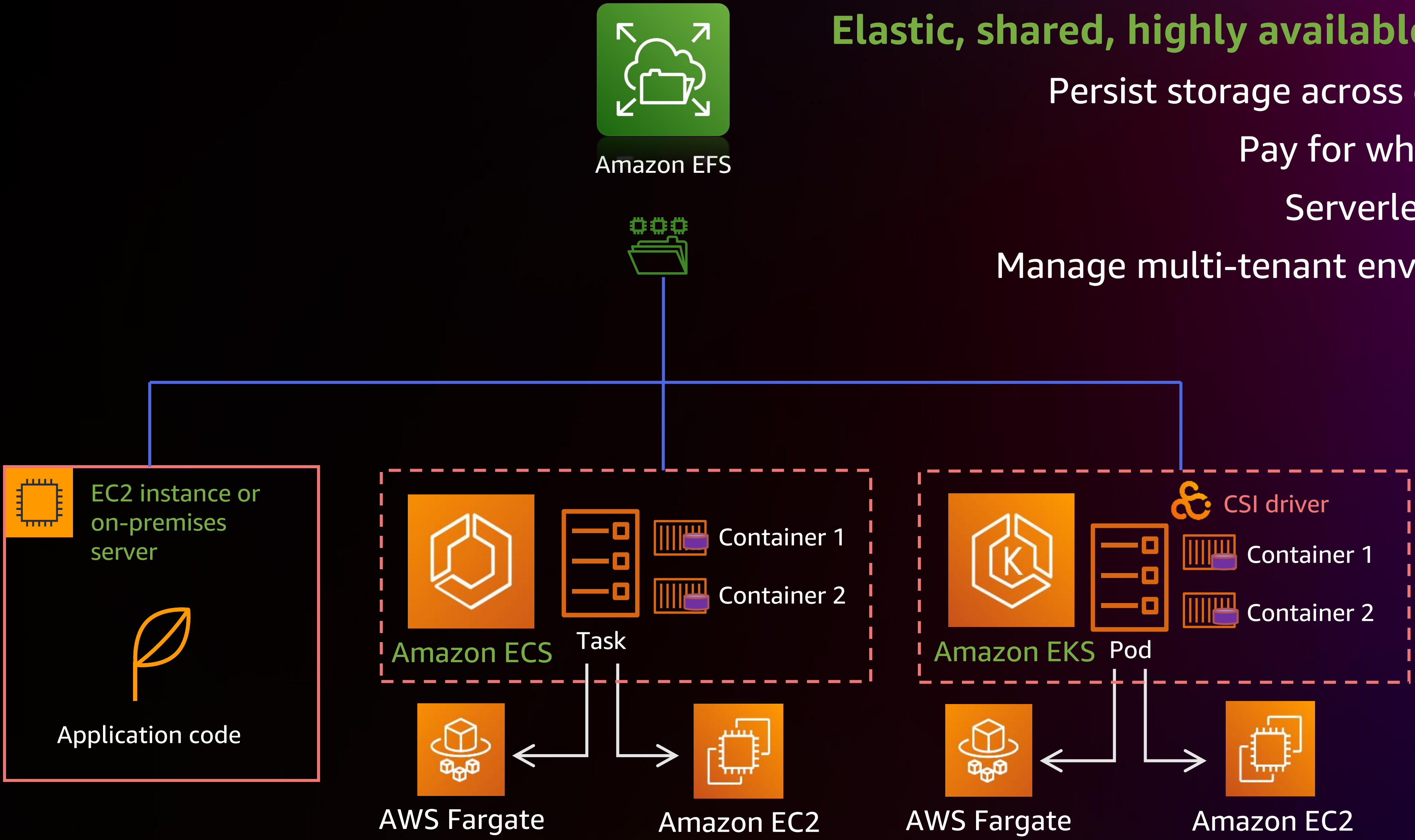
AWS Lambda

Amazon SageMaker

Modernize

Convert existing applications and build new applications with microservices like containers and serverless

Amazon EFS and AWS container services



Elastic, shared, highly available storage

Persist storage across containers

Pay for what you use

Serverless storage

Manage multi-tenant environments

Use cases for modernizing applications with Amazon EFS

Scalable digital experiences

Creation and modification of digital web content

Web hosting with WordPress and Drupal, course management with Moodle, and corporate wiki

Machine learning inference

Deploy ML models for real-time inference with large libraries or pre-trained models

Sentiment analysis, image classification, and search applications

Media processing

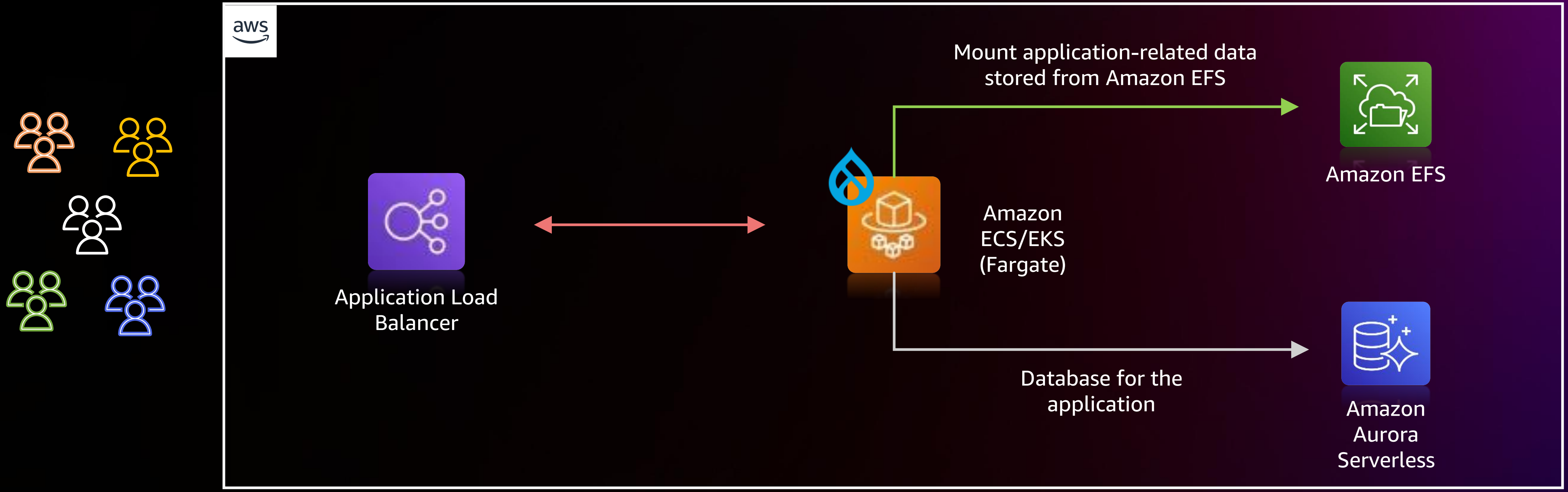
Image processing, video hosting, video editing apps, studio production

Media encoding, high-resolution images, HD videos

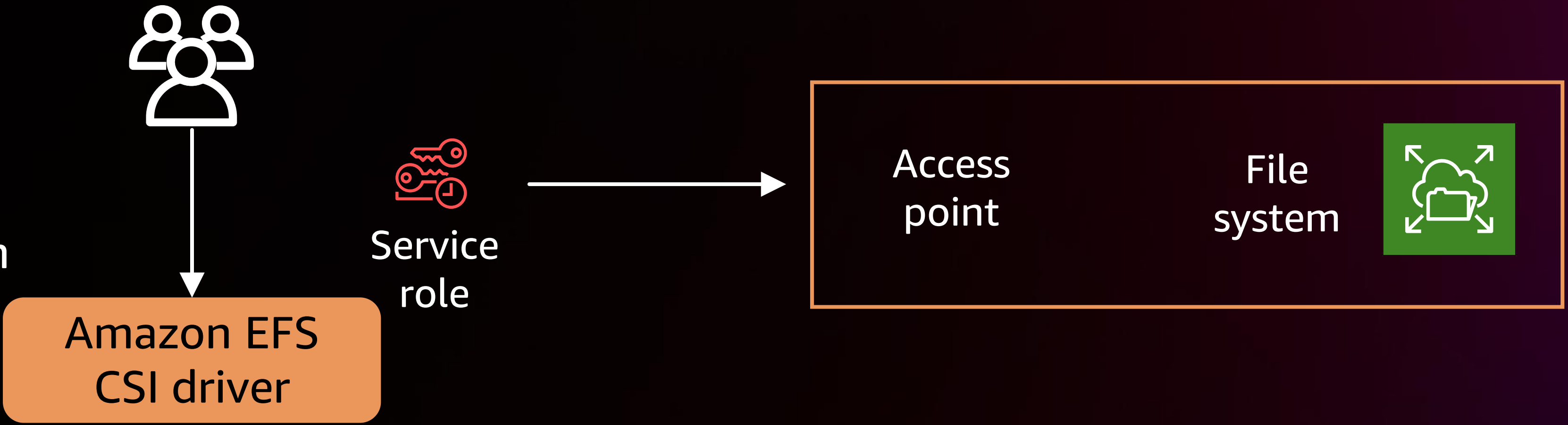
Building scalable digital experiences with Amazon EFS

Building scalable digital experiences

ABILITY TO SCALE IN MINUTES


aws
Mount application-related data stored from Amazon EFS
Amazon EFS
Application Load Balancer
Amazon ECS/EKS (Fargate)
Database for the application
Amazon Aurora Serverless

Attaching Amazon EFS to Amazon EKS pod using dynamic provisioning



1. Create persistent volume claim

Amazon EFS CSI driver

Service role

Access point

File system

2. Create access point and map to a persistent volume

Containers: Acquia modernizes web hosting with Amazon EKS and Amazon EFS

Acquia sought to elastically scale across compute and storage, and containerize hosting applications running on Amazon EKS using Amazon EFS for persistent storage

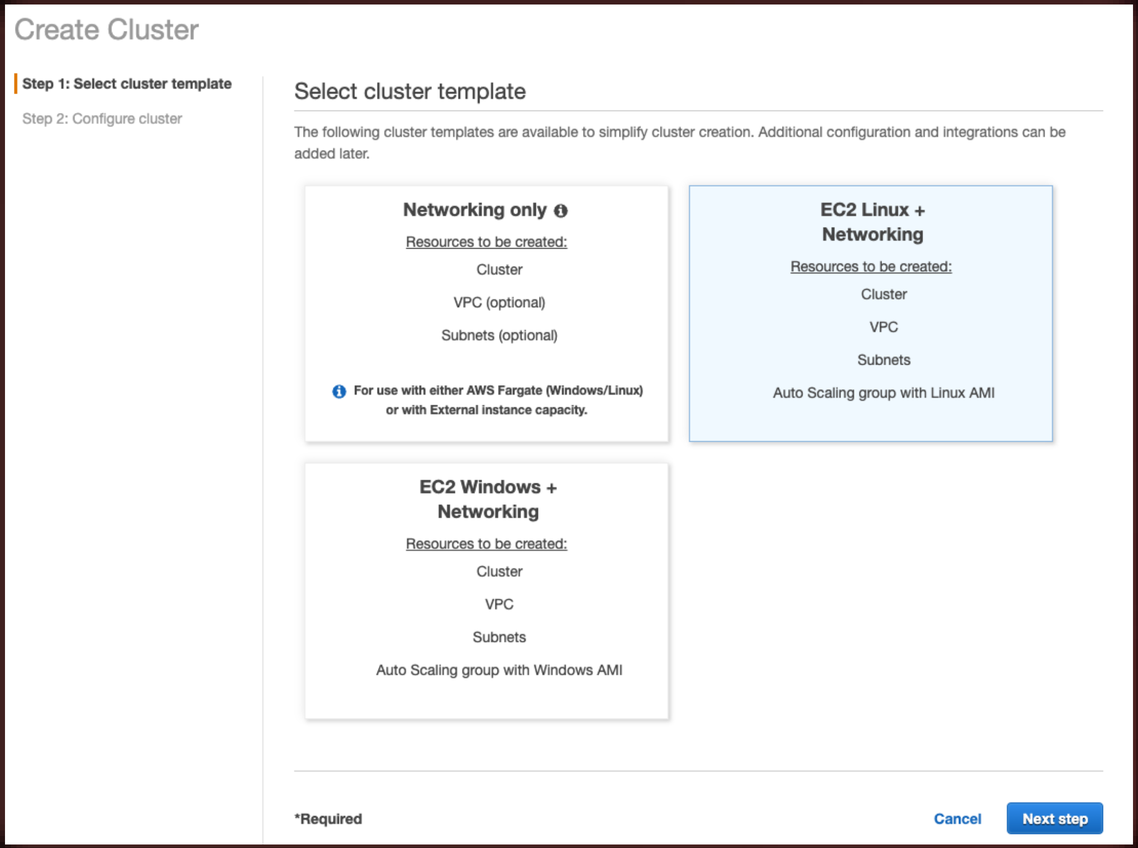
Dynamic scaling of customer environments with lower TCO through improved storage and compute utilization

"By containerizing our hosting applications and running them on Amazon EKS and Amazon EFS, we have improved our customer experience, while considerably reducing our infrastructure and operational maintenance overhead."

Jake Farrell
Senior Director of Engineering, Acquia

Attaching Amazon EFS to Amazon ECS

Amazon ECS Console



Create Cluster

Step 1: Select cluster template

Step 2: Configure cluster

Select cluster template

The following cluster templates are available to simplify cluster creation. Additional configuration and integrations can be added later.

Networking only

Resources to be created:

Cluster

VPC (optional)

Subnets (optional)

For use with either AWS Fargate (Windows/Linux) or with External instance capacity.

EC2 Linux + Networking

Resources to be created:

Cluster

VPC

Subnets

Auto Scaling group with Linux AMI

EC2 Windows + Networking

Resources to be created:

Cluster

VPC

Subnets

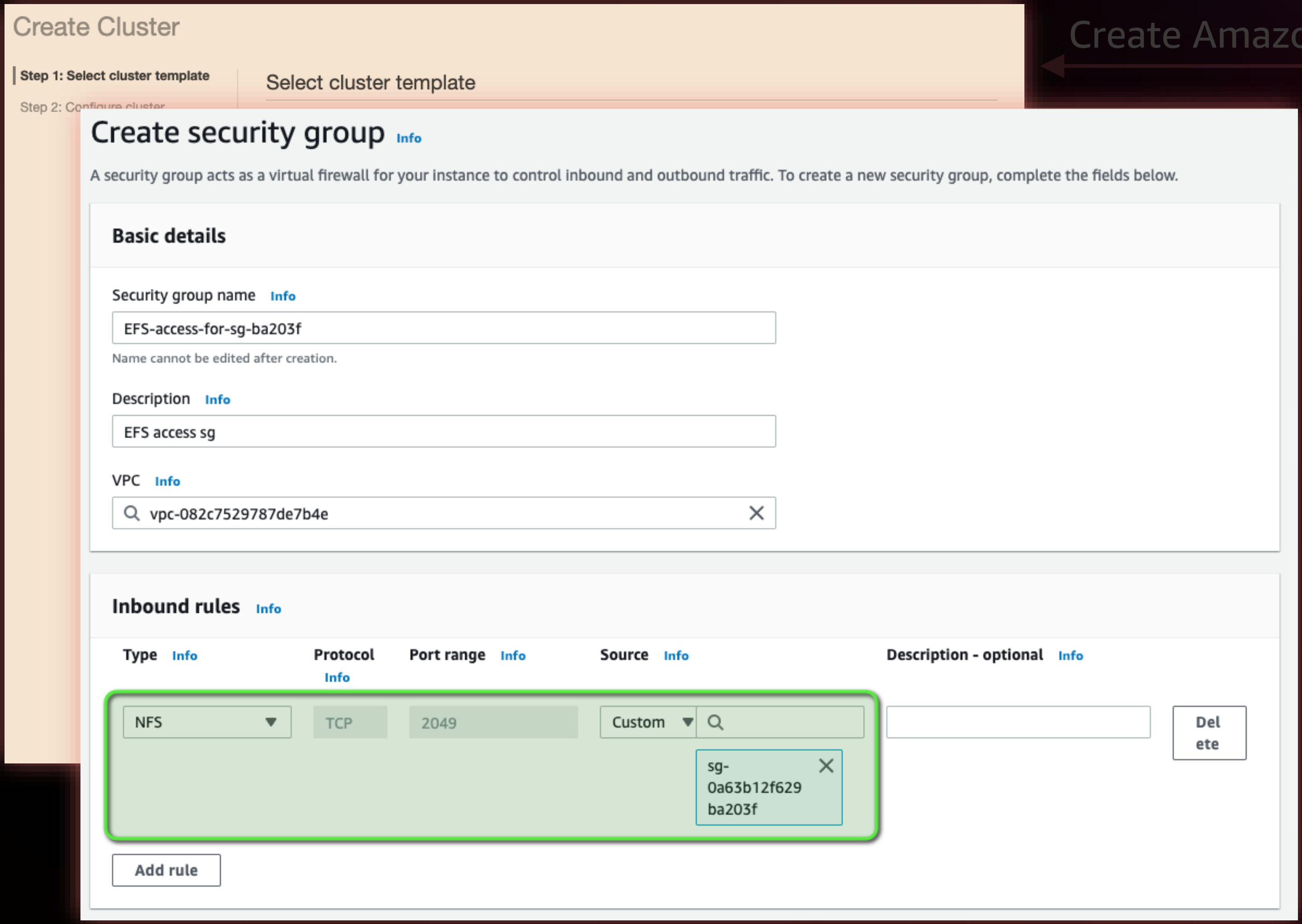
Auto Scaling group with Windows AMI

*Required

Create Amazon ECS cluster

Attaching Amazon EFS to Amazon ECS

Amazon ECS Console



Create Cluster

Step 1: Select cluster template

Step 2: Configure cluster

Select cluster template

Create security group Info

A security group acts as a virtual firewall for your instance to control inbound and outbound traffic. To create a new security group, complete the fields below.

