Caltech | Center for Technology & Management Education

Post Graduate Program in Cloud

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Cloud

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AWS Solution Architect: Associate Level

simplilearn

Application and Serverless Services in AWS

Learning Objectives

By the end of the lesson, you will be able to:

- Explain the application services offered by AWS
- Enable event notification for AWS resources using SNS
- Demonstrate how SQS is used to control workflow among AWS services
- Explain the difference between SNS and SQS
- Create a serverless webpage

Introduction to AWS Application Services

What Are AWS Application Services?

AWS Application services allow users to seamlessly integrate their on-premise and cloud applications while building modern and distributed architectures for their applications.

AWS Application services

AWS Application Services

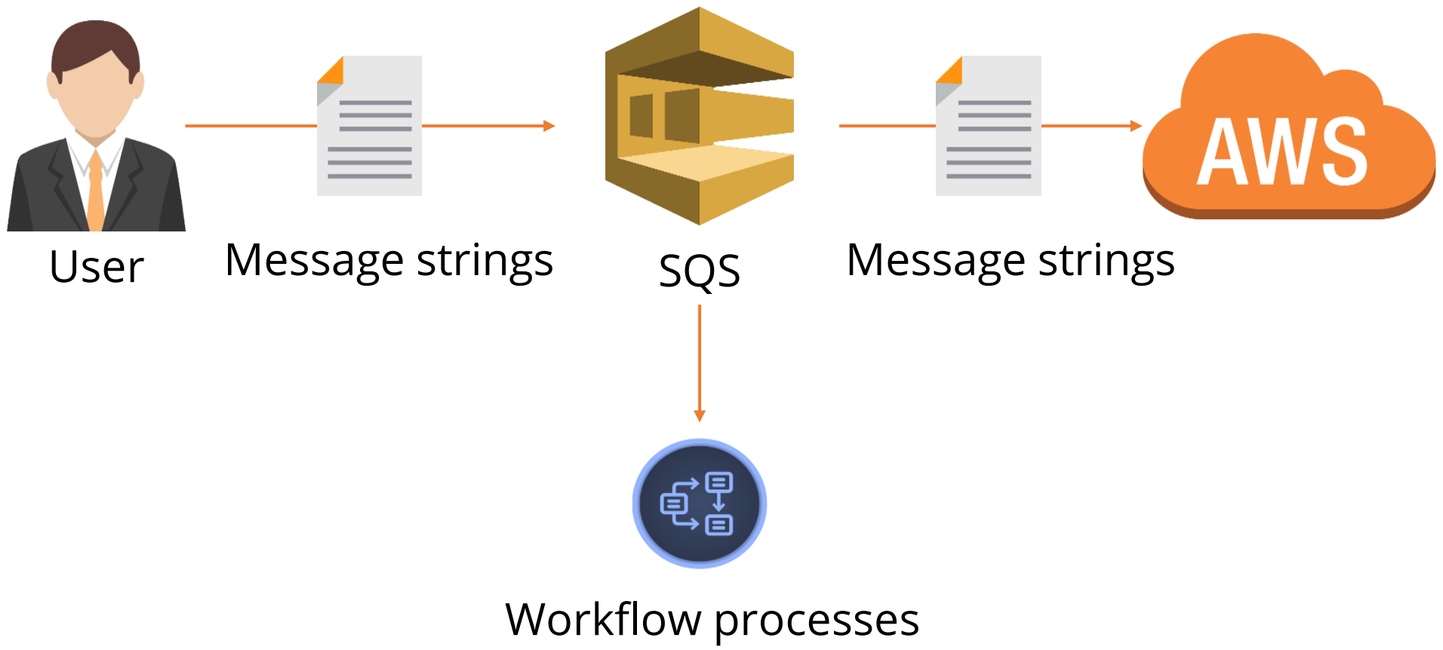
The following are the Application services offered by AWS:

AWS Application service	Category	Description
Amazon Simple Queue Service (SQS)	Messaging	Queue service that sends, stores, and receives messages between application components
Amazon Simple Notification Service (SNS)	Messaging	Notification service that manages the delivery of messages to subscribed or published application endpoint or clients
Amazon Simple Workflow Service (SWF)	Workflows	Simple Workflow service coordinates workflow and tasks among various AWS services and distributed application components
Amazon API Gateway	API Management	API Gateway service that creates, publishes, maintains, and secures API at any scale for web applications

Amazon Simple Queue Service (SQS)

What Is Amazon Simple Queue Service?

Amazon SQS is a fully managed queue service that receives, stores, and sends message strings containing job descriptions across application components and AWS services. SQS follows first-in-first-out (FIFO) standard for sending out messages.



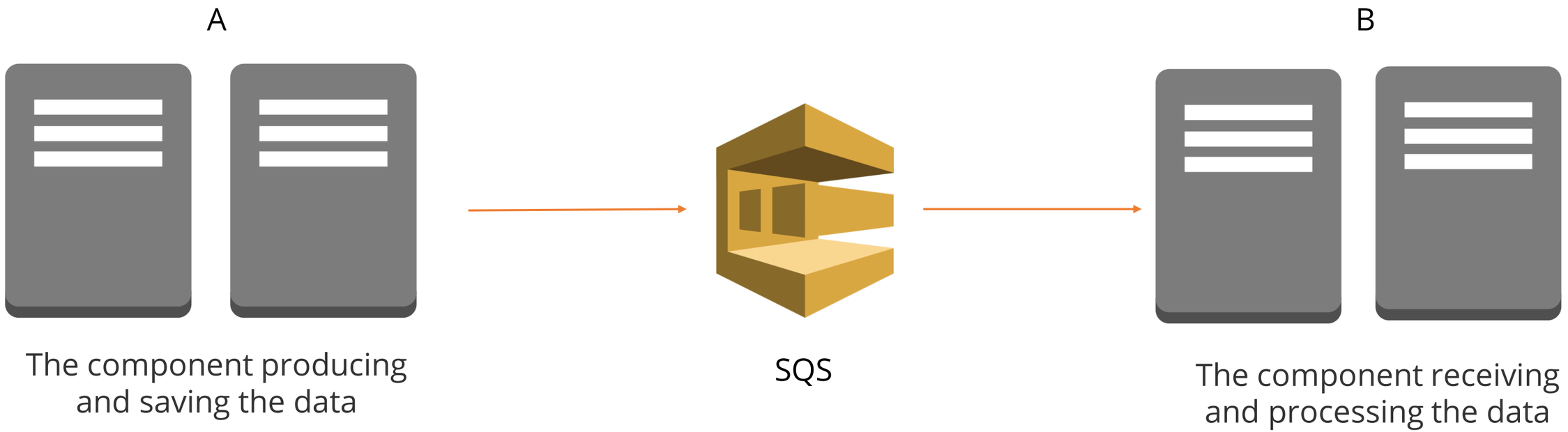
Amazon SQS Features

The following are the key features of SQS:

01	Provides FIFO queues in all the regions
02	Delivers messages at least once
03	Decouples your infrastructure

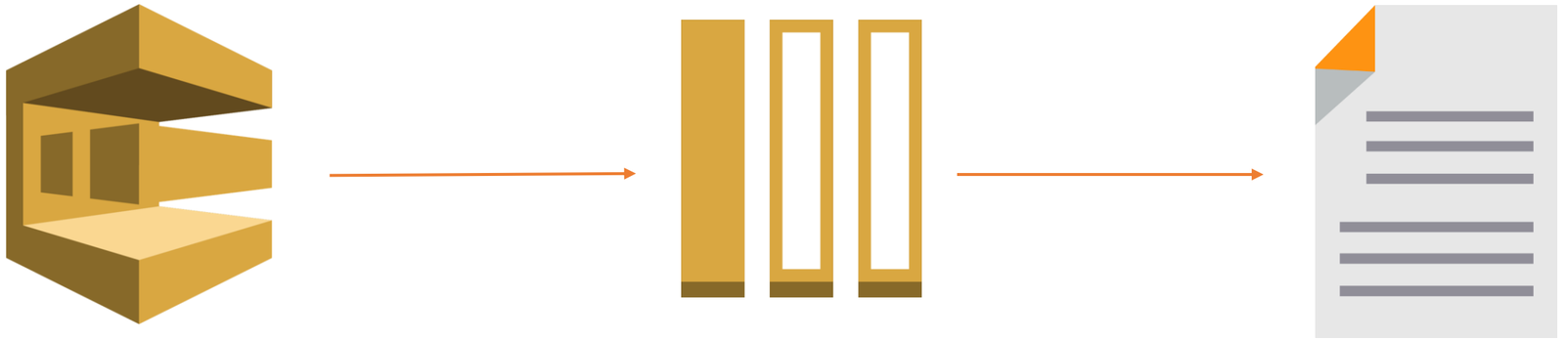
Amazon SQS Workflow

SQS allows you to decouple the components of a cloud application, which is an important concept of the AWS best practices in building architectures on the cloud.



