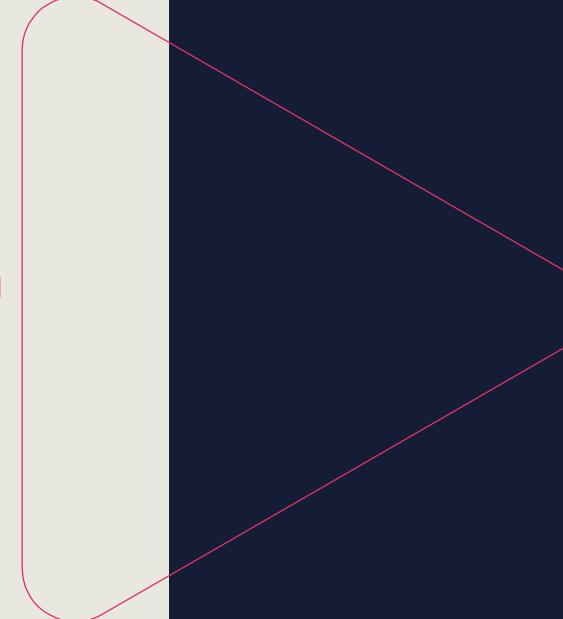




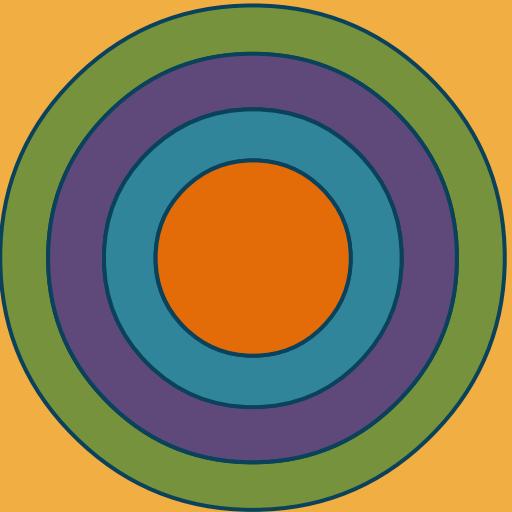
# Welcome Back to AWS Cloud Practitioner

Your instructors:

**Michael  
and  
Irfan**



**Class will begin at  
11:00 A.M. Eastern  
Standard Time (EST)**



# Choosing the Right Region

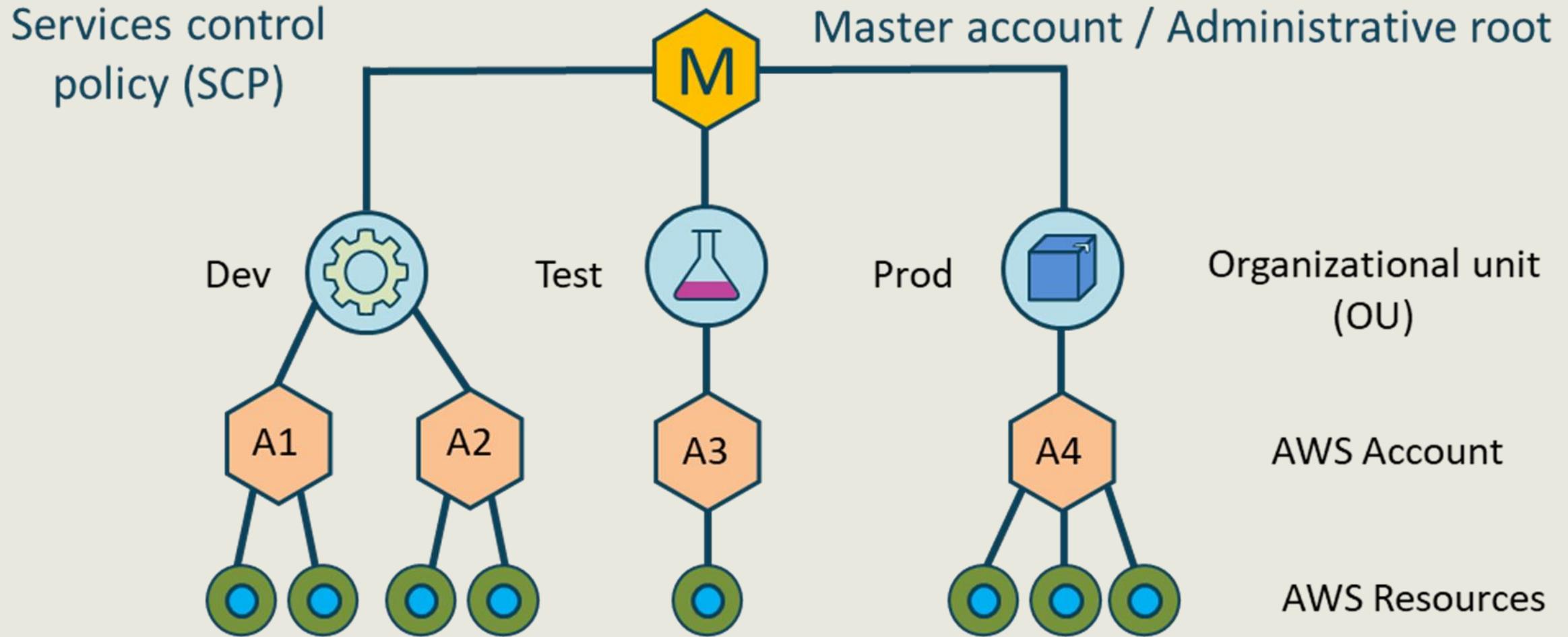
- When selecting the proper Region for your services, data, and applications, consider the following 4 business factors:
  - Compliance with data governance and legal requirements
  - Proximity to your customers
  - Available services within a Region
  - Pricing