Basic details

Security group name Info

EFS-access-for-sg-ba203f

Name cannot be edited after creation.

Description Info

EFS access sg

VPC Info

vpc-082c7529787de7b4e

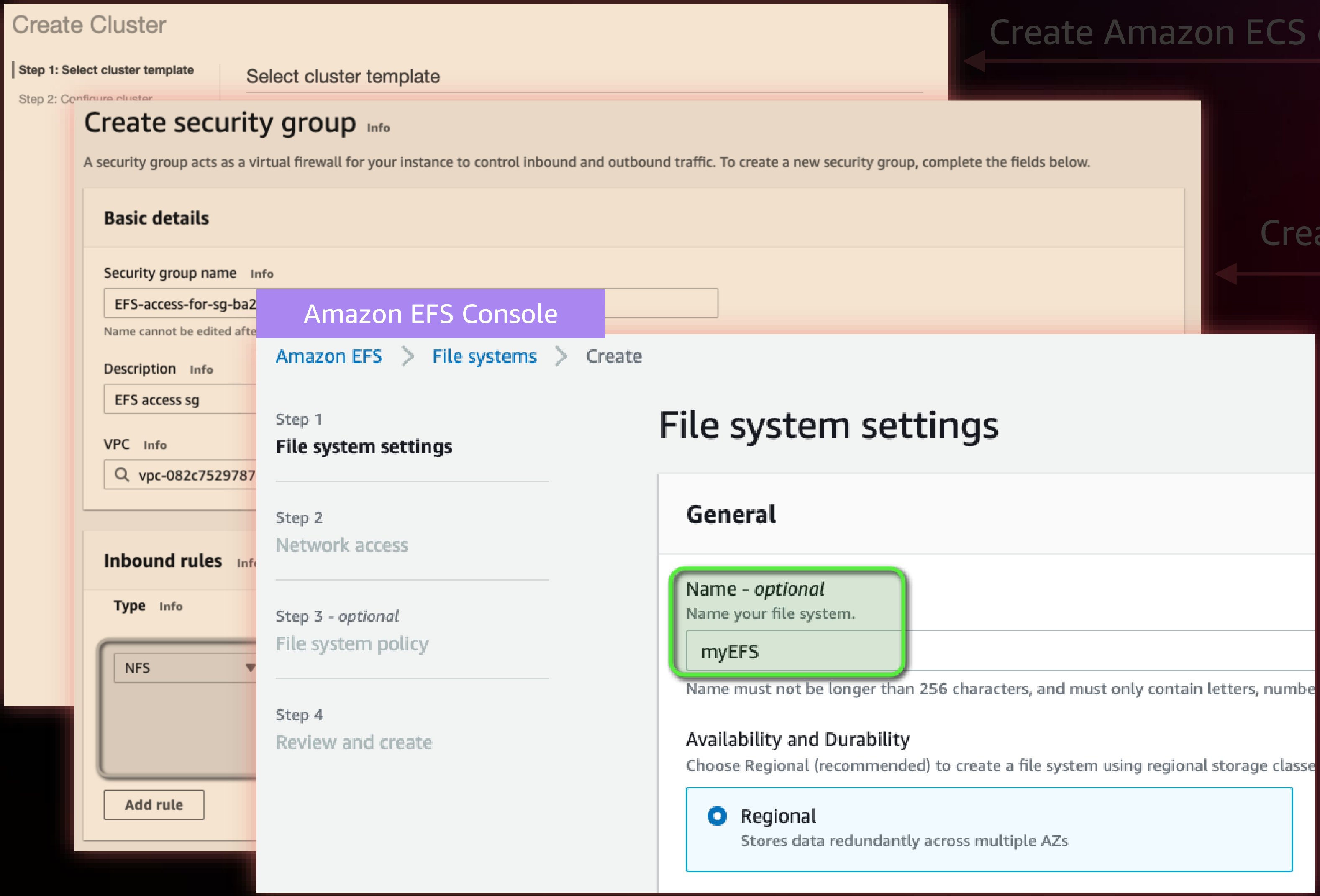
Inbound rules Info

Type Info	Protocol Info	Port range Info	Source Info	Description - optional Info	
NFS	TCP	2049	Custom sg-0a63b12f629ba203f		Delete

Create Amazon ECS cluster

Create a security group for Amazon EFS

Attaching Amazon EFS to Amazon ECS



Create Cluster

Step 1: Select cluster template

Step 2: Configure cluster

Select cluster template

Create security group Info

A security group acts as a virtual firewall for your instance to control inbound and outbound traffic. To create a new security group, complete the fields below.

Basic details

Security group name Info: EFS-access-for-sg-ba2

Name cannot be edited afte

Description Info: EFS access sg

VPC Info: vpc-082c7529787

Inbound rules Info

Type Info: NFS

Add rule

Amazon EFS Console

Amazon EFS > File systems > Create

Step 1 File system settings

Step 2 Network access

Step 3 - *optional* File system policy

Step 4 Review and create

File system settings

General

Name - *optional*

Name your file system.

myEFS

Name must not be longer than 256 characters, and must only contain letters, numbe

Availability and Durability

Choose Regional (recommended) to create a file system using regional storage classe

● Regional

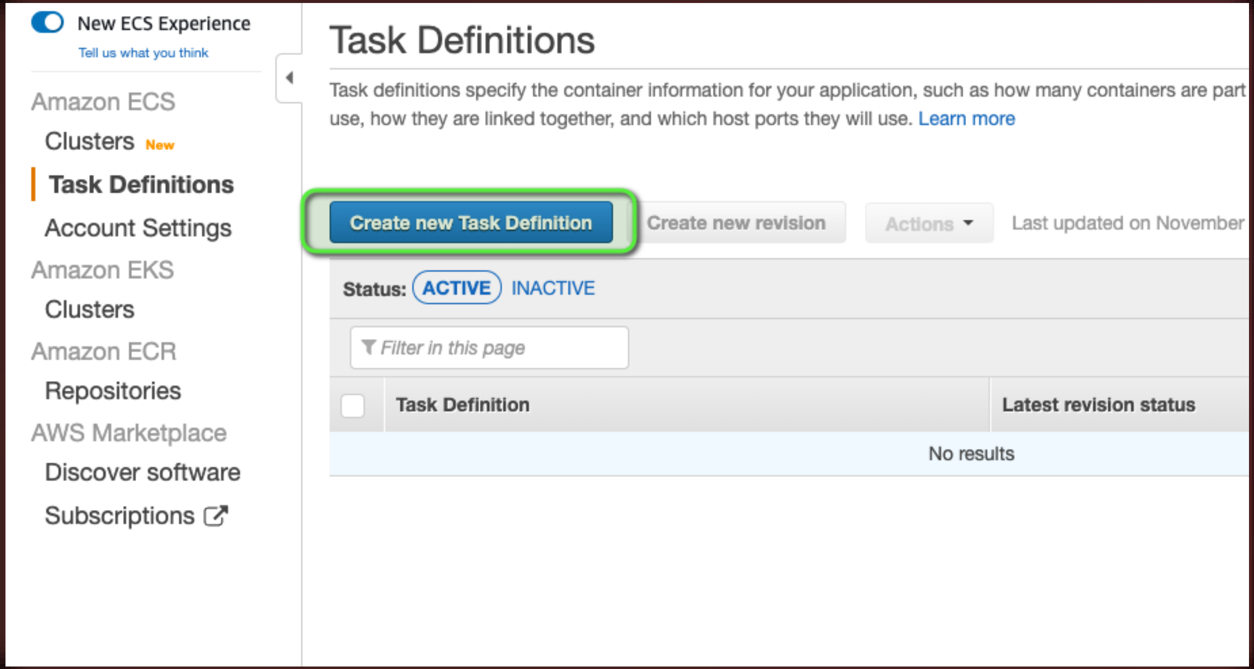
Stores data redundantly across multiple AZs

Create Amazon ECS cluster

Create a security group for Amazon EFS

Create an Amazon EFS file system

Attaching Amazon EFS to Amazon ECS



Task Definitions

Task definitions specify the container information for your application, such as how many containers are part use, how they are linked together, and which host ports they will use. Learn more

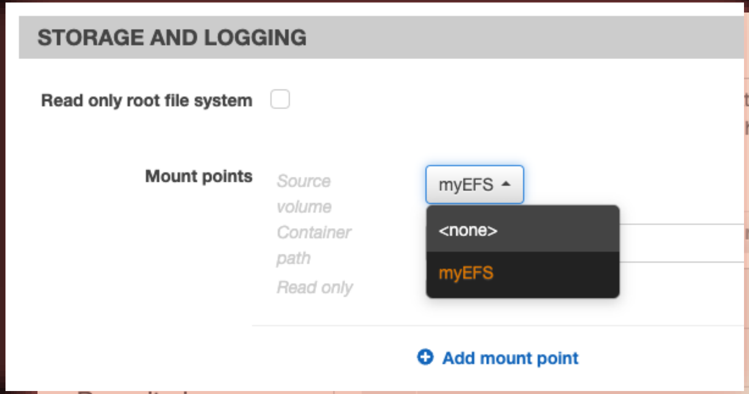
Last updated on November

Status: ACTIVE INACTIVE

□	Task Definition	Latest revision status
	No results	

Create a task definition

Attaching Amazon EFS to Amazon ECS



STORAGE AND LOGGING

Read only root file system □

Mount points

Source volume: myEFS

Container path

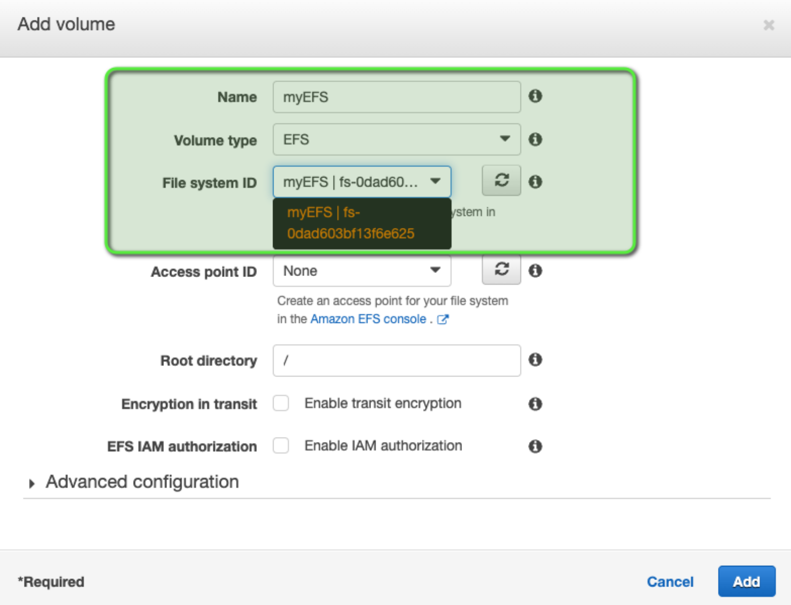
Read only

tion for your ap
host ports they
new revision

Repositories

AWS Marketplace

Task Definition



Add volume

Name: myEFS

Volume type: EFS

File system ID: myEFS | fs-0dad60...

Access point ID: None

Create an access point for your file system in the Amazon EFS console .

Root directory: /

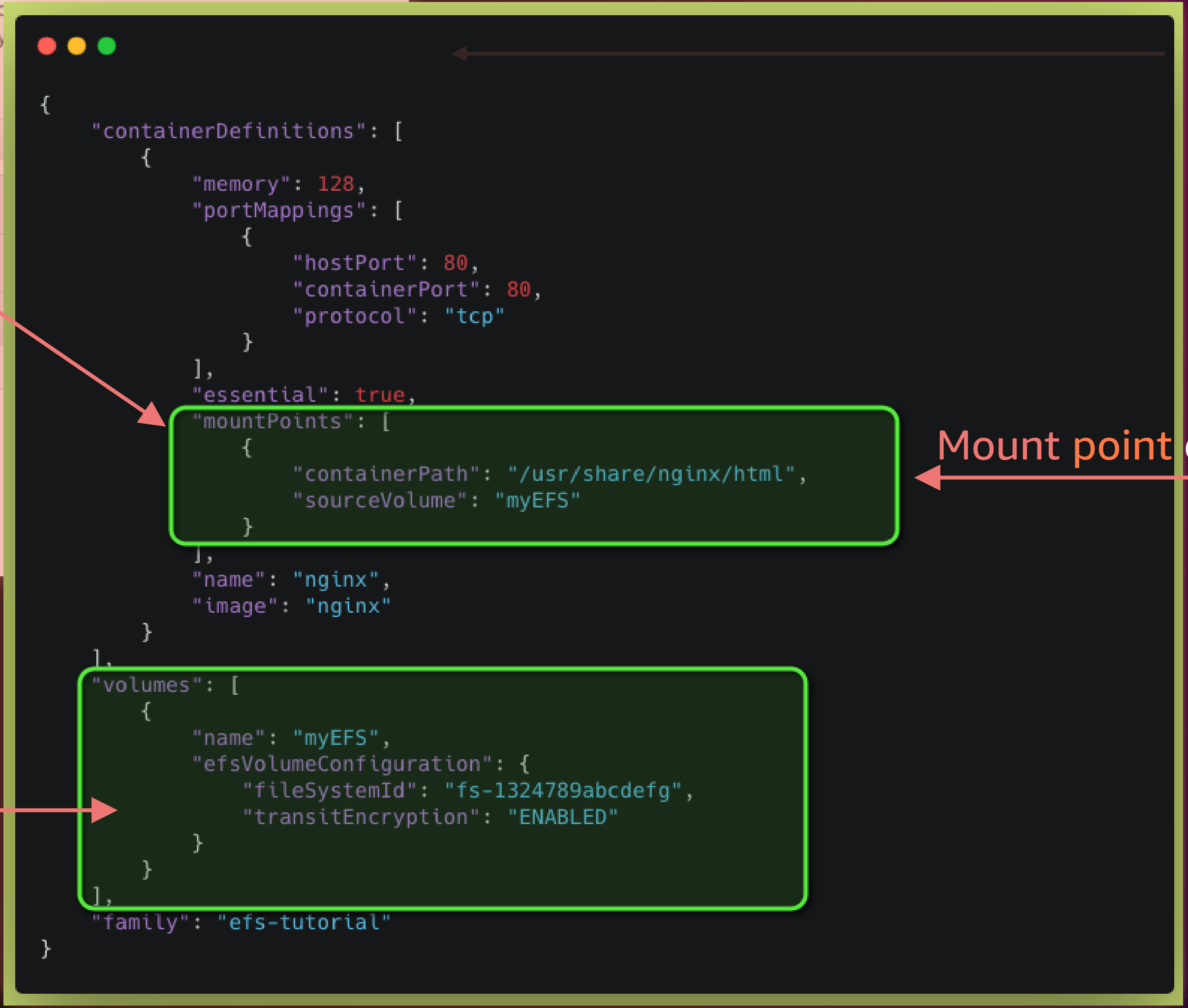
Encryption in transit □ Enable transit encryption

EFS IAM authorization □ Enable IAM authorization

Advanced configuration

*Required

Create a task definition



```
{
    "containerDefinitions": [
        {
            "memory": 128,
            "portMappings": [
                {
                    "hostPort": 80,
                    "containerPort": 80,
                    "protocol": "tcp"
                }
            ],
            "essential": true,
            "mountPoints": [
                {
                    "containerPath": "/usr/share/nginx/html",
                    "sourceVolume": "myEFS"
                }
            ],
            "name": "nginx",
            "image": "nginx"
        }
    ],
    "volumes": [
        {
            "name": "myEFS",
            "efsVolumeConfiguration": {
                "fileSystemId": "fs-1324789abcdefg",
                "transitEncryption": "ENABLED"
            }
        }
    ],
    "family": "efs-tutorial"
}
```

Mount point definition

Containers: AstraZeneca uses Amazon ECS with Amazon EFS and NVIDIA GPUs to accelerate drug discovery

Amazon EFS provides shared, persistent storage for AstraZeneca’s MegaMolBART system, powering their real-time computational drug discovery process on Amazon ECS

Computational clusters scale elastically at both the cluster and task level, reducing operational overhead compared to maintaining instances and auto-scaling

> “Amazon ECS and AWS CDK simplify the creation of the underlying infrastructure to execute containerized workloads at scale and enable repeatable deployments . . . Combining the power and simplicity of Amazon ECS with containerized workloads, we aim to help AWS customers speed up research and lower the barriers to entry for development efforts for drug discovery.”