Amazon SQS Messages

SQS messages can contain up to 256 KB of text and are billed in chunks of 64 KB of data.



Assisted Practice

Configuring Amazon SQS Using the AWS Console

Duration: 10 min.

Problem Statement:

Configure Amazon SQS using the AWS console

Assisted Practice: Guidelines to Configure Amazon SQS Using the AWS Console

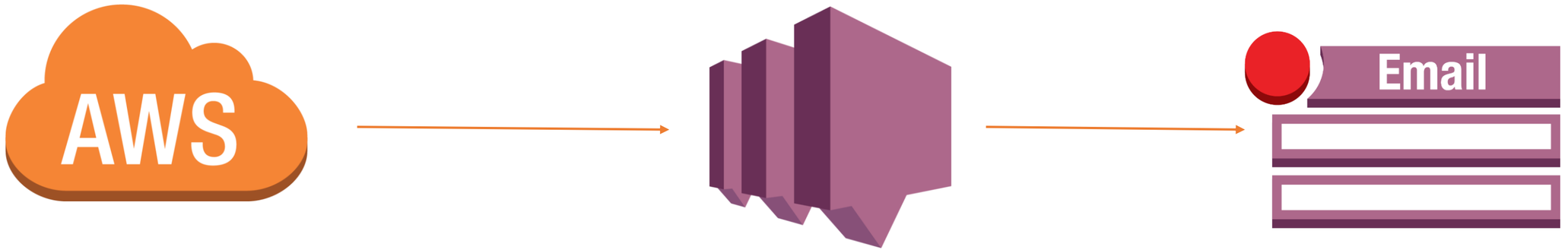
Steps to perform:

1. Go to the AWS console
2. Open the Amazon SQS dashboard
3. Create a queue
4. Add a message in the queue using the Actions option
5. View and delete the message from the queue using the Actions option

Amazon Simple Notification Service (SNS)

What Is Amazon Simple Notification Service?

Amazon SNS is a fully managed publication-subscription based messaging service used to send push notifications, emails, and SMS messages.



SNS

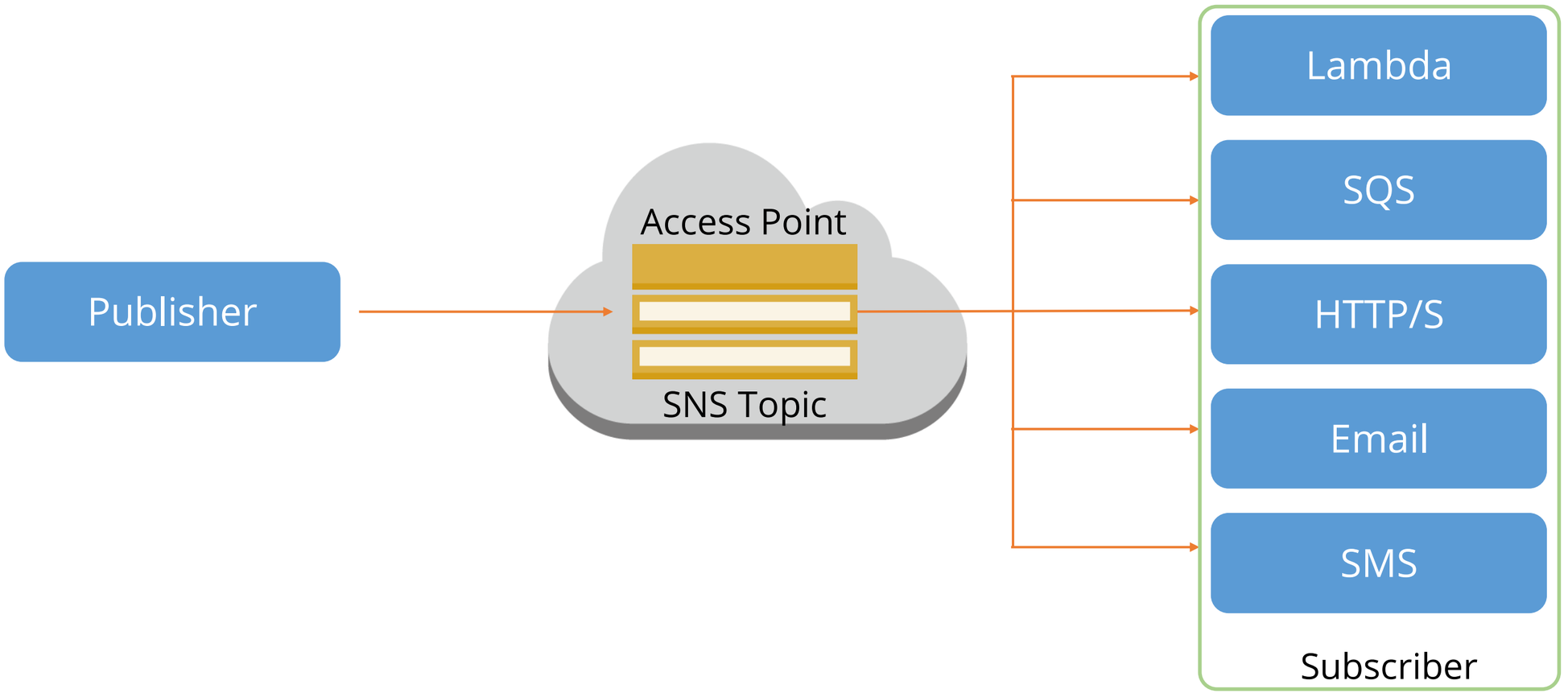
Emails to users

Amazon SNS Features

01	Instantaneous push-based delivery
02	Multiple transfer protocol
03	Pay-as-you-go model
04	Simple web-based interface
05	Message durability

Amazon SNS Topic

An SNS topic is a communication channel that allows you to send messages and subscribe to notifications.



Assisted Practice

Setting Up Amazon SNS Notifications

Duration: 10 min.