## Administer AWS from a Master Account

- AWS Organizations provide policy-based management for multiple AWS accounts
  - Create groups of accounts
  - Automate account creation using console and APIs
  - Apply and manage policies for account groups
- Enables you to simplify costs and take advantage of quantity discounts with a **single consolidated bill**
- Centrally manage **Service Control Policies (SCPs)** across multiple accounts without using custom scripts or manual processes

AWS  
Organizations

# AWS Organizations



# AWS Control Tower

- Enterprises with multiple AWS accounts can use Control Tower to easily set up and manage a secure, multi-account environment based on established best practices
- Operators can provision new AWS accounts with a few clicks and be confident that they conform to organizational governance and policies
- Excellent solution if you are:
  - Building a new AWS environment
  - Beginning a journey to AWS
  - Launching a new cloud initiative
  - Working with existing accounts



# AWS Support Models

- **Basic**
- **Developer**
- **Business**
- **Enterprise**

Basic is the only free plan



# Business and Enterprise Plans

- Only these plans can use AWS Shield Advanced due to 24/7 support teams
- AWS Infrastructure Event Management (IEM) offers architecture and scaling guidance along with operational support for an additional fee
- AWS Support API provides programmatic access to some of the features of the AWS Service Catalog for support case management operations and Trusted Advisor operations (to access the checks)
- Enterprise plans only get the Concierge Support Team
- Get access to all 115 Trusted Advisor checks (14 cost optimization, 17 security, 24 fault tolerance, 10 performance, and 50 service limits) and associated recommendations

# Trusted Advisor



- Online tool that offers real time guidance on provisioning resources using AWS best practices
- “Checks” help to optimize an AWS infrastructure, increase security, enhance performance, reduce total costs, and monitor service limits
- AWS Basic and Developer Support plan customers get 7 security checks and 50 service limit (quota) checks:
  - S3 Bucket Permissions
  - Security Groups - Specific Ports Unrestricted
  - IAM Use
  - MFA on Root Account
  - EBS and RDS Public Snapshots

# AWS Trusted Advisor

Trusted Advisor Manager x

Secure | https://console.aws.amazon.com/trustedadvisor/home?region=us-east-2#/category/security

Dashboard  
Cost Optimization  
Performance  
**Security**  
Fault Tolerance  
Service Limits  
Preferences

## Security

5 ✓ 0 ▲ 1 !

### Security Checks

MFA on Root Account  
Checks the root account and warns if multi-factor authentication (MFA) is not enabled.  
MFA is not enabled on the root account.

Amazon EBS Public Snapshots  
Checks the permission settings for your Amazon Elastic Block Store (Amazon EBS) volume snapshots and alerts you if any snapshots are marked as public.  
0 EBS snapshots are marked as public.

Amazon RDS Public Snapshots  
Checks the permission settings for your Amazon Relational Database Service (Amazon RDS) DB snapshots and alerts you if any snapshots are marked as public.  
0 RDS snapshots are marked as public.