Neel Patel
Drug Discovery Scientist, NVIDIA

aws

Machine learning inference and media processing with AWS Lambda and Amazon EFS

Amazon EFS for AWS Lambda

SERVERLESS STORAGE FOR SERVERLESS APPLICATIONS

Elastic, shared, serverless storage

Petabyte-scale elastic storage for Lambda functions

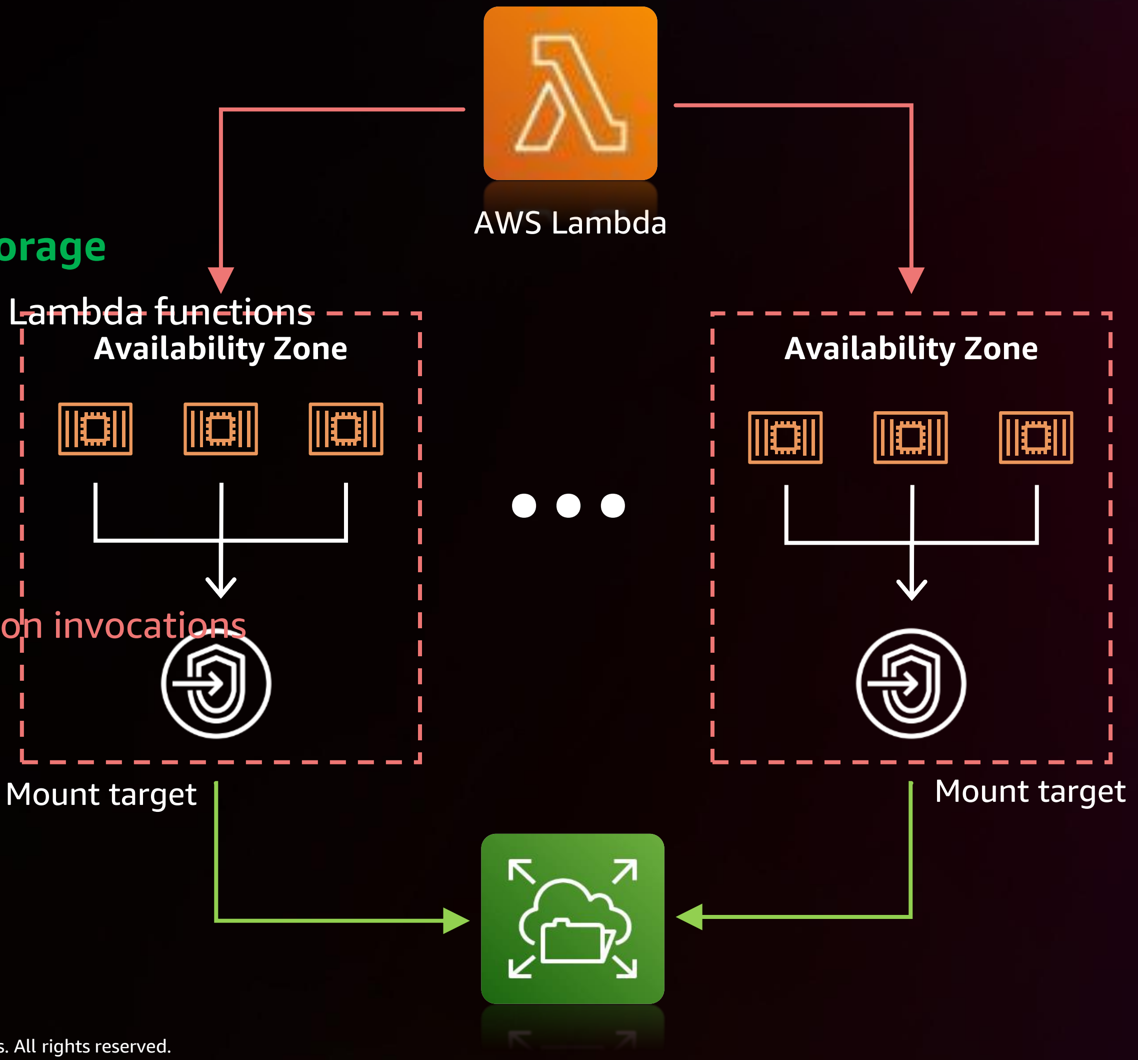
Build stateful applications

Low latency

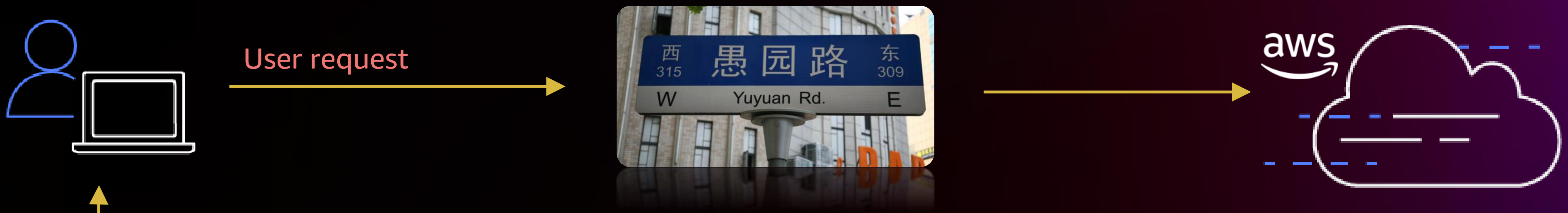
Pay for what you use

Serverless storage

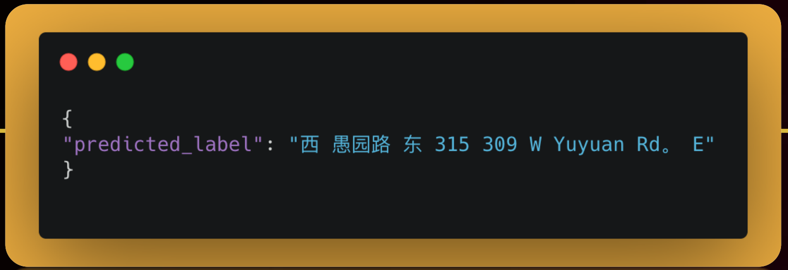
Share data across 1000s of function invocations



Elastic machine learning inference

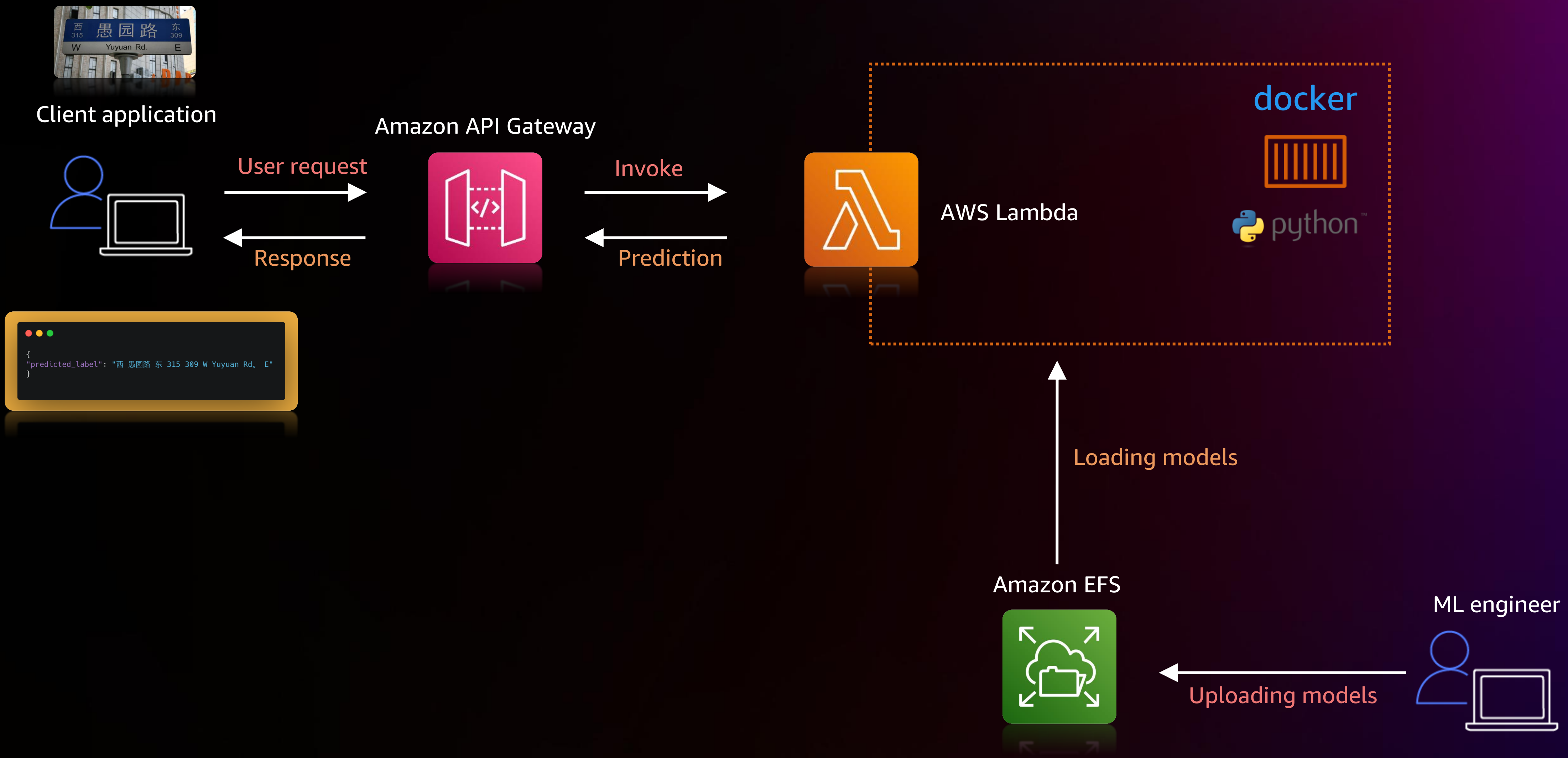


Prediction



```
{
"predicted_label": "西 愚园路 东 315 309 W Yuyuan Rd。 E"
}
```

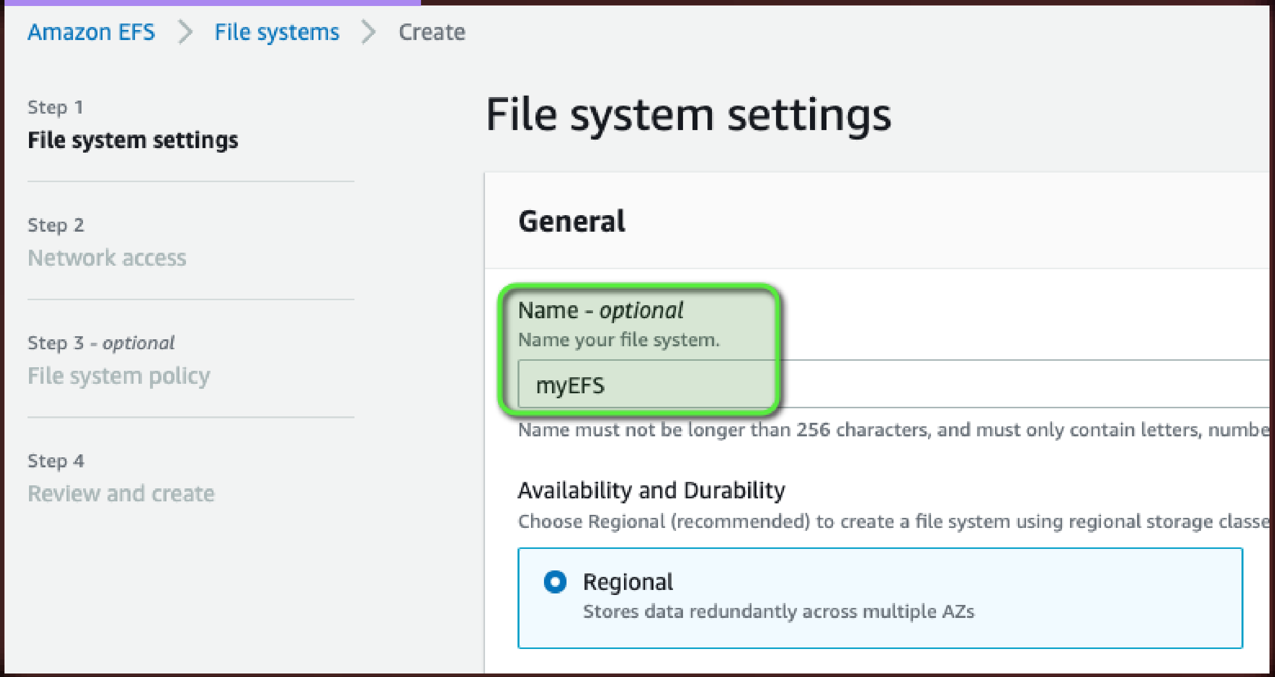
Elastic machine learning inference



```
{
"predicted_label": "西 愚园路 东 315 309 W Yuyuan Rd。 E"
}
```

Attaching Amazon EFS to AWS Lambda

Amazon EFS Console



Amazon EFS > File systems > Create

Step 1
File system settings

Step 2
Network access

Step 3 - *optional*
File system policy

Step 4
Review and create

File system settings

General

Name - *optional*
Name your file system.

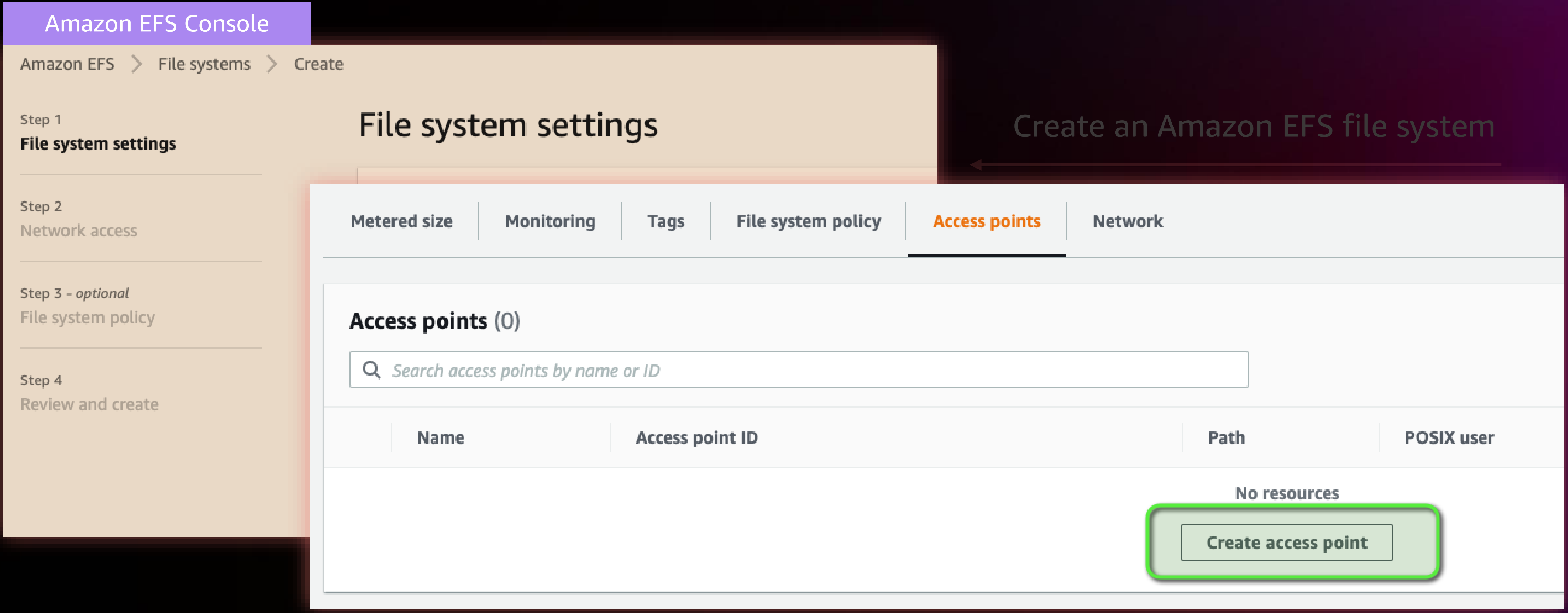
myEFS

Name must not be longer than 256 characters, and must only contain letters, numbe