Problem Statement:

Set up Amazon SNS notifications with email endpoint

Assisted Practice: Guidelines to Set Up Amazon SNS Notifications

Steps to perform:

1. Go to the Amazon console
2. Create a topic
3. Create a subscription
4. Publish a message to the previously created topic
5. Verify the SNS email

Amazon SNS vs. Amazon SQS

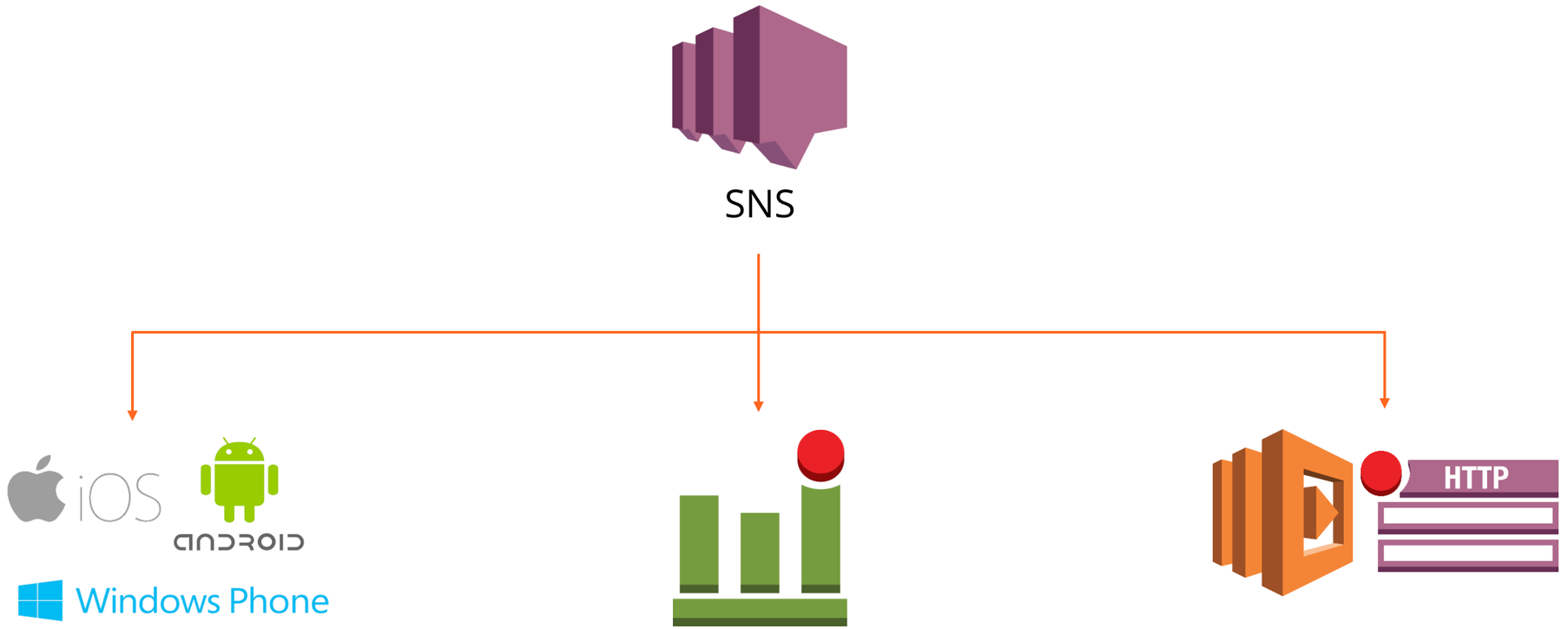
Amazon SNS vs. Amazon SQS

The following is a comparison between Amazon SNS and Amazon SQS based on various differential parameters:

Parameters	Amazon SNS	Amazon SQS
Entity type	Topic is the key entity used in SNS	Queue is the key entity used in SQS
Message consumption model	SNS uses push model as it pushes messages to consumers	SQS uses pull model as consumers pull messages from SQS
Consumer type	All consumers are expected to process the messages in different ways	All consumers are expected to be identical as the messages are configured in the same way
Persistence	Messages are lost if the consumer is unavailable	Messages persist even if the consumer is unavailable

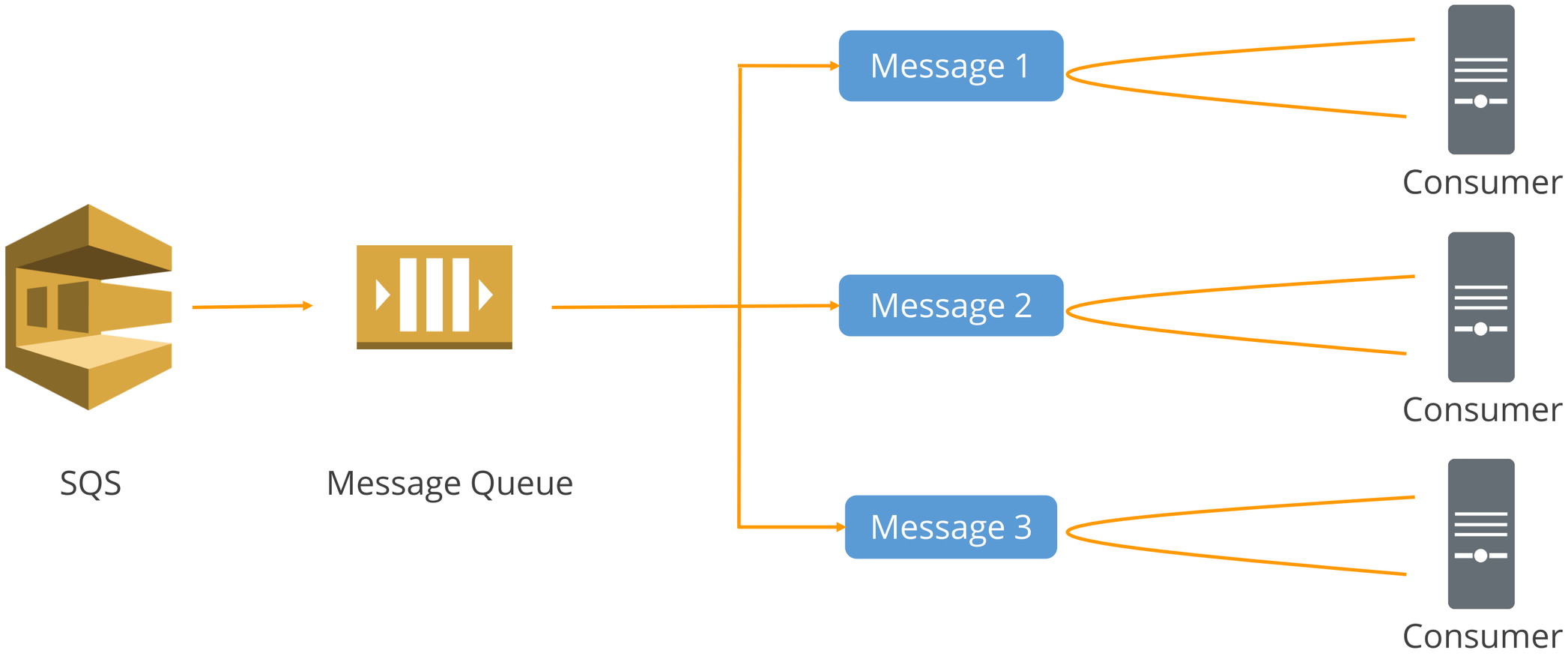
Push Model

In the push model, notifications are sent by Amazon SNS. They can be sent to various operating systems running on mobile devices such as iOS, Android, Windows, and more, in the form of emails and SMS messages.



Pull Model

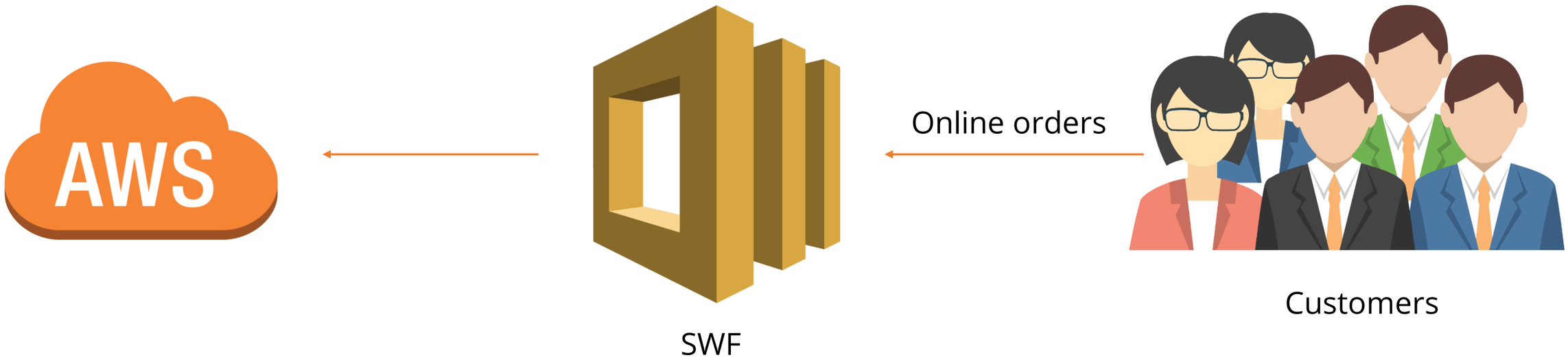
In the pull model, the consumers poll or pull messages from Amazon SQS.