Amazon S3 Bucket Permissions  
Checks buckets in Amazon Simple Storage Service (Amazon S3) that have open access permissions or allow access to any authenticated AWS user.  
0 of 1 buckets have permission properties that grant global access.

IAM Use  
Checks for your use of AWS Identity and Access Management (IAM).  
At least one IAM user has been created for this account.

Security Groups - Specific Ports Unrestricted  
Checks security groups for rules that allow unrestricted access (0.0.0.0/0) to specific ports.  
0 of 0 security group rules allow unrestricted access to a specific port.

Upgrade your Support plan to unlock all Trusted Advisor recommendations!  
You will have access to technical support from a cloud support engineer, with phone and chat support, support API, Identity and Access Management, Architecture support - use case guidance, and more.

# Identity and Access Management (IAM)

- Identity and Access Management is a core AWS security service that enables the secure control of access to AWS resources
- IAM manages who is signed in (authenticated) and has permissions (authorized) to use resources

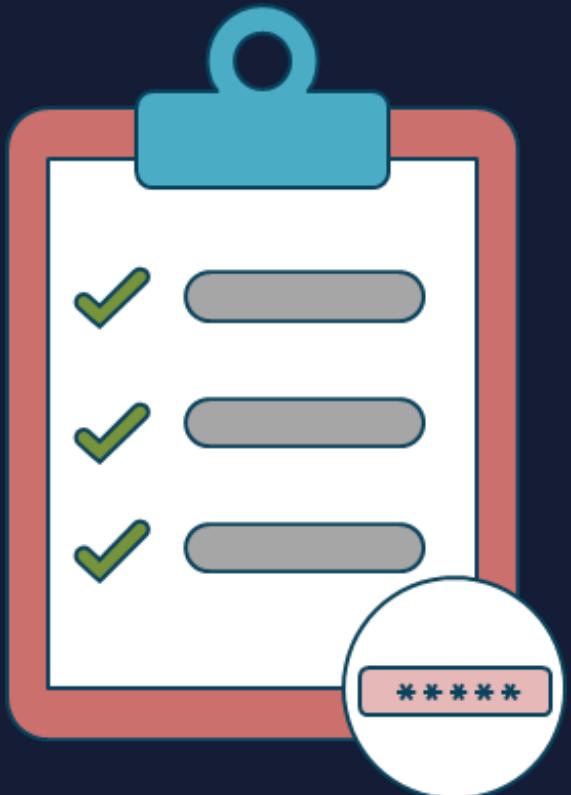


# IAM and the Root User Account



- The AWS account root user is separate from IAM
- The Root user is a single standalone sign-in identity
- The root user has total access to all AWS services and resources in the account
- Do not use the root user account for common tasks
- Use the root user only to create your first IAM highest privilege administrative user

# IAM Password Policies



- Password policies apply to all IAM users but not to the root account user
- Must have a minimum of 8 characters and a maximum of 128 characters
- Cannot be identical to your AWS account name or e-mail address



# Accessing IAM

- AWS Management Console
- AWS command line tools
- AWS software development kits – SDKs
- IAM HTTPS API

# Configuring CLI Access

The screenshot shows the AWS IAM Management Console interface. At the top, the title bar reads "IAM Management Console". Below it, the address bar shows the URL "https://console.aws.amazon.com/iam/home#/users\$new?step=final&accessKey&login". The main navigation bar includes "Services", "Resource Groups", and "Global". On the right, there are links for "shankhantoo", "Global", and "Support".

The central area is titled "Add user" and displays a progress bar with four steps: 1 Details, 2 Permissions, 3 Review, and 4 Complete. Step 4 is highlighted with a blue circle and labeled "Complete".

A green box contains a "Success" message: "You successfully created the users shown below. You can view and download user security credentials. You can also email users instructions for signing in to the AWS Management Console. This is the last time these credentials will be available to download. However, you can create new credentials at any time." It also includes a link: "Users with AWS Management Console access can sign-in at: <https://219258942154.signin.aws.amazon.com/console>".

Below this, there is a "Download .csv" button and a table showing the newly created user:

	User	Access key ID	Secret access key	Email login instructions
<input checked="" type="checkbox"/>	Administrator	AKIAIBX4IGZMHPPV4XA	<a href="#">***** Show</a>	<a href="#">Send email</a>

At the bottom right of the table is a "Close" button.