Availability and Durability
Choose Regional (recommended) to create a file system using regional storage classe

● Regional
Stores data redundantly across multiple AZs

Attaching Amazon EFS to AWS Lambda



Amazon EFS Console

Amazon EFS > File systems > Create

Step 1
File system settings

Step 2
Network access

Step 3 - *optional*
File system policy

Step 4
Review and create

File system settings

Access points (0)

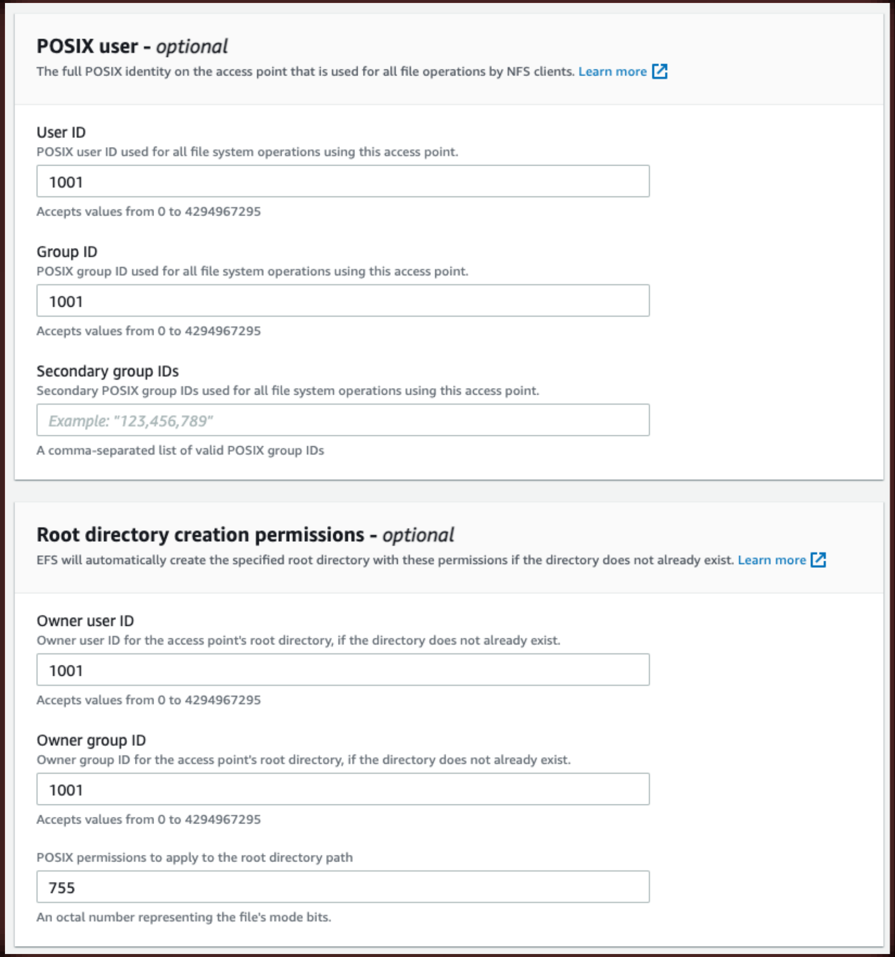
Name	Access point ID	Path	POSIX user

No resources

Create an Amazon EFS file system

Create an access point

Attaching Amazon EFS to AWS Lambda



POSIX user - *optional*

The full POSIX identity on the access point that is used for all file operations by NFS clients. Learn more

User ID
POSIX user ID used for all file system operations using this access point.
1001
Accepts values from 0 to 4294967295

Group ID
POSIX group ID used for all file system operations using this access point.
1001
Accepts values from 0 to 4294967295

Secondary group IDs
Secondary POSIX group IDs used for all file system operations using this access point.
Example: "123,456,789"
A comma-separated list of valid POSIX group IDs

Root directory creation permissions - *optional*

EFS will automatically create the specified root directory with these permissions if the directory does not already exist. Learn more

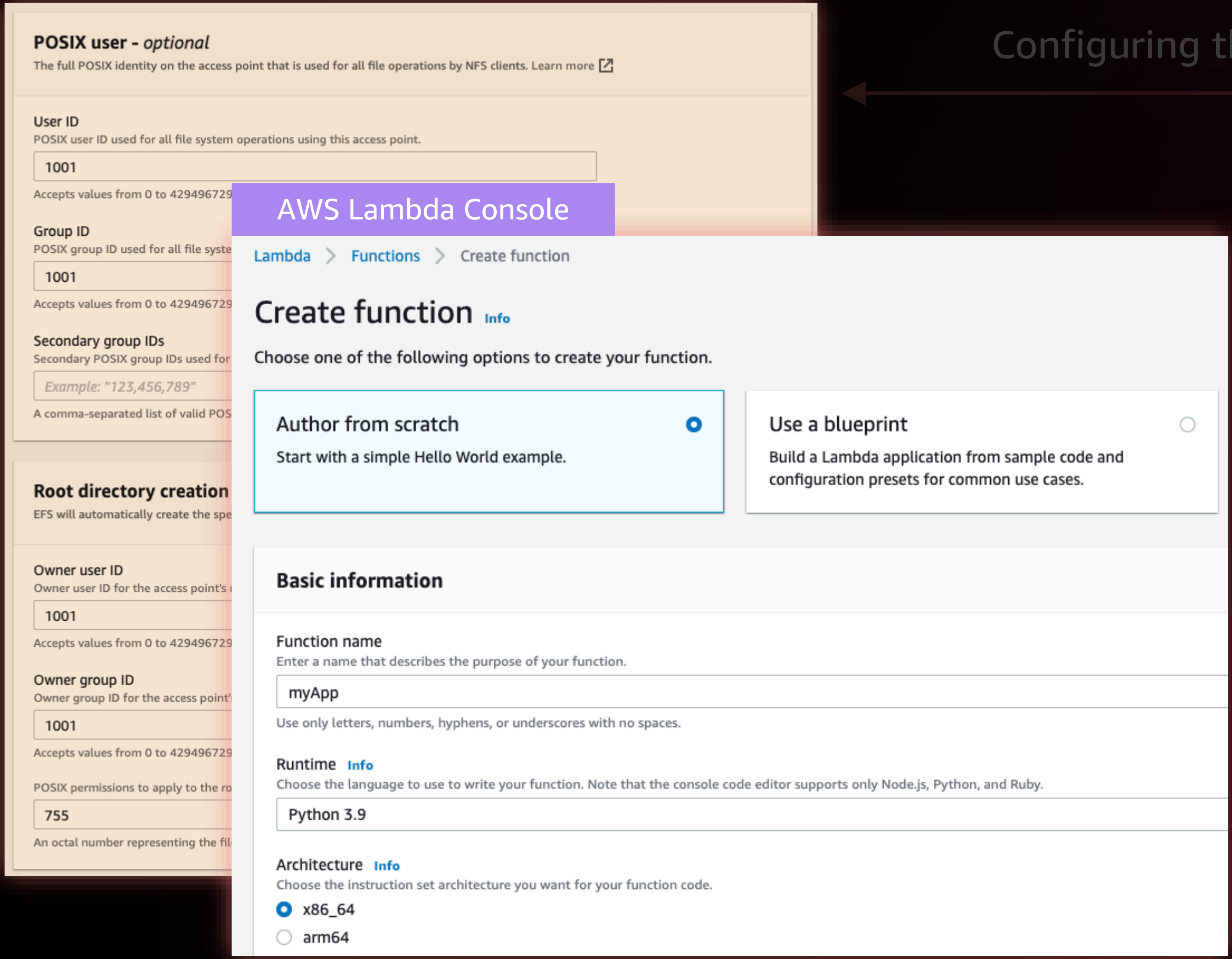
Owner user ID
Owner user ID for the access point's root directory, if the directory does not already exist.
1001
Accepts values from 0 to 4294967295

Owner group ID
Owner group ID for the access point's root directory, if the directory does not already exist.
1001
Accepts values from 0 to 4294967295

POSIX permissions to apply to the root directory path
755
An octal number representing the file's mode bits.

Configuring the access point

Attaching Amazon EFS to AWS Lambda



POSIX user - *optional*

The full POSIX identity on the access point that is used for all file operations by NFS clients. Learn more

User ID

POSIX user ID used for all file system operations using this access point.

1001

Accepts values from 0 to 429496729

Group ID

POSIX group ID used for all file syste

1001

Accepts values from 0 to 429496729

Secondary group IDs

Secondary POSIX group IDs used for

Example: "123,456,789"

A comma-separated list of valid POS

Root directory creation

EFS will automatically create the spe

Owner user ID

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Owner group ID

Owner group ID for the access point'

1001

Accepts values from 0 to 429496729

POSIX permissions to apply to the ro

755

An octal number representing the fil

AWS Lambda Console

Lambda > Functions > Create function

Create function Info

Choose one of the following options to create your function.

Author from scratch ●
Start with a simple Hello World example.

Use a blueprint ○
Build a Lambda application from sample code and configuration presets for common use cases.

Basic information

Function name

Enter a name that describes the purpose of your function.

myApp

Use only letters, numbers, hyphens, or underscores with no spaces.

Runtime Info

Choose the language to use to write your function. Note that the console code editor supports only Node.js, Python, and Ruby.

Python 3.9

Architecture Info

Choose the instruction set architecture you want for your function code.

● x86_64

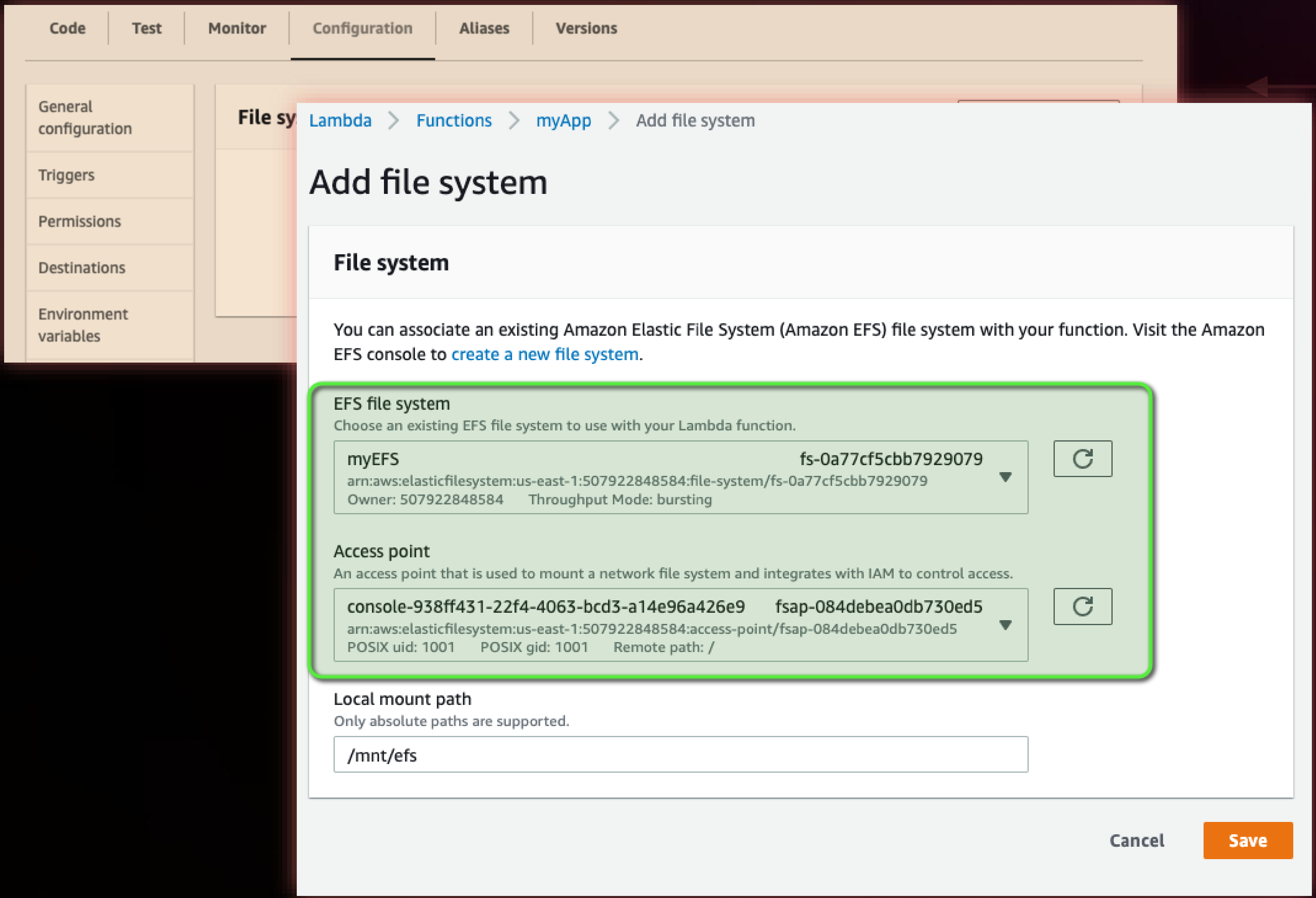
○ arm64

Configuring the access point

Creating the Lambda function

Attaching Amazon EFS to AWS Lambda

AWS Lambda Console



Lambda > Functions > myApp > Add file system

Add file system

File system

You can associate an existing Amazon Elastic File System (Amazon EFS) file system with your function. Visit the Amazon EFS console to create a new file system.

EFS file system
Choose an existing EFS file system to use with your Lambda function.

myEFS fs-0a77cf5cbb7929079
arn:aws:elasticfilesystem:us-east-1:507922848584:file-system/fs-0a77cf5cbb7929079
Owner: 507922848584 Throughput Mode: bursting

Access point
An access point that is used to mount a network file system and integrates with IAM to control access.

console-938ff431-22f4-4063-bcd3-a14e96a426e9 fsap-084debea0db730ed5
arn:aws:elasticfilesystem:us-east-1:507922848584:access-point/fsap-084debea0db730ed5
POSIX uid: 1001 POSIX gid: 1001 Remote path: /

Local mount path
Only absolute paths are supported.

/mnt/efs

Adding the file system

Select the file system

ML inference: Asurion powers real-time machine learning using Amazon EFS

Amazon EFS provides shared, persistent storage for Asurion's trained machine learning models, powering their real-time inference workflows running on AWS Lambda

ML inference infrastructure scales elastically with call volume, reducing operational overhead compared to maintaining instances and auto-scaling

asurion

"We really wanted to use AWS Lambda to make our ML inference elastic but thought we wouldn't be able to because of the size of data the process required. With Amazon EFS, we were easily able to give our [Lambda] function all of the storage space it needs."

Jeff Tougas
Senior Principal Software Engineer, Asurion

aws

Serverless: SkyWatch processes satellite images using AWS Lambda and Amazon EFS

SkyWatch uses AWS Lambda and Amazon EFS to provide a digital infrastructure for the distribution of satellite imagery

Faster image processing from low-latency AWS infrastructure lowers costs and scales elastically with image volume

"AWS Lambda lets us run large-scale image applications, and Amazon EFS enables us to concurrently process shared data with a low-latency file system through a multi-stage image processing pipeline, scaling elastically with image volume."