Amazon Simple Workflow Service (SWF)

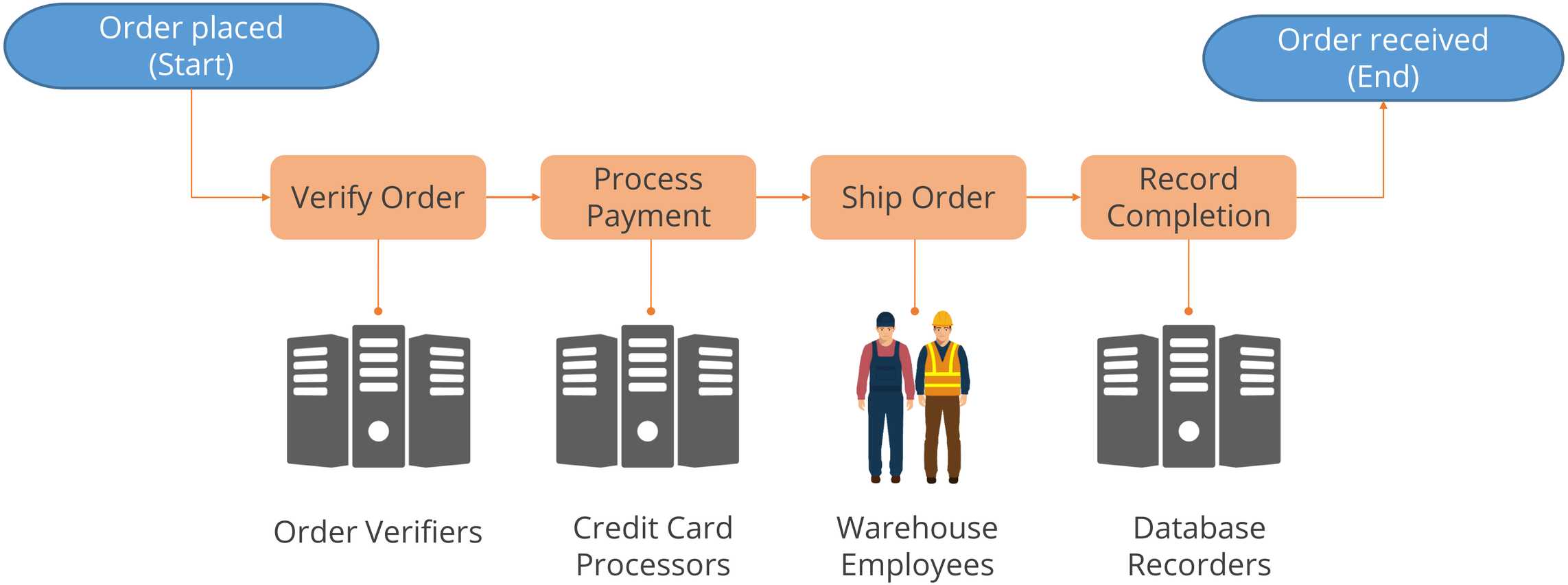
Amazon Simple Workflow Service

Amazon SWF helps developers build, run, and scale background jobs that have parallel or sequential steps. It is a fully-managed state tracker and task coordinator in the cloud.



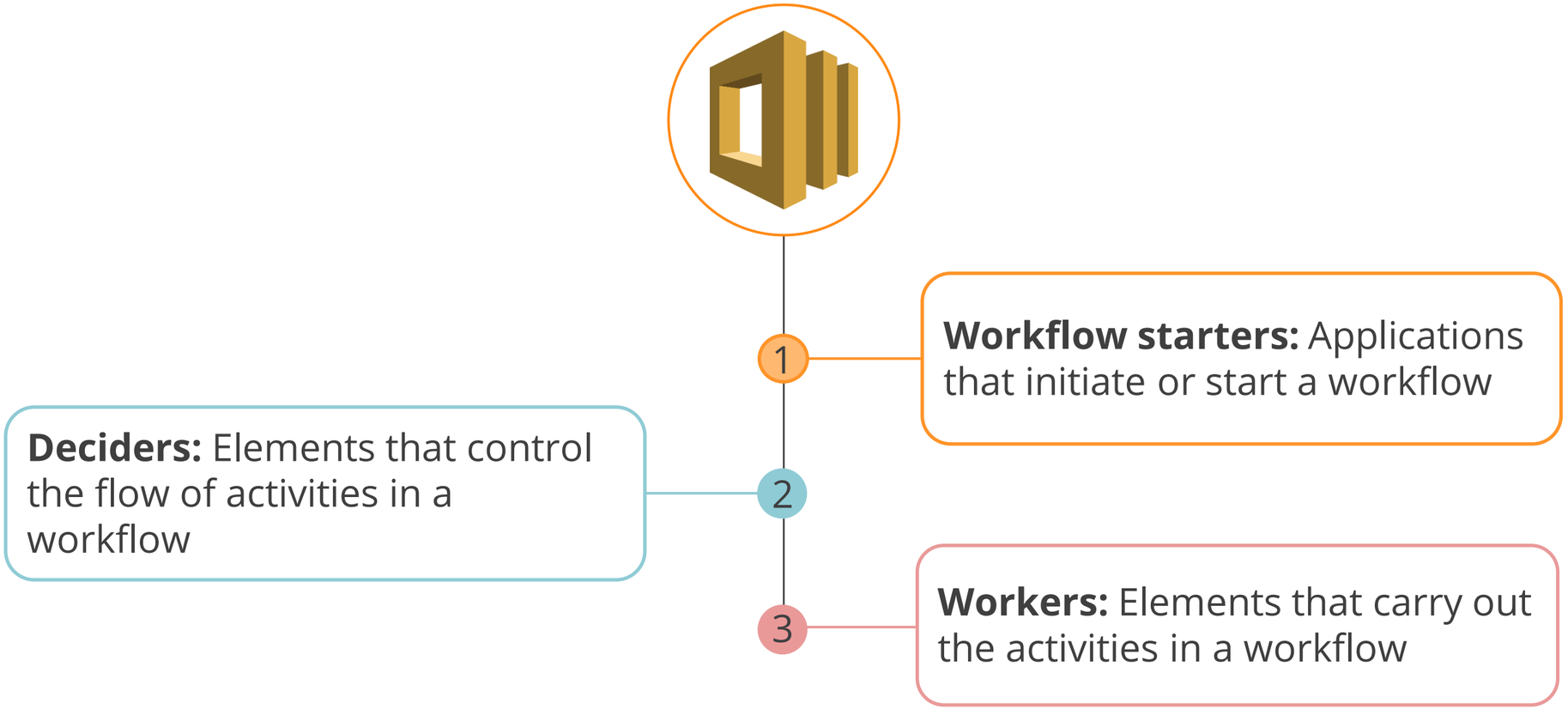
Example of Amazon SWF

Amazon.com uses SWF to manage their online orders. The following diagram depicts the workflow that is used by Amazon SWF for order management:



SWF Actors

While performing operations, Amazon SWF interacts with various programmatic elements called actors in SWF terminology. The following are the different types of SWF actors:



Amazon SWF vs. Amazon SQS

The following is a comparison between Amazon SWF and Amazon SQS based on various differential parameters:

Parameters	SWF	SQS
Message Retention Period	Up to 1 year	Up to 14 days
API	Task-oriented	Message-oriented
Delivery	Task can be assigned only once and can never be duplicated	Message can be delivered more than once
Tracking	In-built tracking of all the tasks and events is available	Requires the creation of application-level tracking system

Amazon API Gateway

What Is an API?