The footer of the page includes links for "Feedback", "English (US)", "© 2008 - 2018, Amazon Web Services, Inc. or its affiliates. All rights reserved.", "Privacy Policy", and "Terms of Use".

# Configuring CLI Access

## AWS Command Line Interface

<https://aws.amazon.com/cli/>

The AWS Command Line Interface (CLI) is a unified tool to manage your AWS services. With just one tool to download and configure, you can control multiple AWS services from the command line and automate them through scripts.

The AWS CLI introduces a new set of simple [file commands](#) for efficient file transfers to and from Amazon S3.



[Getting Started »](#)

[CLI Reference »](#)

[GitHub Project »](#)

[Community Forum »](#)

### Windows

Download and run the [64-bit or 32-bit](#) Windows installer.

### Mac and Linux

Requires [Python 2.6.5](#) or higher.  
Install using [pip](#).

```
pip install awscli
```

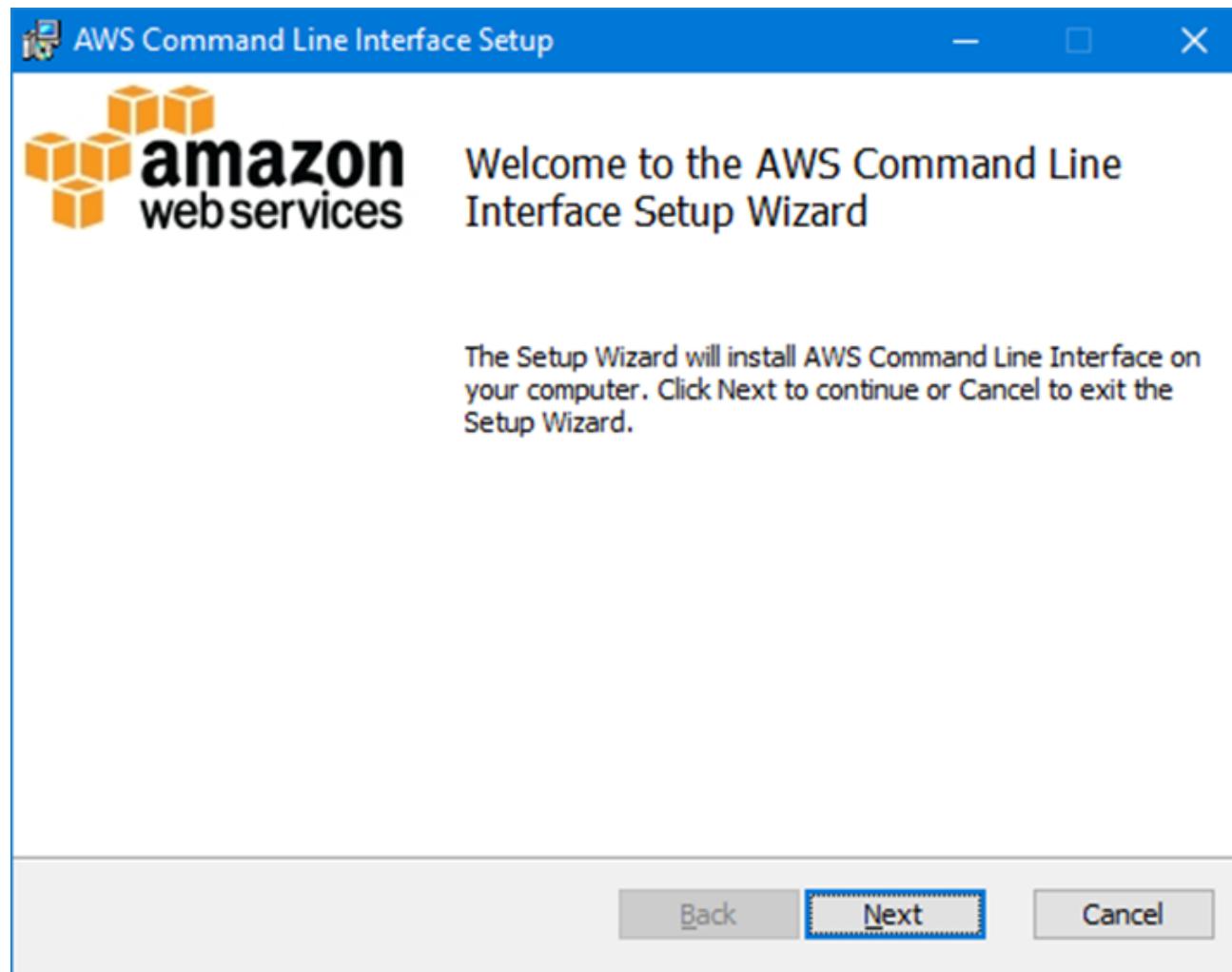
### Amazon Linux

The AWS CLI comes pre-installed on [Amazon Linux AMI](#).