Luis Veci
Image Processing Software Lead, SkyWatch

Customer use cases for modernizing applications with Amazon EFS

Scalable digital experiences

Creation and modification of digital web content

Web hosting with WordPress and Drupal, course management with Moodle, and corporate wiki

Machine learning inference

Deploy ML models for real-time inference with large libraries or pre-trained models

Sentiment analysis, image classification, and search applications

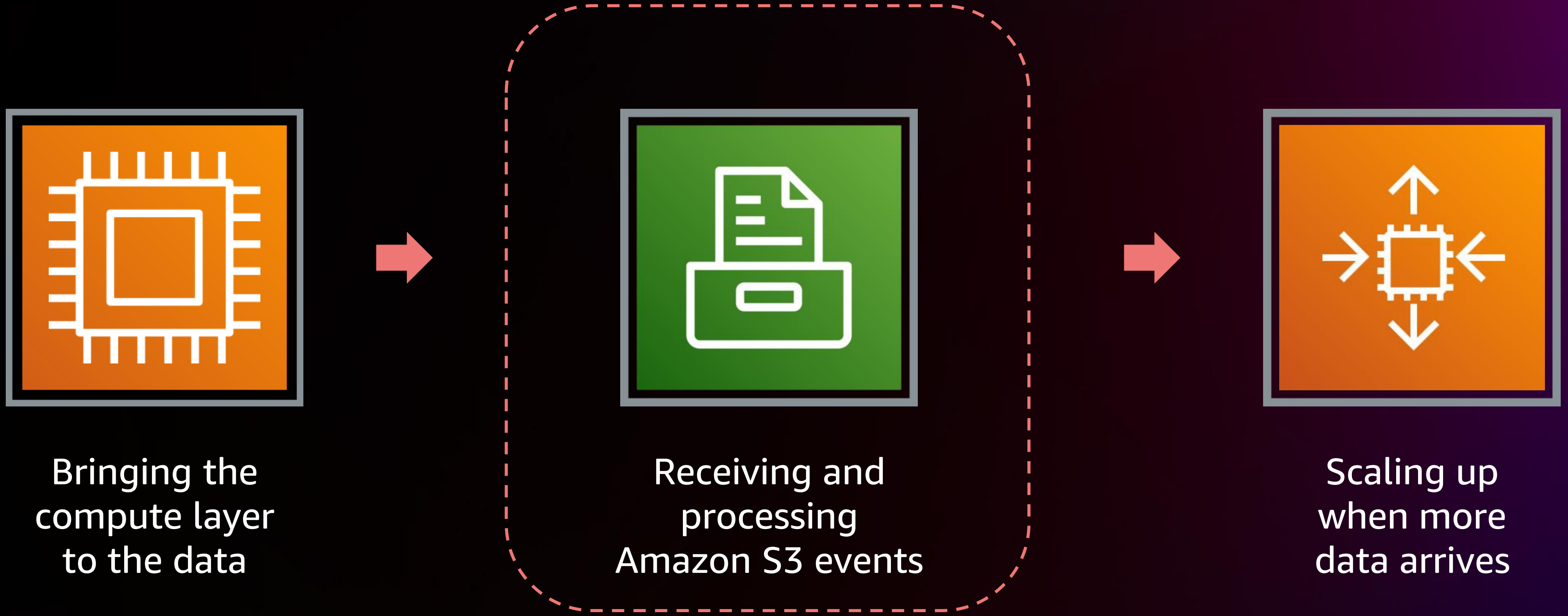
Media processing

Image processing, video hosting, video editing apps, and studio production

Media encoding, high-resolution images, and HD videos

Using Amazon S3 for event-driven serverless architectures

Building scalable serverless applications with Amazon S3



Bringing the compute layer to the data

Receiving and processing Amazon S3 events

Scaling up when more data arrives

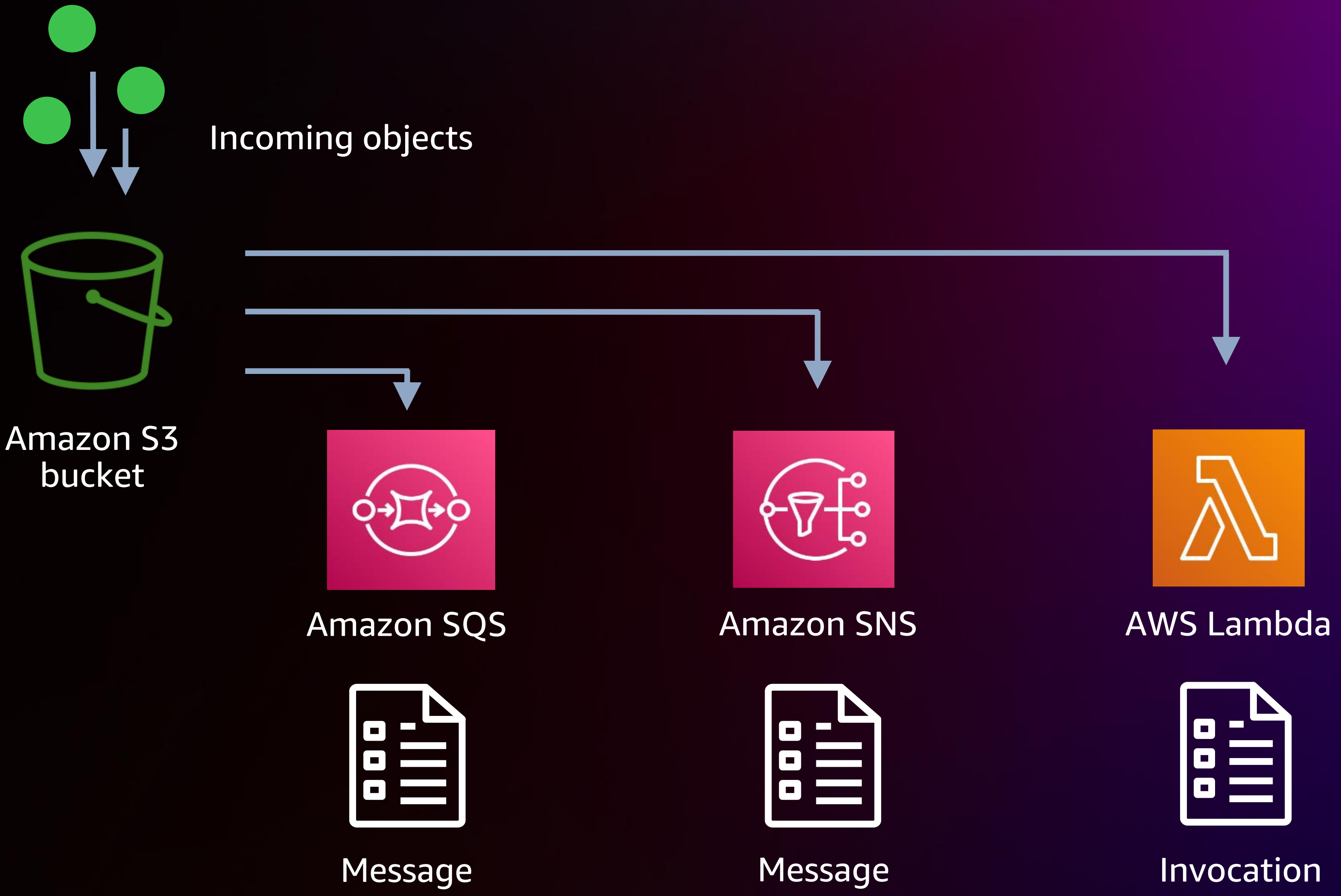
Amazon S3 is a critical component to a growing environment of serverless applications

Every day, Amazon S3 sends 131 billion event notifications to serverless applications

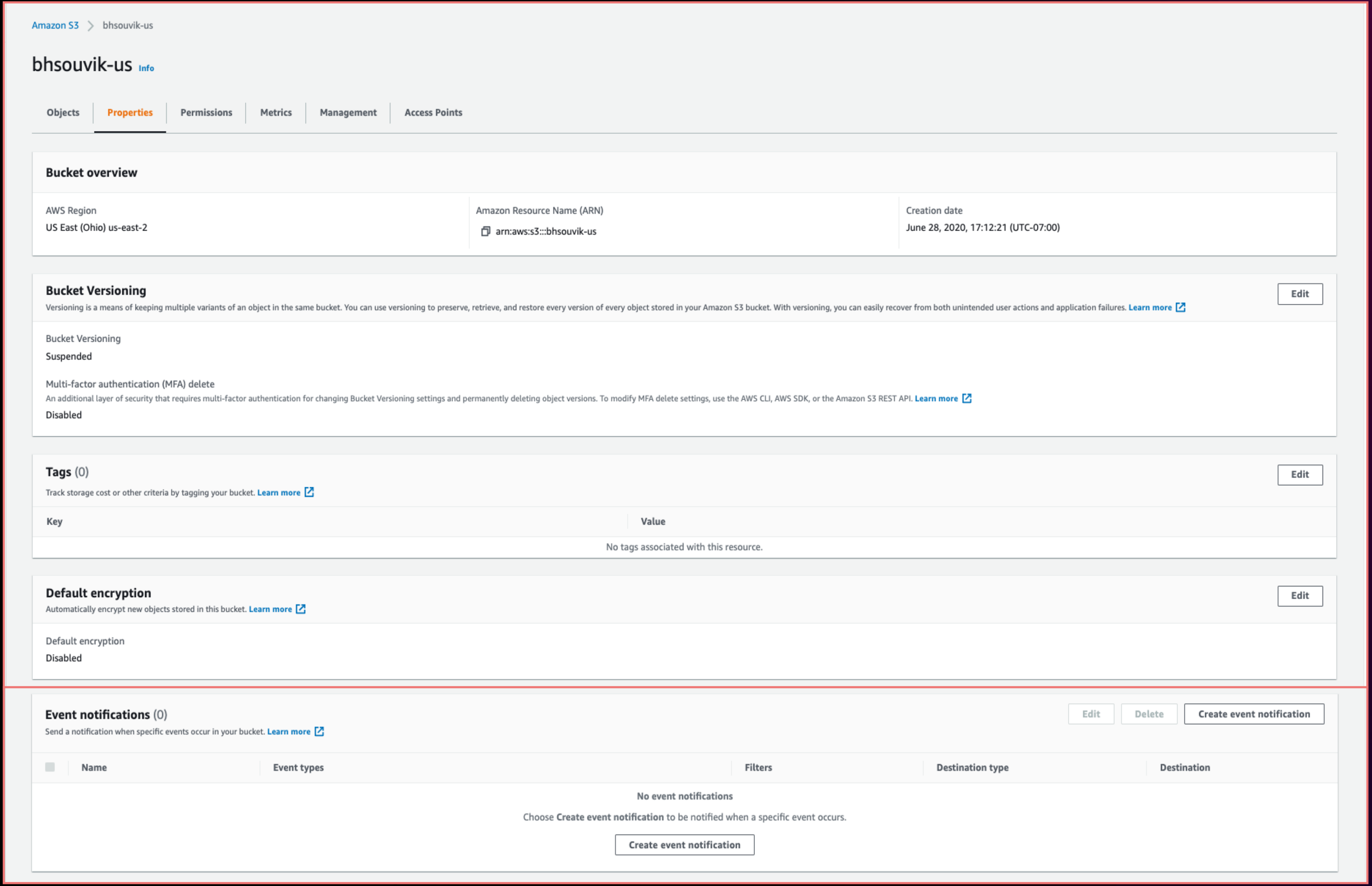
Amazon S3 Event Notifications

Reliable and scalable notifications

- At-least-once delivery
- Multiple delivery destinations
- Low latency, no charge
- Notifications on create, delete, restore, and lifecycle actions



Setting up Amazon S3 Event Notifications



Amazon S3 > bhsouvik-us

bhsouvik-us Info

Objects | Properties | Permissions | Metrics | Management | Access Points

Bucket overview

AWS Region
US East (Ohio) us-east-2

Amazon Resource Name (ARN)
arn:aws:s3:::bhsouvik-us

Creation date
June 28, 2020, 17:12:21 (UTC-07:00)

Bucket Versioning

Edit

Versioning is a means of keeping multiple variants of an object in the same bucket. You can use versioning to preserve, retrieve, and restore every version of every object stored in your Amazon S3 bucket. With versioning, you can easily recover from both unintended user actions and application failures. Learn more

Bucket Versioning
Suspended

Multi-factor authentication (MFA) delete
An additional layer of security that requires multi-factor authentication for changing Bucket Versioning settings and permanently deleting object versions. To modify MFA delete settings, use the AWS CLI, AWS SDK, or the Amazon S3 REST API. Learn more
Disabled

Tags (0)

Edit

Track storage cost or other criteria by tagging your bucket. Learn more

Key	Value
No tags associated with this resource.	

Default encryption

Edit

Automatically encrypt new objects stored in this bucket. Learn more

Default encryption
Disabled

Event notifications (0)

Edit | Delete | Create event notification

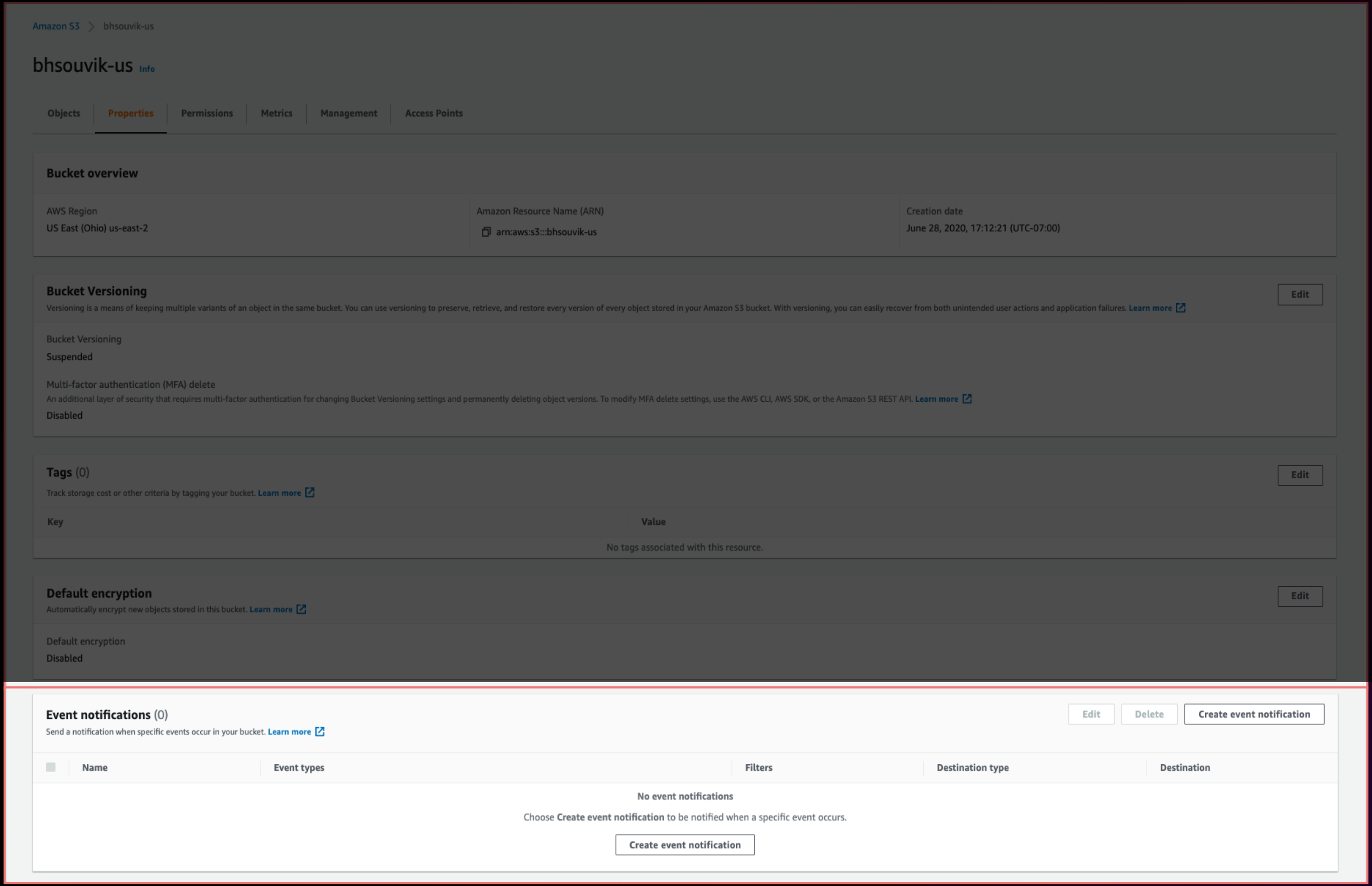
Send a notification when specific events occur in your bucket. Learn more

□	Name	Event types	Filters	Destination type	Destination
		No event notifications			

Choose **Create event notification** to be notified when a specific event occurs.

Create event notification

Setting up Amazon S3 Event Notifications



bhsouvik-us

Bucket overview

AWS Region
US East (Ohio) us-east-2

Amazon Resource Name (ARN)
arn:aws:s3:::bhsouvik-us

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June 28, 2020, 17:12:21 (UTC-07:00)

Bucket Versioning

Versioning is a means of keeping multiple variants of an object in the same bucket. You can use versioning to preserve, retrieve, and restore every version of every object stored in your Amazon S3 bucket. With versioning, you can easily recover from both unintended user actions and application failures. Learn more

Bucket Versioning
Suspended

Multi-factor authentication (MFA) delete
An additional layer of security that requires multi-factor authentication for changing Bucket Versioning settings and permanently deleting object versions. To modify MFA delete settings, use the AWS CLI, AWS SDK, or the Amazon S3 REST API. Learn more
Disabled

Tags (0)

Track storage cost or other criteria by tagging your bucket. Learn more

Key	Value
No tags associated with this resource.	