API stands for Application Programming Interface. It allows communication between two applications and is created for apps to access data, logic, and more.

Application Programming Interface

Amazon API Gateway

Amazon API Gateway is a fully-managed, scalable API management service that allows you to create, publish, maintain, monitor, and secure your API's.

Amazon API Gateway

Features of API Gateway

01	Stores responses for most common HTTP requests
02	Scales automatically
03	Cheaper than other gateways
04	Throttles requests to prevent attacks
05	Enables CORS to serve HTTP requests from other domains

Assisted Practice

Setting Up API Methods to Access an Amazon S3 Bucket

Duration: 10 min.

Problem Statement:

Set up and test an API method using the API Gateway.

Assisted Practice: Guidelines to Set Up API Methods to Access an Amazon S3 Bucket

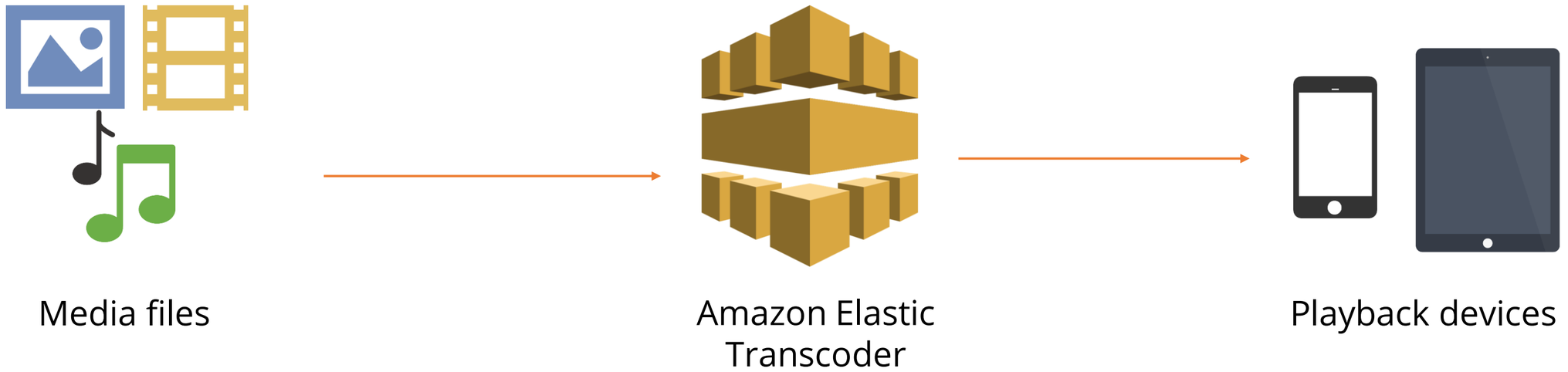
Steps to perform:

1. Go to the Amazon console
2. Navigate to the IAM dashboard
3. Set up IAM roles for the API
4. Go to the API Gateway dashboard
5. Create and expose a PUT method
6. Test the PUT method

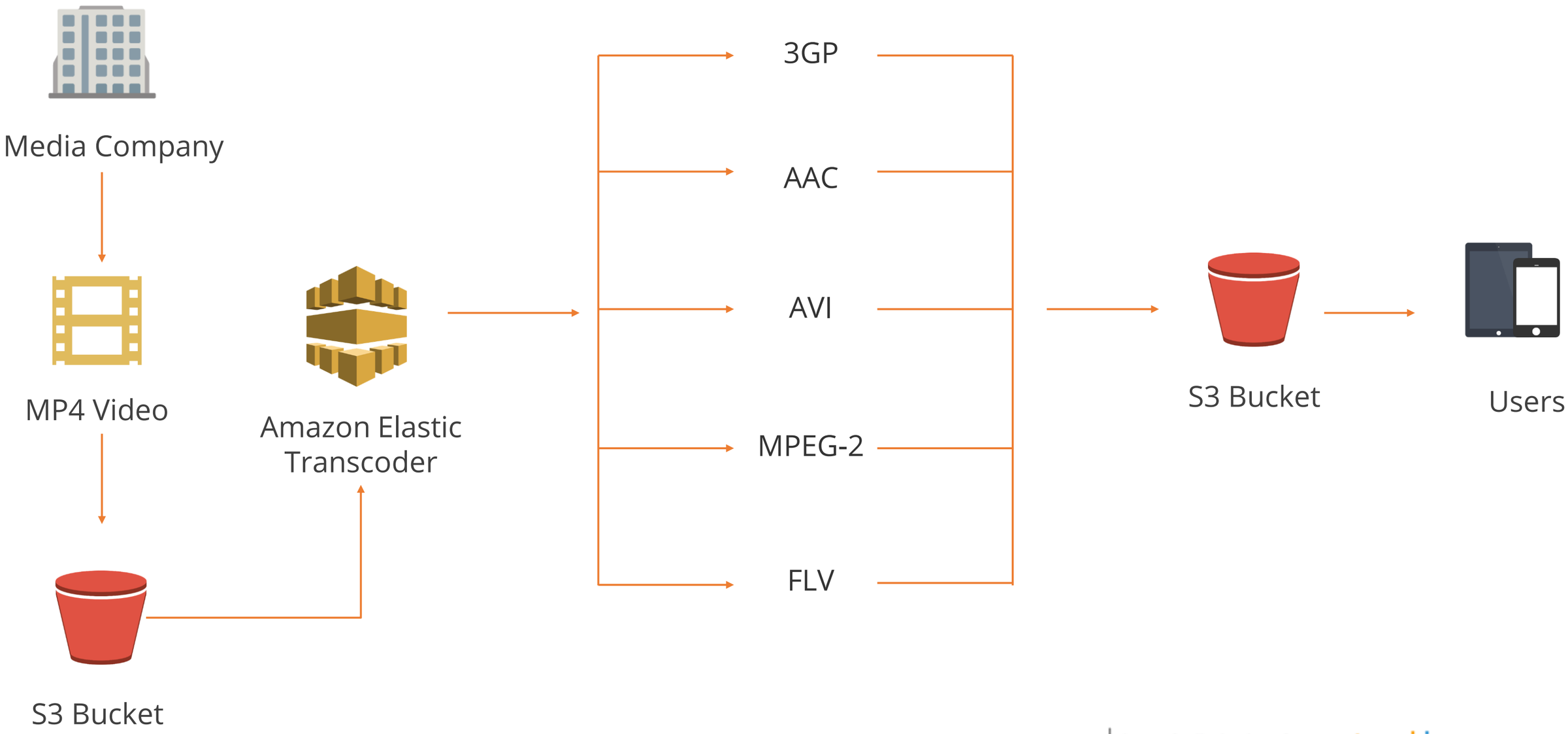
Amazon Elastic Transcoder

Amazon Elastic Transcoder

Amazon Elastic Transcoder is a media transcoding service in the cloud. It enables users to convert their media files stored in Amazon S3 into the format required by the consumer playback devices.



Example of Elastic Transcoder



Components of Amazon Elastic Transcoder

01

Jobs:
This component transcodes the media files. Each job can convert a media file into up to 30 formats.

02

Pipelines:
This component is the queue that manages multiple jobs. If the user creates a new job and the pipeline already contains a job, then the Elastic Transcoder queues the newest job.

03

Presets:
This component is the template that contains most of the settings used by the jobs to convert a media file from one format to the other.

04

Notifications:
This component lets the users configure Elastic Transcoder with Amazon SNS to keep track of the job status.

Amazon Kinesis

Amazon Kinesis

Amazon Kinesis is a fully managed and scalable service that allows real-time collection, processing, and analysis of streaming data.

Amazon Kinesis

Amazon Kinesis Capabilities

Kinesis Data Streams: It allows you to build custom applications to process data in real-time.