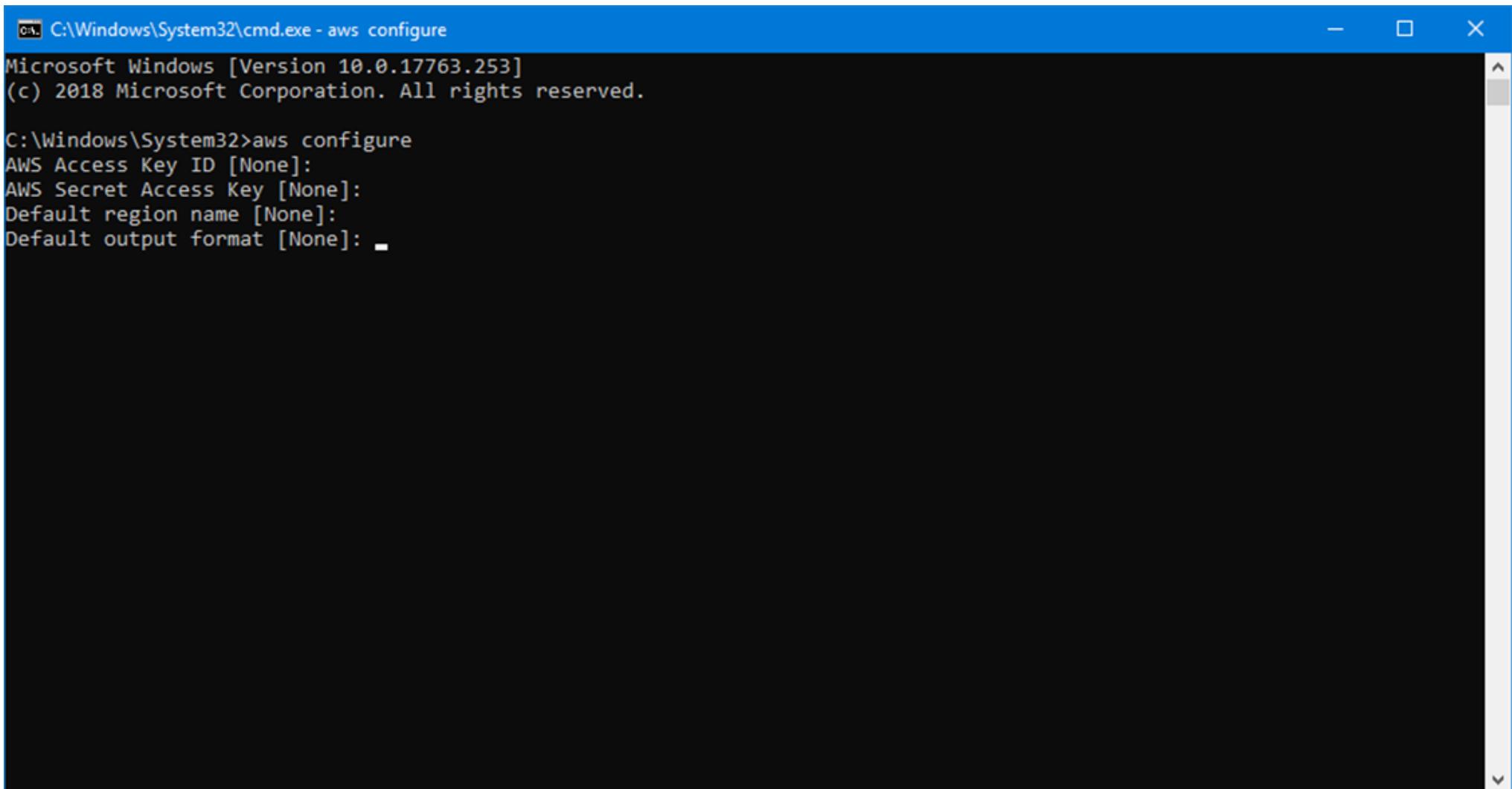
### Release Notes

Check out the [Release Notes](#) for more information on the latest version.