Default encryption

Automatically encrypt new objects stored in this bucket. Learn more

Default encryption
Disabled

Event notifications (0)

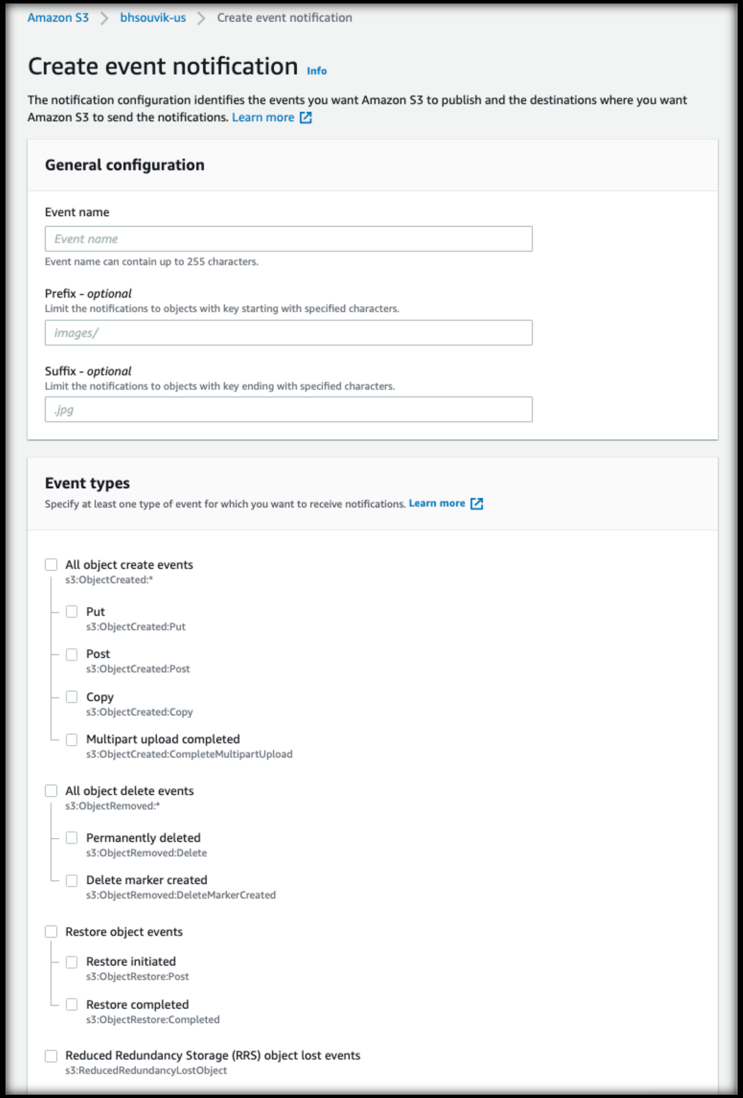
Send a notification when specific events occur in your bucket. Learn more

□	Name	Event types	Filters	Destination type	Destination

No event notifications

Choose **Create event notification** to be notified when a specific event occurs.

Setting up Amazon S3 Event Notifications



Amazon S3 > bhsouvik-us > Create event notification

Create event notification Info

The notification configuration identifies the events you want Amazon S3 to publish and the destinations where you want Amazon S3 to send the notifications. Learn more

General configuration

Event name

Event name

Event name can contain up to 255 characters.

Prefix - *optional*
Limit the notifications to objects with key starting with specified characters.

images/

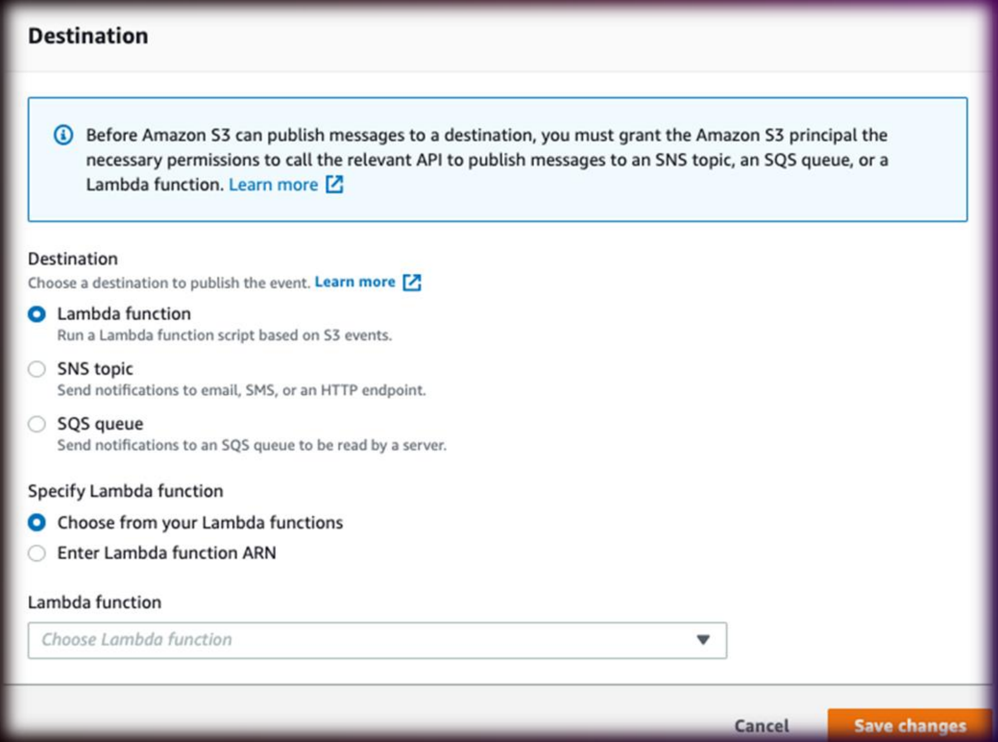
Suffix - *optional*
Limit the notifications to objects with key ending with specified characters.

.jpg

Event types

Specify at least one type of event for which you want to receive notifications. Learn more

- □ All object create events
  s3:ObjectCreated:*
  - □ Put
    s3:ObjectCreated:Put
  - □ Post
    s3:ObjectCreated:Post
  - □ Copy
    s3:ObjectCreated:Copy
  - □ Multipart upload completed
    s3:ObjectCreated:CompleteMultipartUpload
- □ All object delete events
  s3:ObjectRemoved:*
  - □ Permanently deleted
    s3:ObjectRemoved:Delete
  - □ Delete marker created
    s3:ObjectRemoved:DeleteMarkerCreated
- □ Restore object events
  - □ Restore initiated
    s3:ObjectRestore:Post
  - □ Restore completed
    s3:ObjectRestore:Completed
- □ Reduced Redundancy Storage (RRS) object lost events
  s3:ReducedRedundancyLostObject



Destination

Before Amazon S3 can publish messages to a destination, you must grant the Amazon S3 principal the necessary permissions to call the relevant API to publish messages to an SNS topic, an SQS queue, or a Lambda function. Learn more

Destination
Choose a destination to publish the event. Learn more

- ● Lambda function
  Run a Lambda function script based on S3 events.
- ○ SNS topic
  Send notifications to email, SMS, or an HTTP endpoint.
- ○ SQS queue
  Send notifications to an SQS queue to be read by a server.

Specify Lambda function

- ● Choose from your Lambda functions
- ○ Enter Lambda function ARN

Lambda function

Choose Lambda function ▼

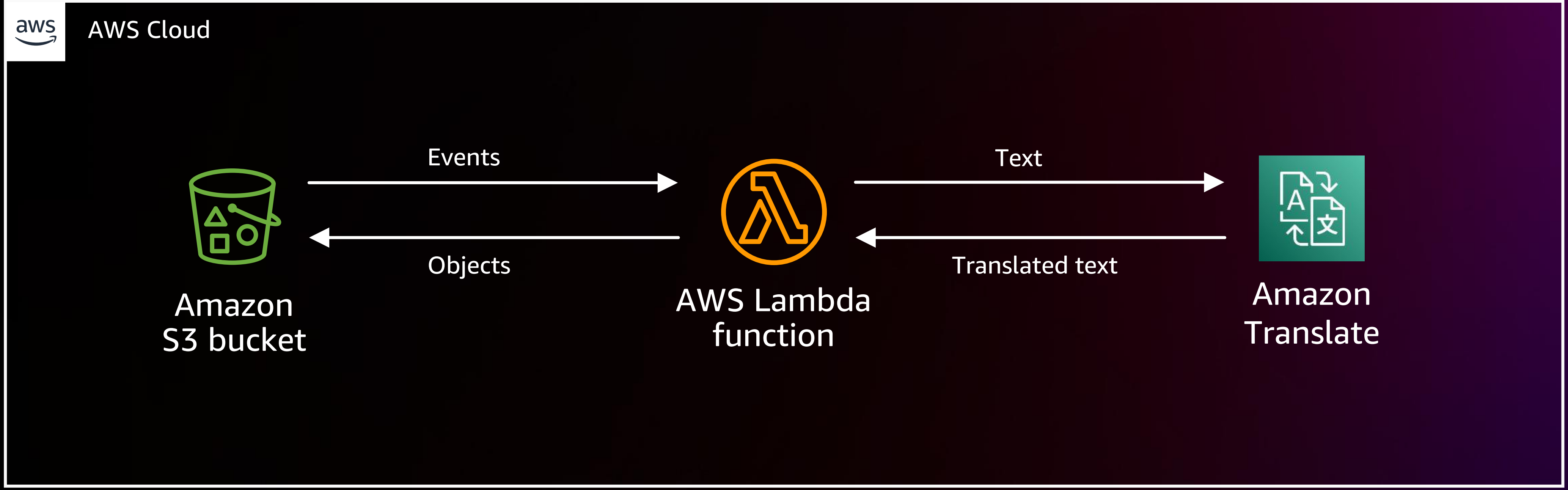
Cancel Save changes

Translating at scale using Amazon S3

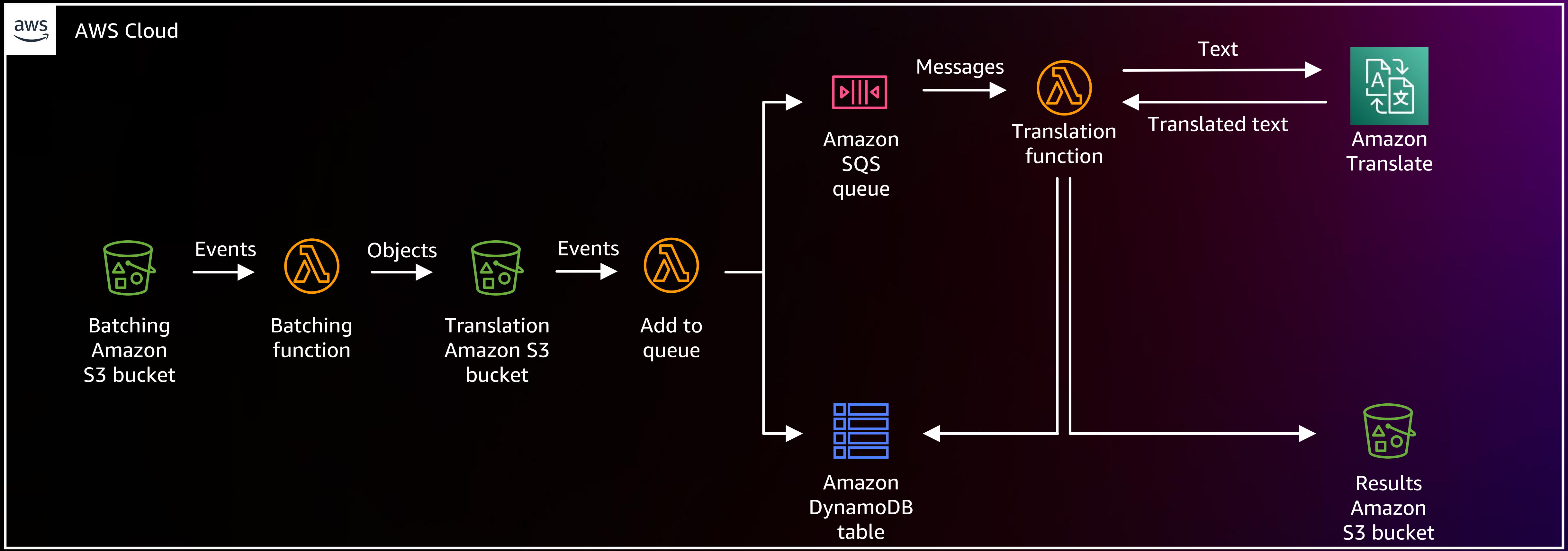
Hello

你好

Translating documents at near real time



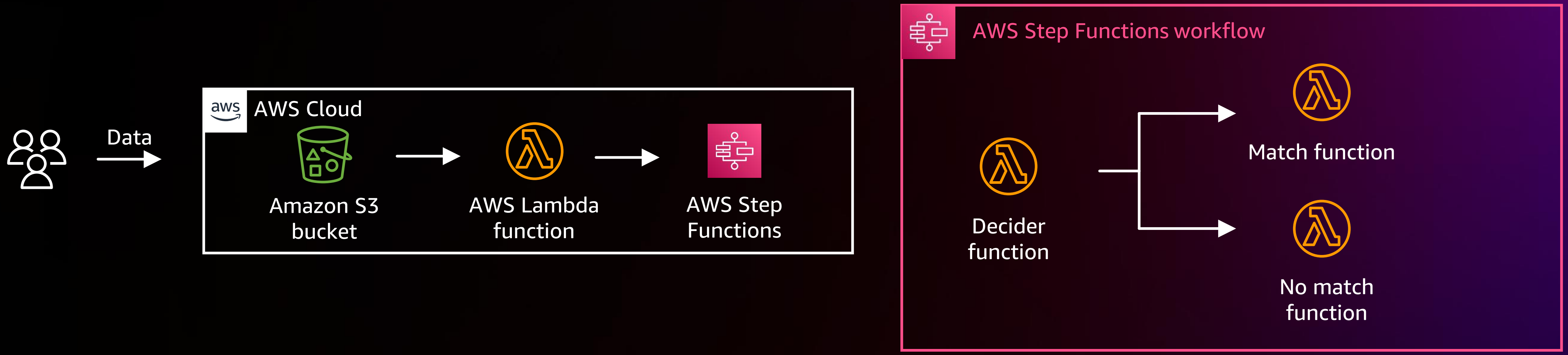
Scaling the translation solution



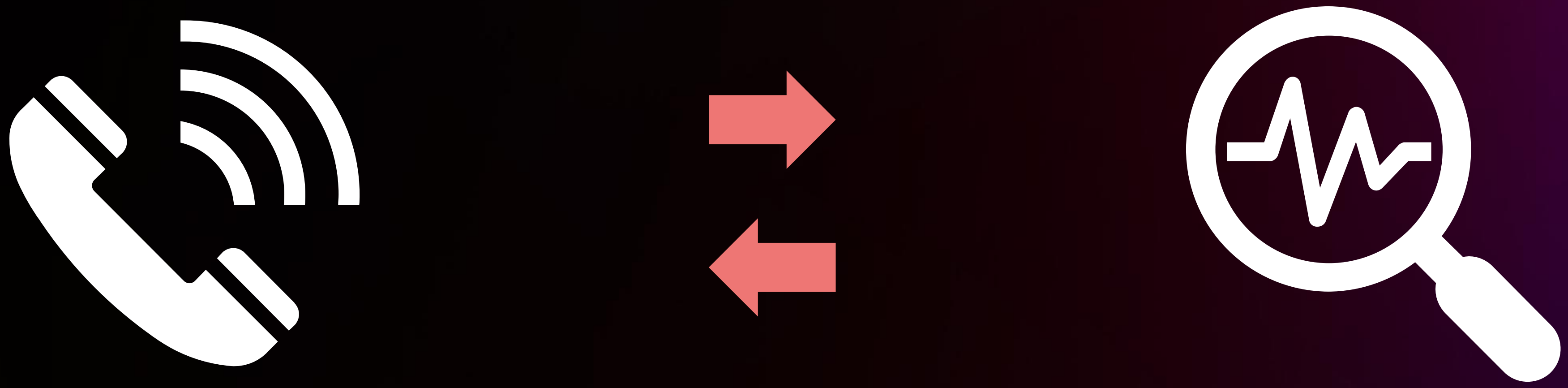
Automating business workflows with minimal code