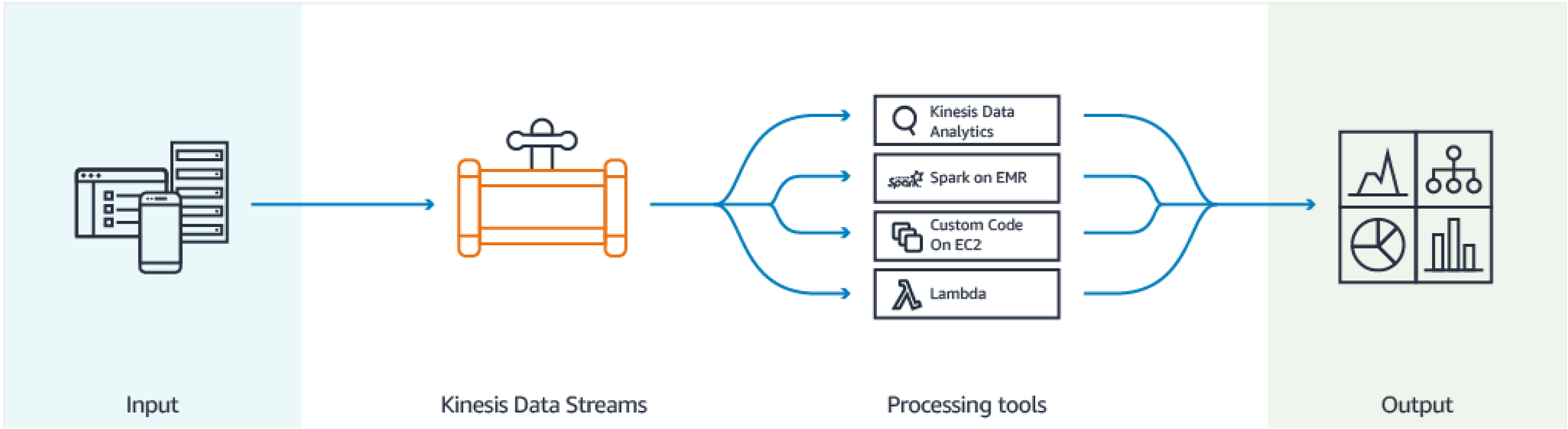
Kinesis Videos Streams : It allows you to securely stream videos from connected devices to AWS for processing.

Kinesis Data Firehose: It allows you to capture, transform, and load data into AWS data stores.

Kinesis Data Analytics: It runs queries against the data in real-time.

Amazon Kinesis Data Streams

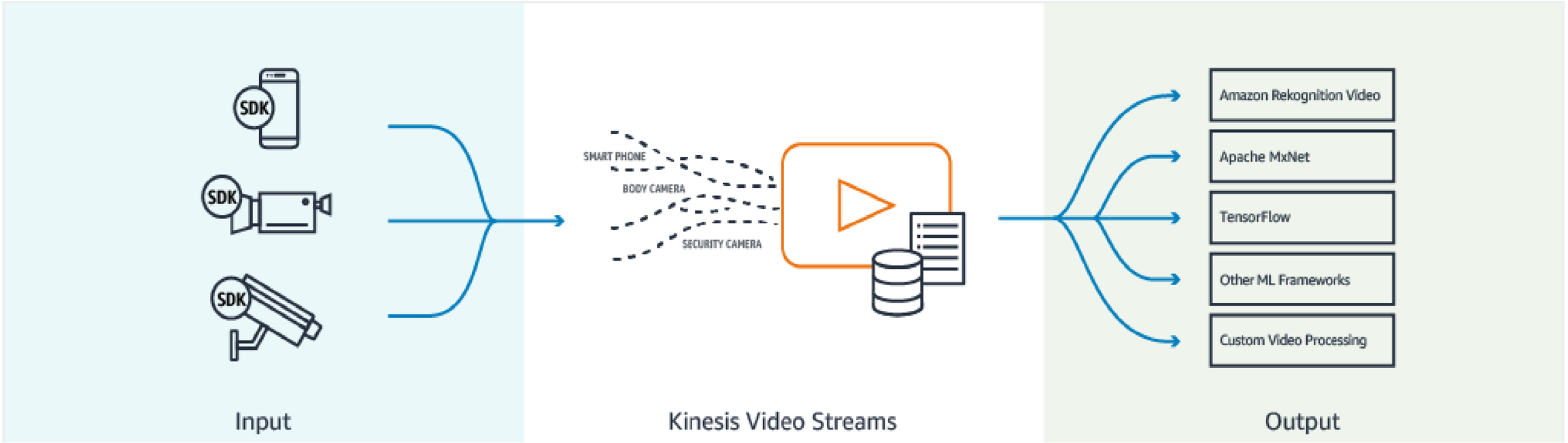
The following diagram shows the working of Amazon Kinesis Data Streams:



Source: aws.amazon.com

Amazon Kinesis Video Streams

The following diagram shows the working of Amazon Kinesis Video Streams:

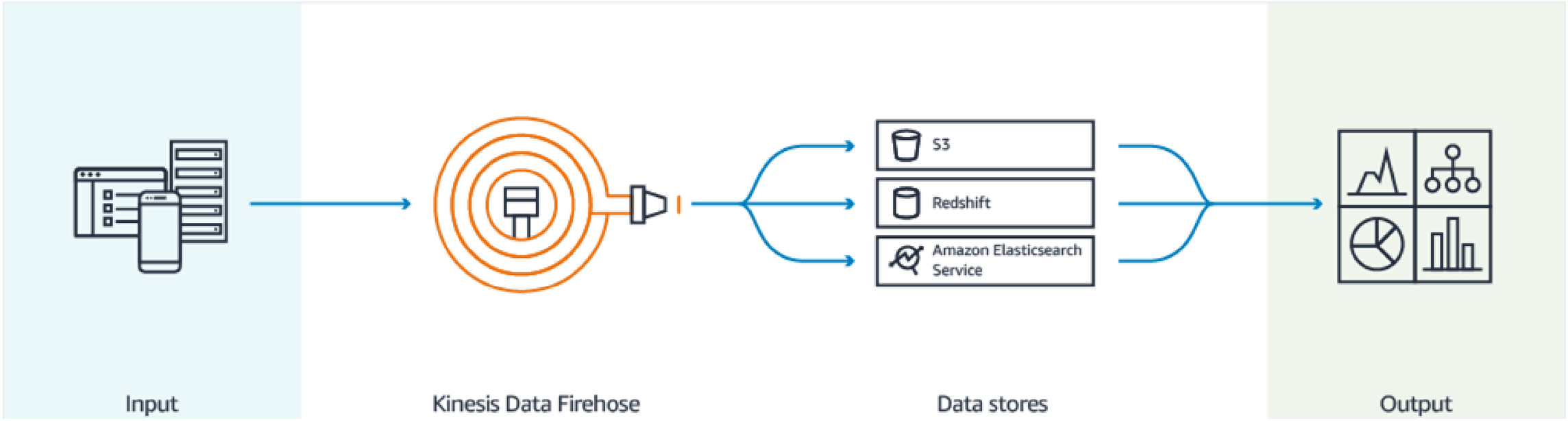


Step 1 **Step 2** **Step 3**

Source: aws.amazon.com

Amazon Kinesis Data Firehose

The following diagram shows the working of Amazon Kinesis Data Firehose:



Step 1 **Step 2** **Step 3** **Step 4**

Source: aws.amazon.com

Amazon Kinesis Data Analytics

The following diagram shows the working of Amazon Kinesis Data Analytics:

Step 1 **Step 2** **Step 3**

Source: aws.amazon.com

Application Services Best Practices

SQS Best Practices

The following are the AWS recommended Application Services best practices:

SQS

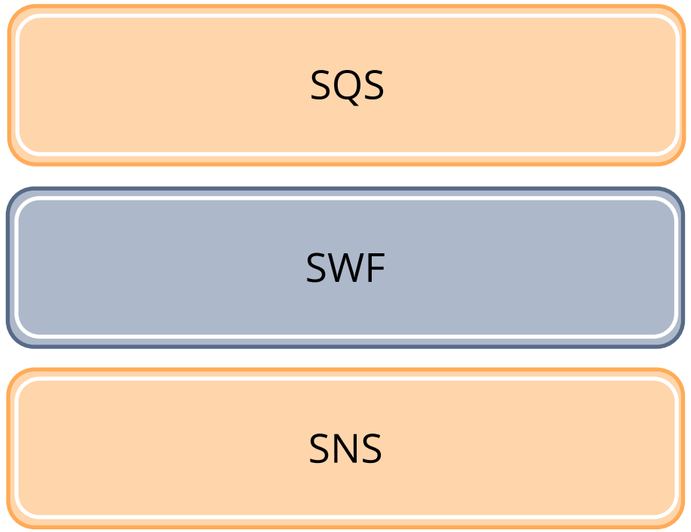
SWF

SNS

- SQS helps the users to architect stateless applications and use asynchronous integration.
- It creates a message queue so that resources can process a task and send the information back to SQS.
- Asynchronous integration involves the use of an intermediate storage layer like SQS.