# Configuring CLI Access



# Configuring CLI Access



A screenshot of a Windows Command Prompt window titled "C:\Windows\System32\cmd.exe - aws configure". The window shows the following text:

```
Microsoft Windows [Version 10.0.17763.253]
(c) 2018 Microsoft Corporation. All rights reserved.

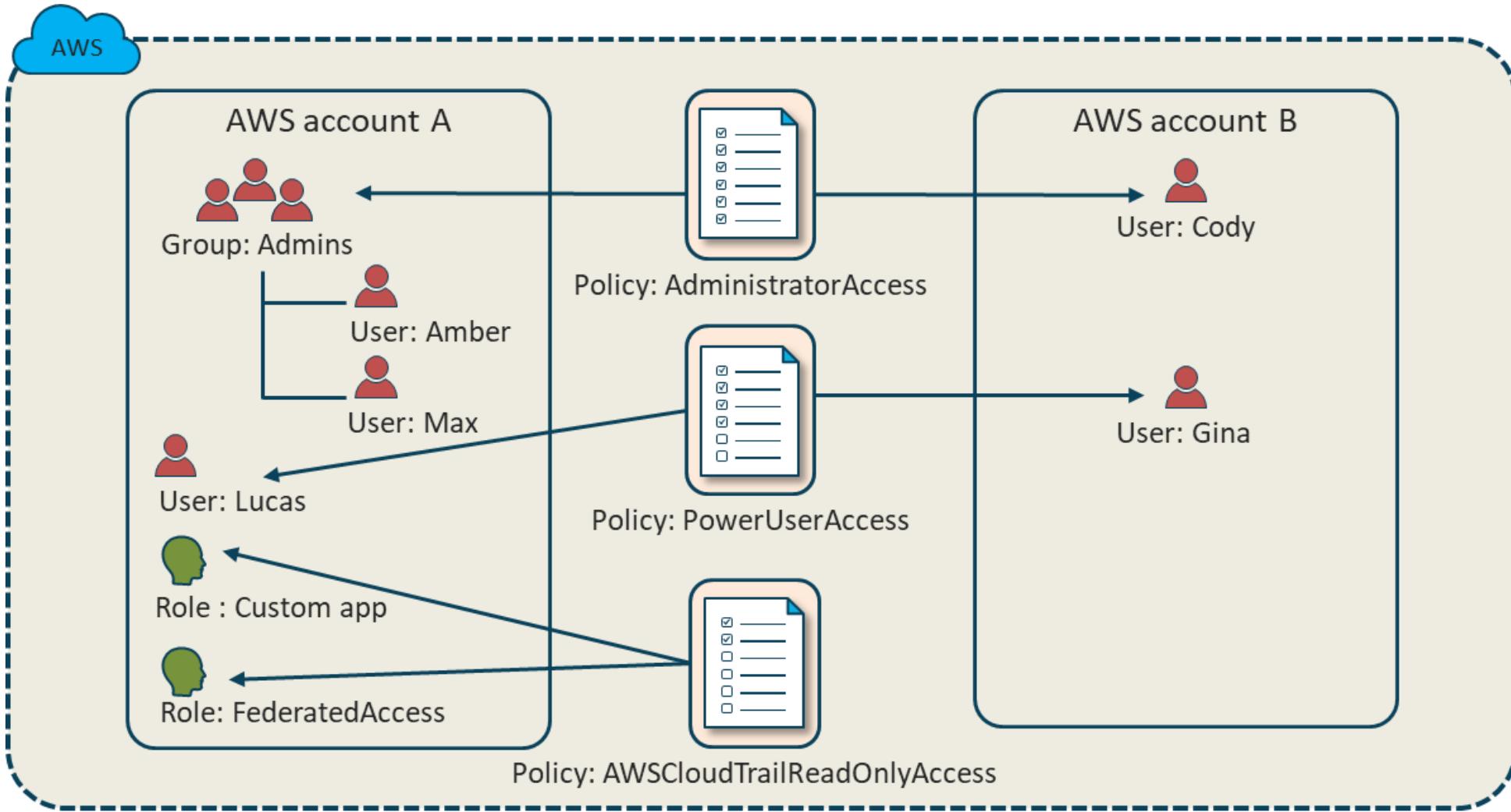
C:\Windows\System32>aws configure
AWS Access Key ID [None]:
AWS Secret Access Key [None]:
Default region name [None]:
Default output format [None]:
```