IF this THEN that

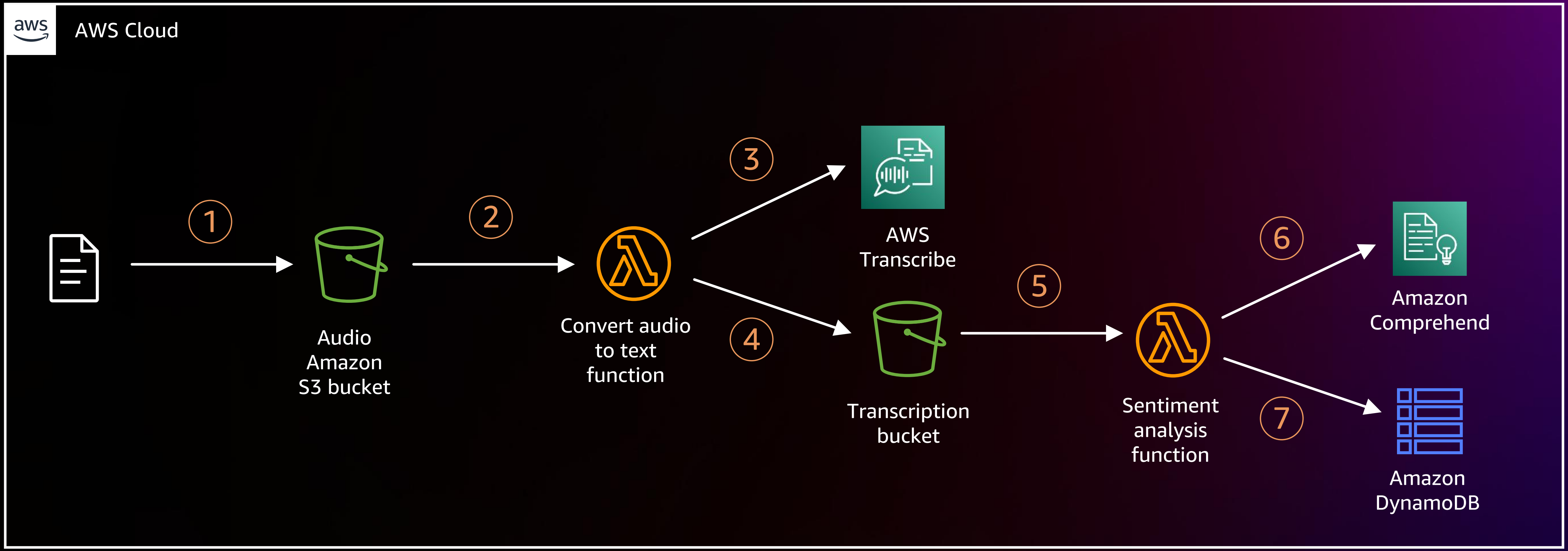
Automating scalable business workflows with minimal code



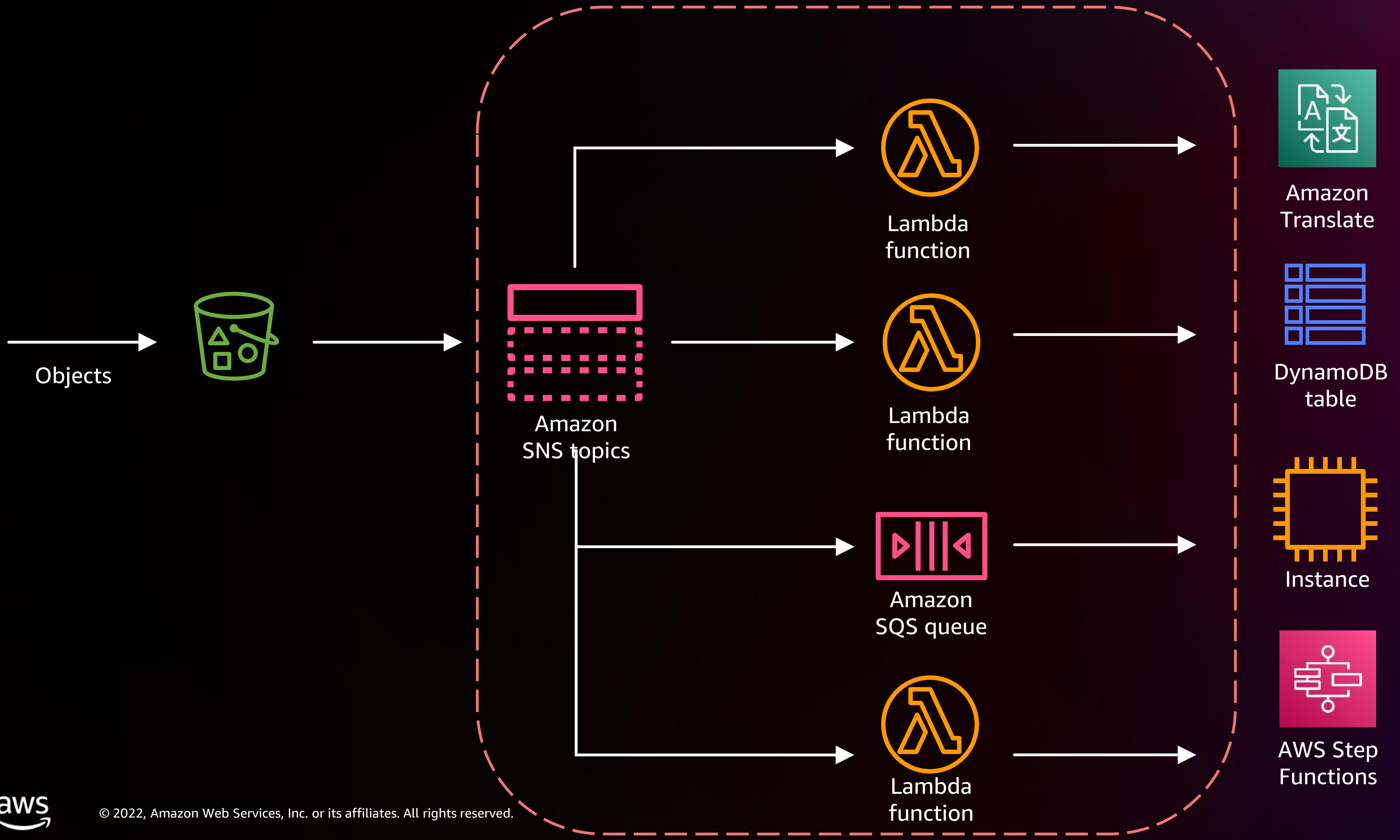
Converting call center recordings into useful analytics



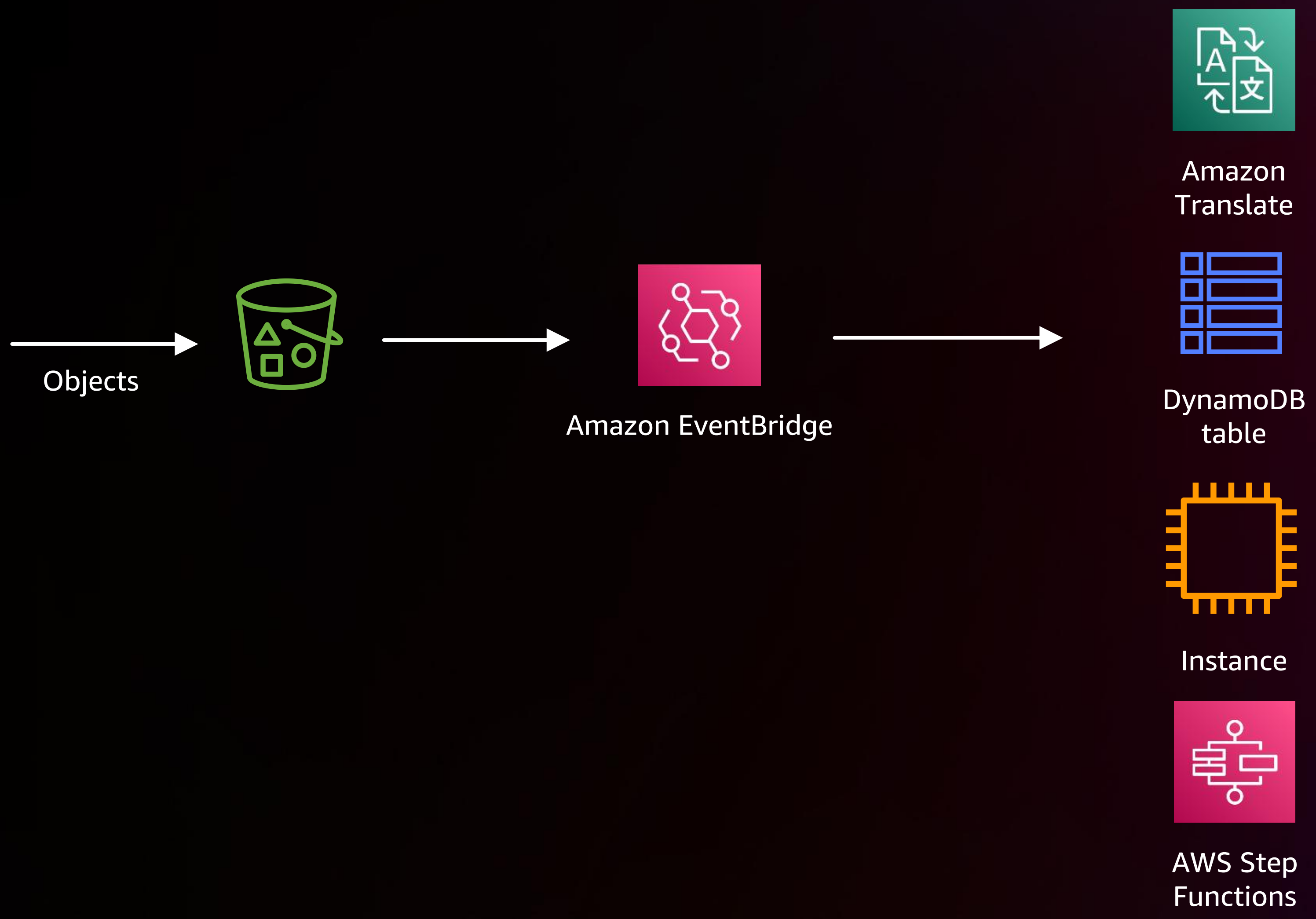
Converting call center recordings into useful data for analytics



Simplifying serverless architectures



Simplifying serverless architectures



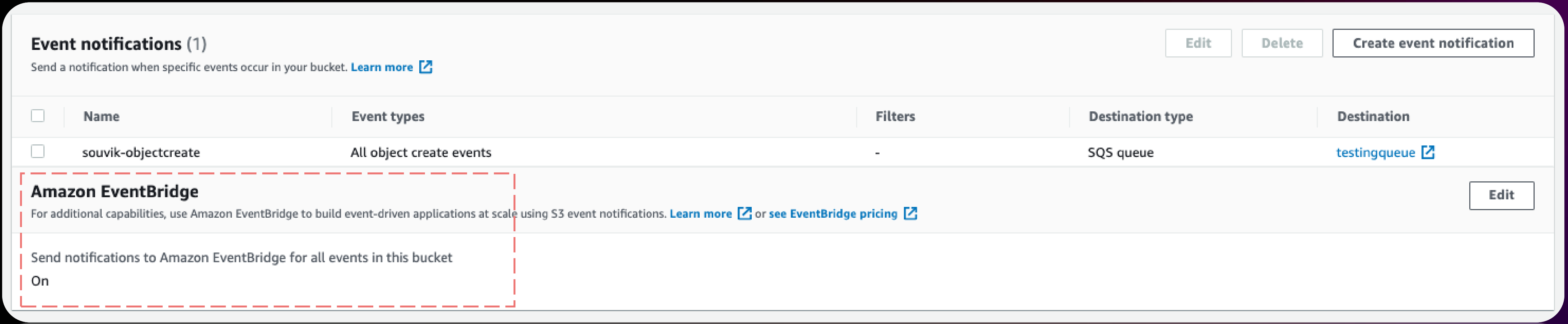
EventBridge and Amazon S3 make serverless easier

Trigger multiple event-driven workflows based on changes to your data

Filter objects for your applications with industry-leading pattern matching

Fast and reliable invocations with at-least-once delivery

How it works – Enable in Amazon S3 bucket



Event notifications (1)

Send a notification when specific events occur in your bucket. Learn more

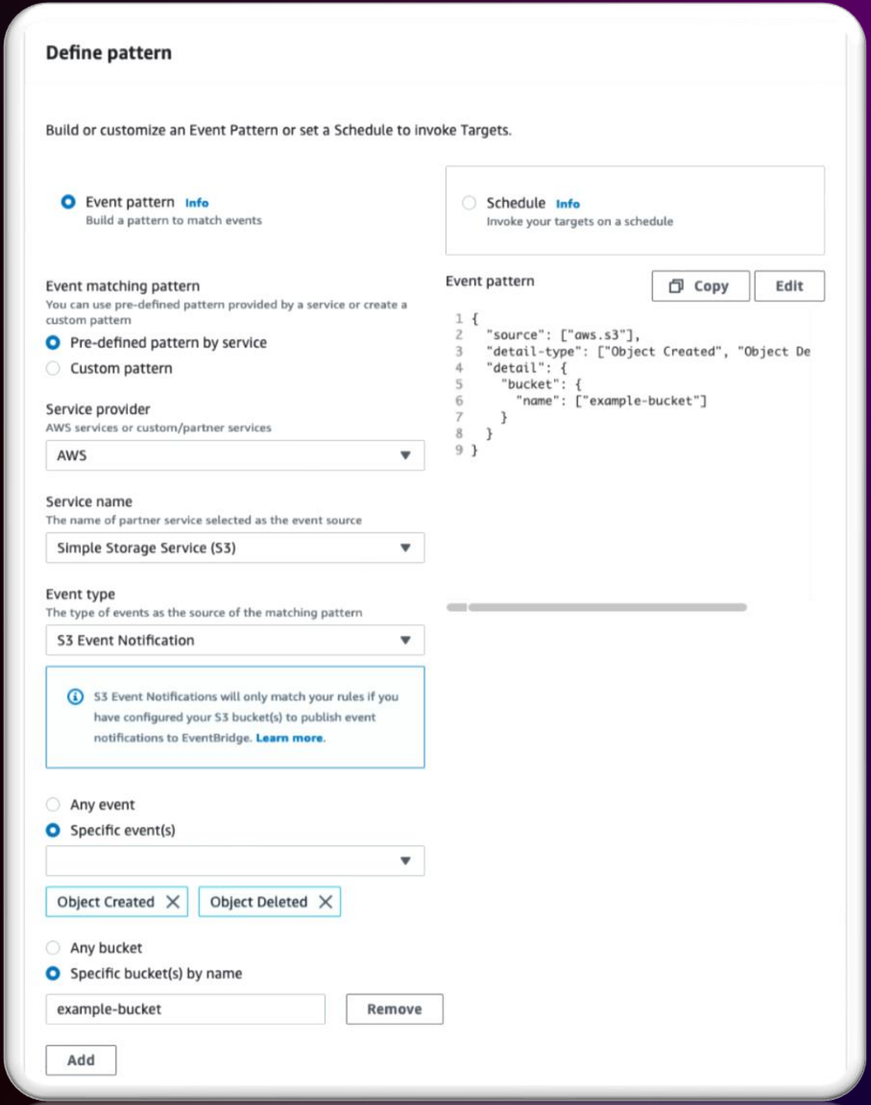
□	Name	Event types	Filters	Destination type	Destination
□	souvik-objectcreate	All object create events	-	SQS queue	testingqueue

Amazon EventBridge

For additional capabilities, use Amazon EventBridge to build event-driven applications at scale using S3 event notifications. Learn more or see EventBridge pricing

Send notifications to Amazon EventBridge for all events in this bucket
On

How it works – Set up rules and patterns in EventBridge



Define pattern

Build or customize an Event Pattern or set a Schedule to invoke Targets.

● Event pattern Info
Build a pattern to match events

○ Schedule Info
Invoke your targets on a schedule

Event matching pattern
You can use pre-defined pattern provided by a service or create a custom pattern

● Pre-defined pattern by service
○ Custom pattern

Service provider
AWS services or custom/partner services
AWS ▼

Service name
The name of partner service selected as the event source
Simple Storage Service (S3) ▼

Event type
The type of events as the source of the matching pattern
S3 Event Notification ▼

S3 Event Notifications will only match your rules if you have configured your S3 bucket(s) to publish event notifications to EventBridge. Learn more.