SWF Best Practices

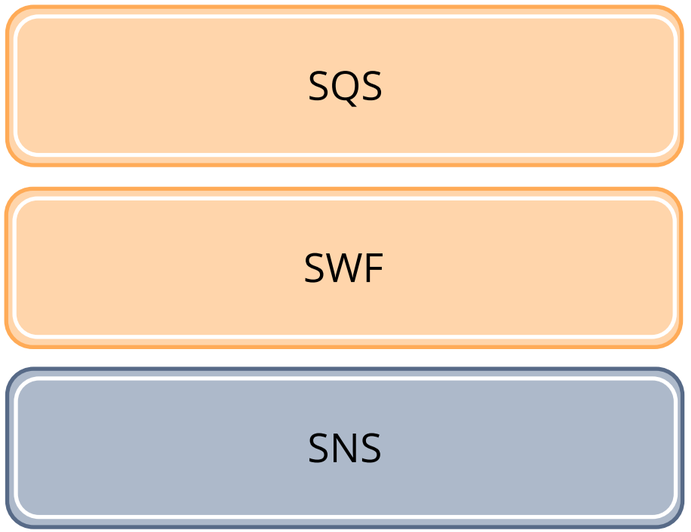
The following are the AWS recommended Application Services best practices:



- SWF is used while coordinating and tracking tasks that have parallel or sequential steps and involve more than just AWS resources.
- It is used to coordinate tasks without a given framework.

SNS Best Practices

The following are the AWS recommended Application Services best practices:

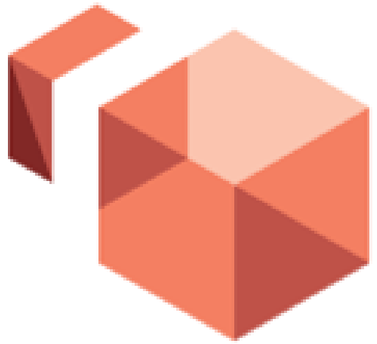


- SNS is used to keep you informed about any events occurring with your AWS resources.
- It pushes notifications to Lambda to create distributed processes that do not rely directly on each other.

Amazon WorkSpaces

Amazon WorkSpaces

Amazon WorkSpaces is a fully managed and secure Desktop-as-a-Service solution that runs on AWS. It enables users to provision virtual and cloud-based Microsoft Windows or Amazon Linux desktops known as WorkSpaces.



Amazon WorkSpaces

Amazon WorkSpaces

More about Amazon WorkSpaces:

01	Amazon WorkSpaces can run on Windows 7 and Windows 10.
02	Users can bring their own licenses or purchase them from AWS Marketplace.
03	Users can use the same tools to manage WorkSpaces and on-premises desktops.
04	Amazon WorkSpaces throttles requests to prevent attacks.
05	AWS offers monthly and hourly pricing for Amazon WorkSpaces.

Introduction to AWS Serverless Services

What Are AWS Serverless Services?

AWS serverless services help users to build and run applications without having to worry about provisioning, maintaining, and managing the servers.

AWS serverless services

Why Use AWS Serverless Services

AWS serverless services eliminate the following infrastructure management tasks:

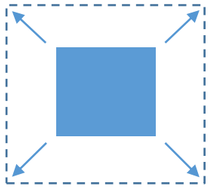
- Server or cluster provisioning
- Operating system maintenance
- Software and hardware patching
- Compute capacity provisioning

Benefits of AWS Serverless Services

The following are the benefits of AWS serverless services:

01 **No Server Management**

02 **Flexible Scalability**



03 **Pay for Value**

04 **High Availability**

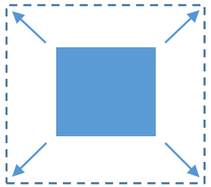
Users need not provide or maintain servers. There is no software or runtime that needs to be installed, maintained, or administered from the user's end.

Benefits of AWS Serverless Services

The following are the benefits of AWS serverless services:

01 **No Server Management**

02 **Flexible Scalability**



03 **Pay for Value**

04 **High Availability**

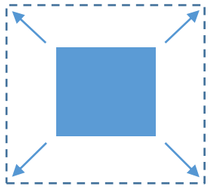
AWS serverless services allow the applications to be scaled up or down automatically.

Benefits of AWS Serverless Services

The following are the benefits of AWS serverless services:

01 No Server Management

02 Flexible Scalability



03 Pay for Value

04 High Availability

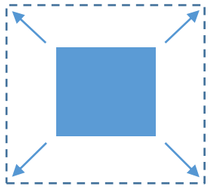
Users are charged for the consistent throughput or execution duration of the services rather than by server units.

Benefits of AWS Serverless Services

The following are the benefits of AWS serverless services:

01 **No Server Management**

02 **Flexible Scalability**



03 **Pay for Value**

04 **High Availability**

AWS serverless services provide built-in availability and fault tolerance to the applications running on them.

AWS Lambda

What Is AWS Lambda?

AWS Lambda is a serverless compute service that allows users to run code without provisioning or managing servers. It executes the code only when needed and scales automatically, from a few requests per day to thousands per second.

AWS Lambda

Terminologies in AWS Lambda

The following are the terminologies used in context with AWS Lambda:

01	02	03
Function	**Qualifier**	**Runtime**

A function is a resource that contains a code to process events and a runtime to pass requests between Lambda and the function code.

Terminologies in AWS Lambda

The following are the terminologies used in context with AWS Lambda:

01	02	03
Function	Qualifier	Runtime

Qualifier is used to specify a version or an alias for a Lambda function.

Terminologies in AWS Lambda

The following are the terminologies used in context with AWS Lambda:

01	02	03
Function	**Qualifier**	**Runtime**

Runtimes allow function code written in different languages to run in the same base execution environment. Users are required to choose a runtime that matches the programming language of the code.

Terminologies in AWS Lambda

The following are the terminologies used in context with AWS Lambda:

04	05	06
Event	**Concurrency**	**Trigger**

An event is a JSON formatted document that contains data for a function to process. It is converted to an object and passed to the function code.

Terminologies in AWS Lambda

The following are the terminologies used in context with AWS Lambda:

04	05	06
Event	Concurrency	Trigger

Concurrency is the number of requests that a function is serving at any given time. Users can configure their functions to limit their concurrency.

Terminologies in AWS Lambda

The following are the terminologies used in context with AWS Lambda:

04	05	06
Event	Concurrency	Trigger

A trigger is a resource that invokes a Lambda function. It can be an AWS service, an application, or an event.

Assisted Practice

Setting UP an API with Lambda Proxy Integration

Duration: 15 min.

Problem Statement:

Set up an API with Lambda Proxy Integration

Assisted Practice: Guidelines to Set Up an API with Lambda Proxy Integration

Steps to perform:

1. Go to your Amazon Console
2. Open the Lambda dashboard
3. Create a Lambda function
4. Fill in the details about the function
5. Skip to the review page and click on the Save function button

AWS Serverless Application Model

AWS Serverless Application Model

The AWS Serverless Application Model (AWS SAM) is an open-source framework that can be used to build serverless applications on AWS.