# IAM Managed Policies



- A standalone permission set that is created and administered by AWS
- Standalone policies have their own Amazon Resource Name (ARN) that includes the policy name.
- For example:  
**arn:aws:iam::aws:policy/IAMReadOnlyAccess**
- They are intended to offer permissions for many common AWS use cases
  - Full-access
  - Power-user
  - Partial-access

# AWS Managed Policies

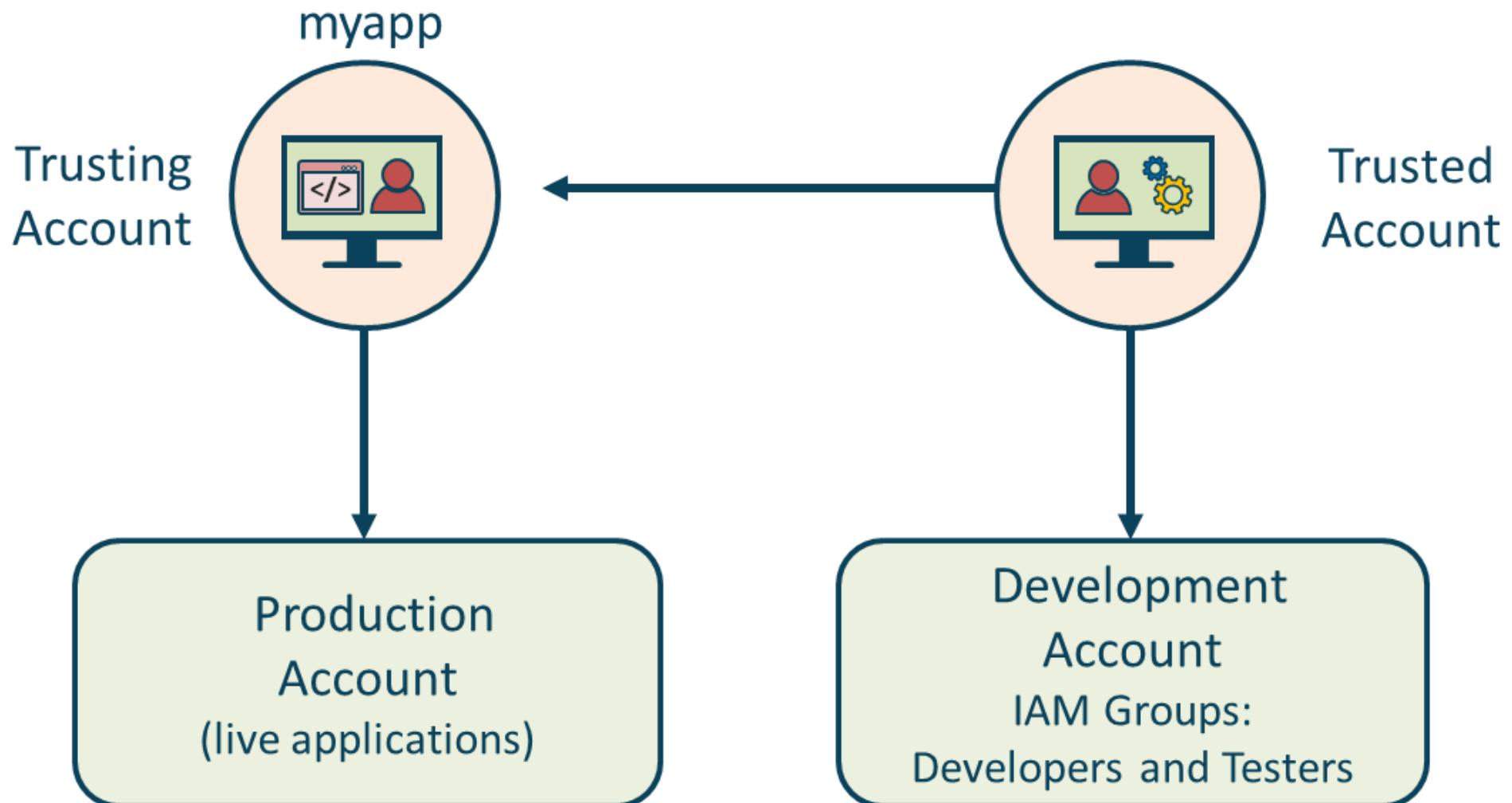


# IAM Roles



- Identity that has permission assigned
- Intended to be assumed by a user, application, or service
- Does not have long-term credentials like passwords or keys
- AWS offers temporary credentials for the lifetime of session
- Often used to give access to identities outside of AWS