○ Any event
● Specific event(s)

Object Created ✕ Object Deleted ✕

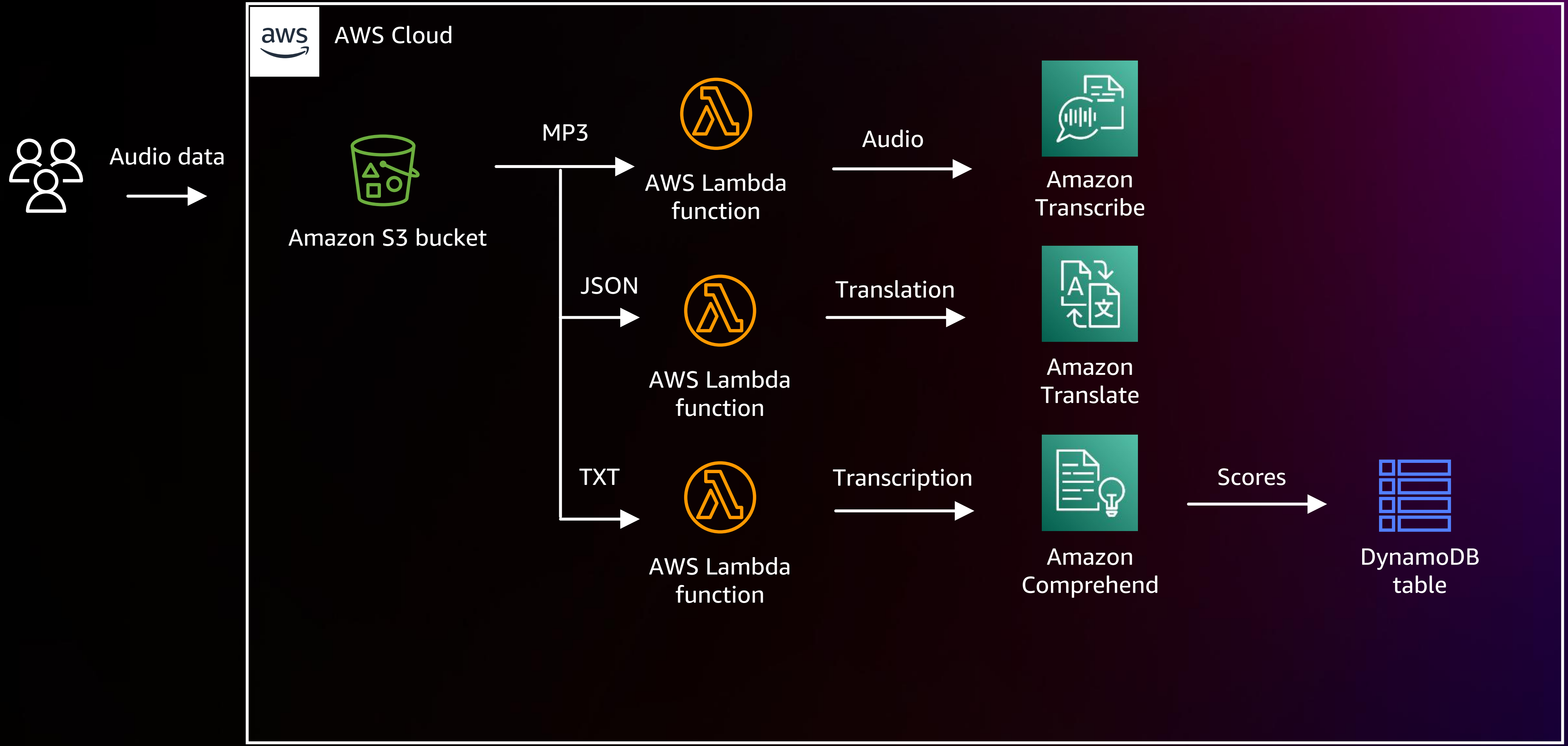
○ Any bucket
● Specific bucket(s) by name

example-bucket

Event pattern

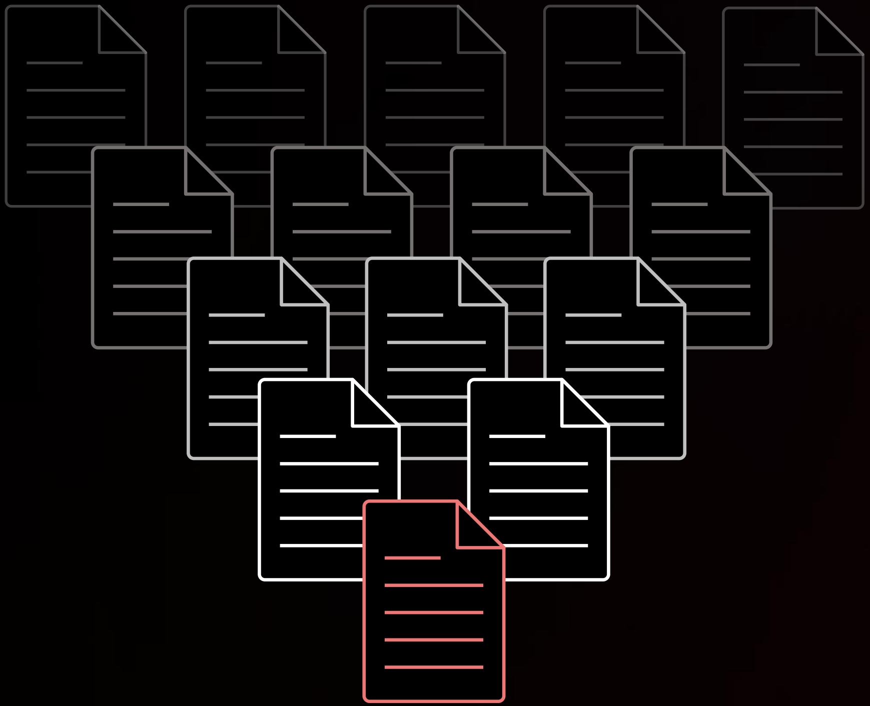
```
{
  "source": ["aws.s3"],
  "detail-type": ["Object Created", "Object De
  "detail": {
    "bucket": {
      "name": ["example-bucket"]
    }
  }
}
```

Handling multiple languages



Amazon S3 Object Lambda

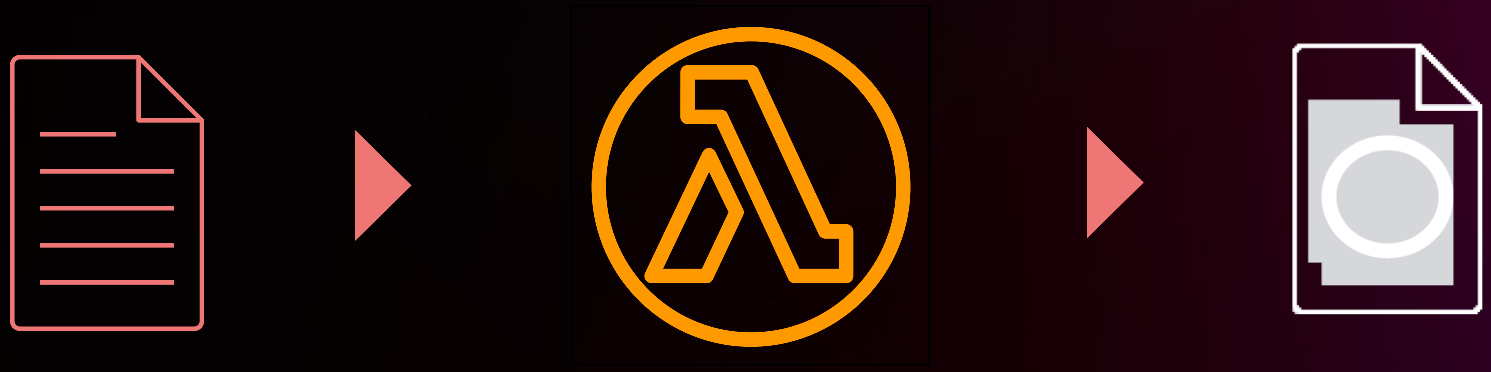
Previously . . .



Many derivative copies

Proxy infrastructure

Now . . .



Amazon S3 Object Lambda

Add your own code to Amazon S3 GET, HEAD, and LIST requests to process and modify data returned to an application

Fully managed, powered by AWS Lambda functions

Eliminates the need to create and store derivative copies of your data, and requires no application changes

Amazon S3 Object Lambda

Filter rows

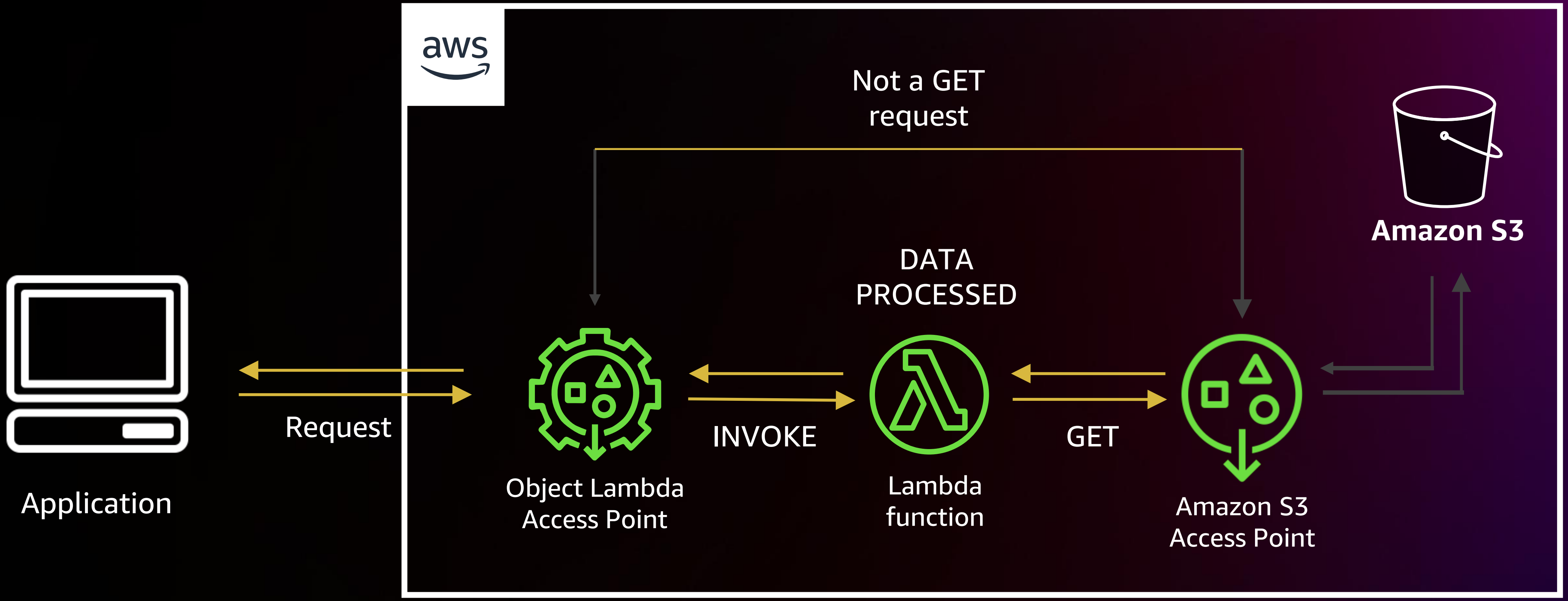
Resize images

1001XX010
0X0010101
00XXXX010
1010101XX

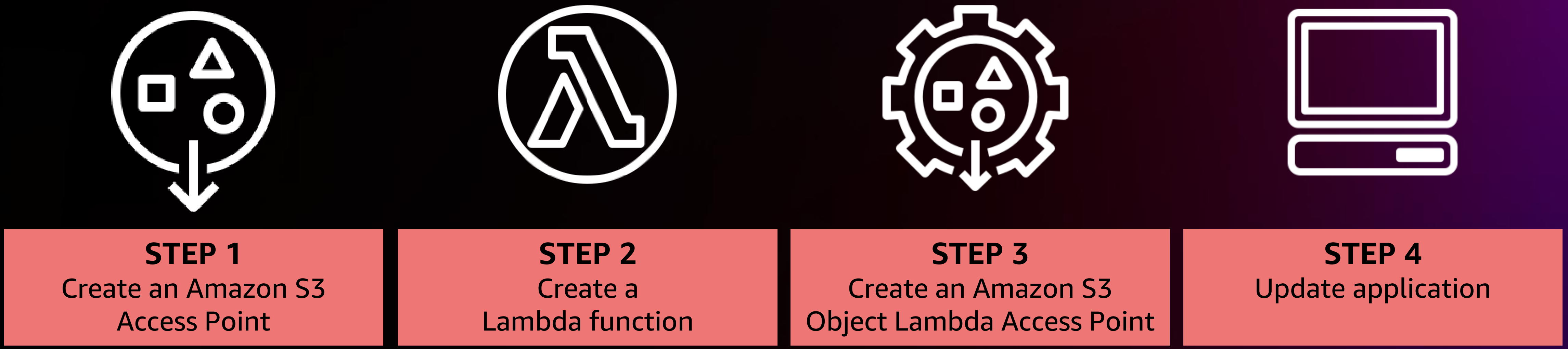
Redact data

. . . and much more

S3 Object Lambda: How it works



Getting started with Amazon S3 Object Lambda



STEP 1
Create an Amazon S3
Access Point

STEP 2
Create a
Lambda function

STEP 3
Create an Amazon S3
Object Lambda Access Point

STEP 4
Update application

Insert your own code to process data as it is retrieved from Amazon S3

Use cases for Amazon S3 Object Lambda

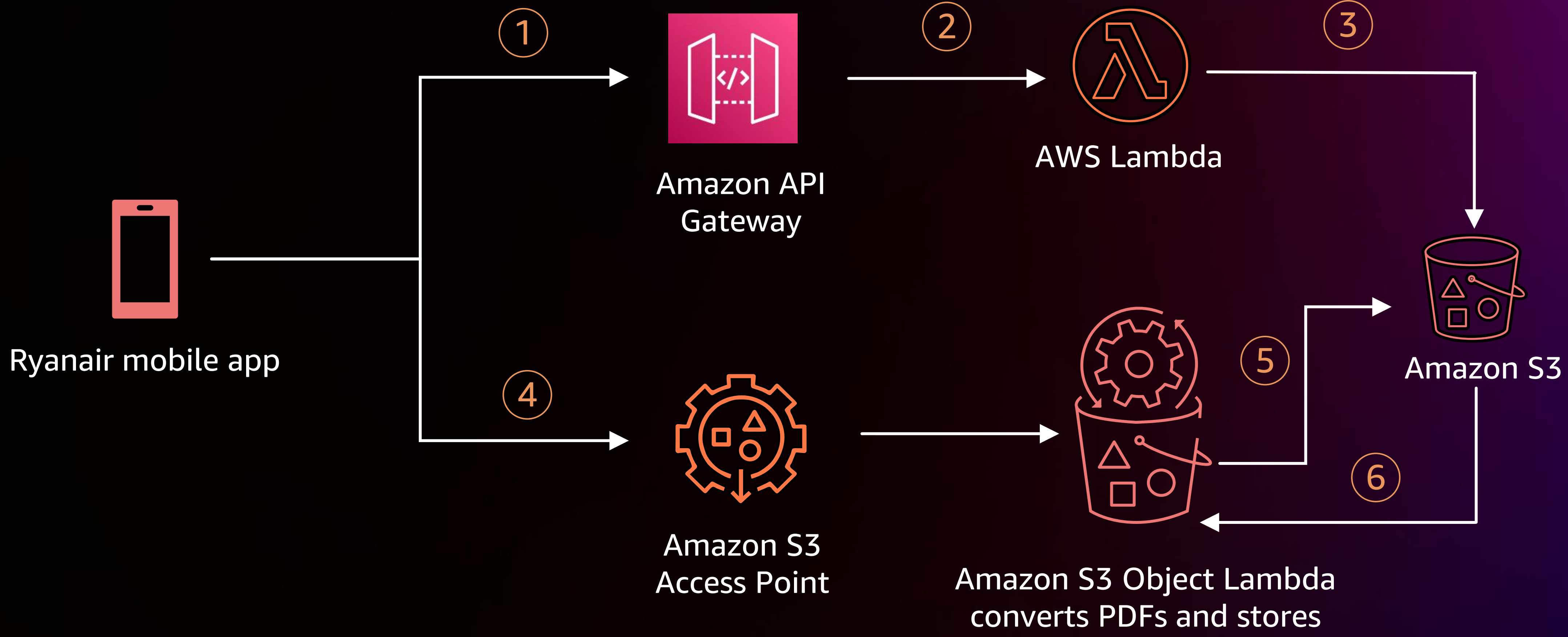
Compression and decompression

Audio and video transcoding

Custom authorization

Image resizing and watermarking

Ryanair COVID-19 mobile wallet with Amazon S3 Object Lambda



Summary

Build loosely coupled applications with AWS services

Use Amazon EFS for serverless applications that need a serverless file system (for example, content management systems, machine learning inference, and media processing)

Use Amazon S3 Object Lambda for in-line GET processing

Use Amazon S3 Event Notifications with EventBridge for serverless applications reacting to object changes

Increase observability with Amazon S3 Storage Lens and AWS X-Ray

Other sessions

STG221: AWS storage innovations at exabyte scale

STG001: Use S3 Object Lambda to transform objects for virtually any use case

STG309: Using code and AWS Lambda to process data retrieved from Amazon S3

STG311: Building serverless, modern applications using Amazon S3 or Amazon EFS

STG316: Transforming your data with Amazon S3 Object Lambda

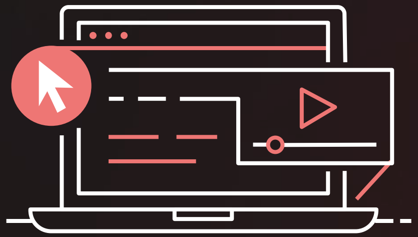
SVS404: A closer look at AWS Lambda

Continue your AWS Storage learning

Build a learning plan

Set your AWS Storage learning plans using **AWS Skill Builder**

Increase your knowledge



Use our **Ramp-Up Guides** to build your storage knowledge

Earn AWS Storage Badges

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Increase your knowledge

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https://s12d.com/serverless-learning

Thank you!

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