AWS SAM consists of the following components:

01 AWS SAM template specification

02 AWS SAM command line interface

Components of AWS SAM

01 AWS SAM template specification

AWS SAM template specification is used to define the serverless application. It provides simple syntax to describe the functions, APIs, permissions, configurations, and events that make up a serverless application.

Components of AWS SAM

02 AWS SAM command line interface

AWS SAM CLI is used to build the serverless applications that are defined by AWS SAM template specifications. It provides commands that users can use to verify the AWS SAM templates, invoke Lambda functions, start local debugging, package and deploy serverless applications on AWS cloud, and so on.

Benefits of Using AWS SAM

1

Single-deployment configuration

AWS SAM makes it is easy to organize all the related components and resources.

2

Built-in best practices

AWS SAM can be used to define and deploy infrastructure as config.

3

Local debugging and testing

AWS SAM CLI lets users locally build, test, and debug serverless applications that are defined by AWS SAM templates.

Amazon Elastic Container Service

What Is a Container?

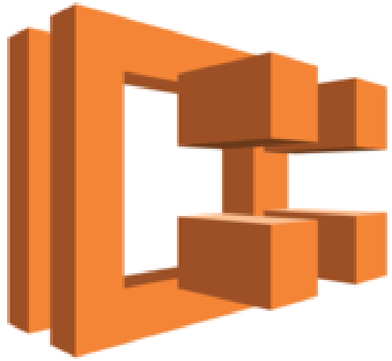
A container is a standardized unit of software development, containing everything that your software application needs to run such as code, runtime, system tools, system libraries, and more.

More about containers:

01	Containers are created from a read-only template called an image.
02	Images are text files that specify all the components of a container.

Amazon Elastic Container Service

Amazon Elastic Container Service (Amazon ECS) is a highly scalable, fast, container management service that makes it easy to run, stop, and manage containers on a cluster. It enables users to launch and stop container-based applications with simple API calls.



Amazon Elastic Container Service

Amazon Elastic Container Service

More about Amazon Elastic Container Service:

01	Amazon ECS enables users to run containers on a cluster of Amazon EC2.
02	It scales, monitors, and manages the cluster of Amazon EC2 instances.
03	It can be used to manage the instances through both an API and the Amazon Management Console.
04	It can be used to create a consistent deployment and build experience, and manage Extract-Transform-Load (ETL) workloads.

Terminologies in Amazon ECS

The following are the terminologies used in context with Amazon ECS:

01	02	03	04
Container instance	**Task definition**	**Task**	**Service**

Container instance is an EC2 instance that is part of an ECS cluster and is pre-installed with Docker.

Terminologies in Amazon ECS

The following are the terminologies used in context with Amazon ECS :

01	02	03	04
Container instance	Task definition	Task	Service

A task definition is a text file in JSON format that describes one or more containers that make up an application.

Terminologies in Amazon ECS

The following are the terminologies used in context with Amazon ECS:

01	02	03	04
Container instance	Task definition	Task	Service

A task is the instantiation of a task definition on a container instance within the cluster.

Terminologies in Amazon ECS

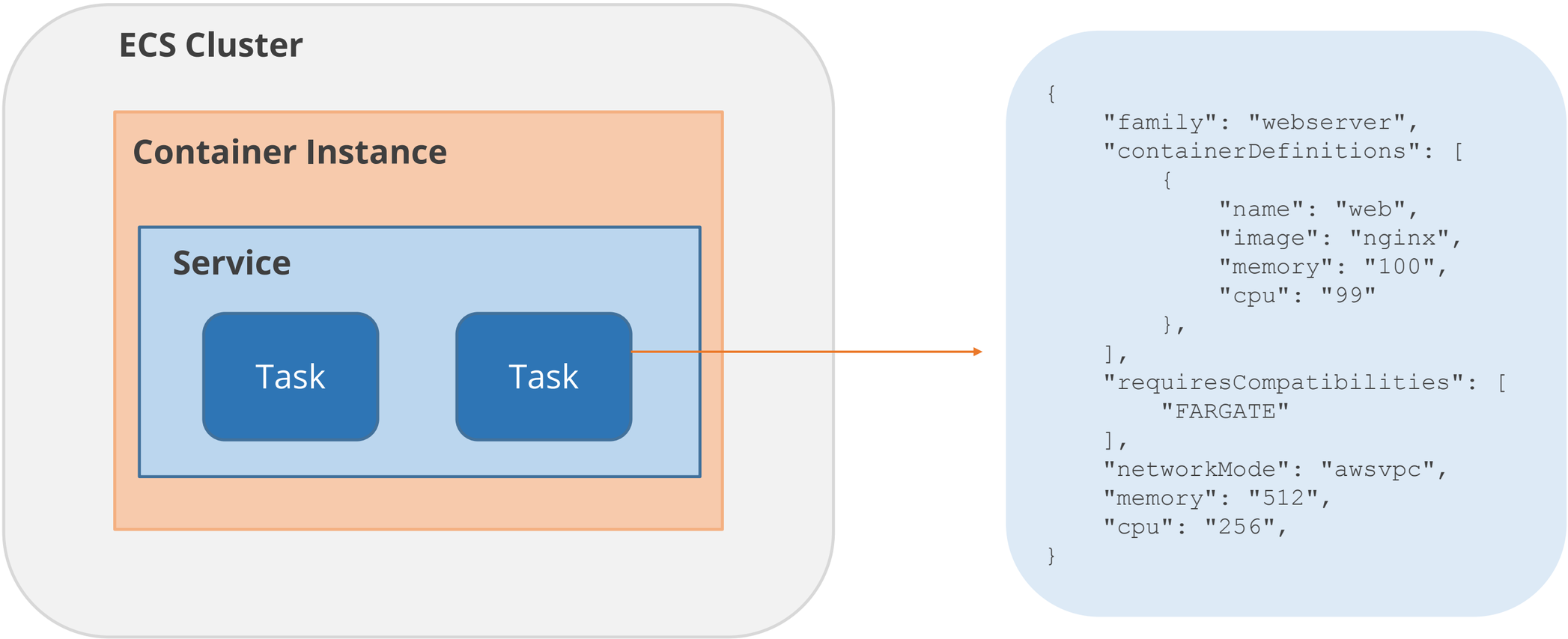
The following are the terminologies used in context with Amazon ECS:

01	02	03	04
Container instance	Task definition	Task	Service

A service defines the maximum and minimum tasks from one task definition at any given time.

Working of Amazon ECS

The following diagram shows the working of Amazon ECS:



Key Takeaways

- Amazon SQS is a fast, reliable, scalable, and fully managed message queuing service. It can be used to control workflow processes.
- Amazon SNS is a fully managed publication-subscription based messaging service used to send push notifications, emails, and SMS messages.
- Amazon SWF is a fully-managed task coordinator and tracker that allows you to build, run, and scale background jobs that have parallel or sequential steps.
- Amazon Kinesis is a fully managed and scalable service that allows real-time collection, processing, and analysis of streaming data.

Key Takeaways

- Amazon WorkSpaces is a fully managed and secure Desktop-as-a-Service (DaaS) solution which runs on AWS.
- AWS Lambda is a serverless compute service that allows the users to run codes without provisioning or managing servers.
- Amazon ECS is a highly scalable, high-performance container management service that allows users to run distributed application on a managed cluster of Amazon EC2 instances.

Lesson-End Project

Duration: 60 min.

Build a Serverless Website in the AWS Cloud

Problem Statement:

You have been asked to build a serverless website in the AWS cloud.

Perform the following:

- Create a Lambda Blueprint
- Configure and create the Lambda function
- Invoke the Lambda function
- Verify the Lambda function results
- Monitor the metrics
- Delete the Lambda function