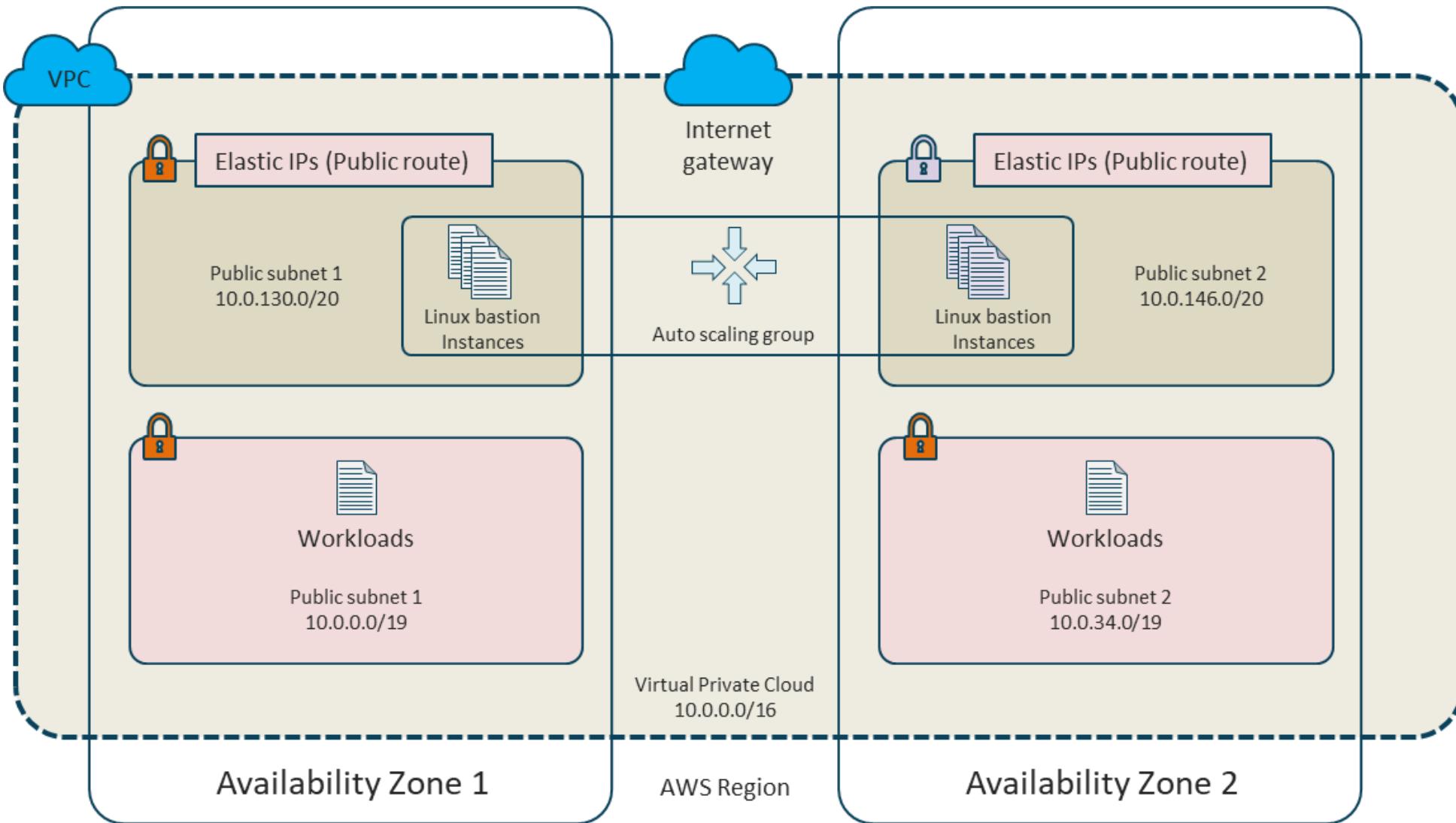
# IAM Roles



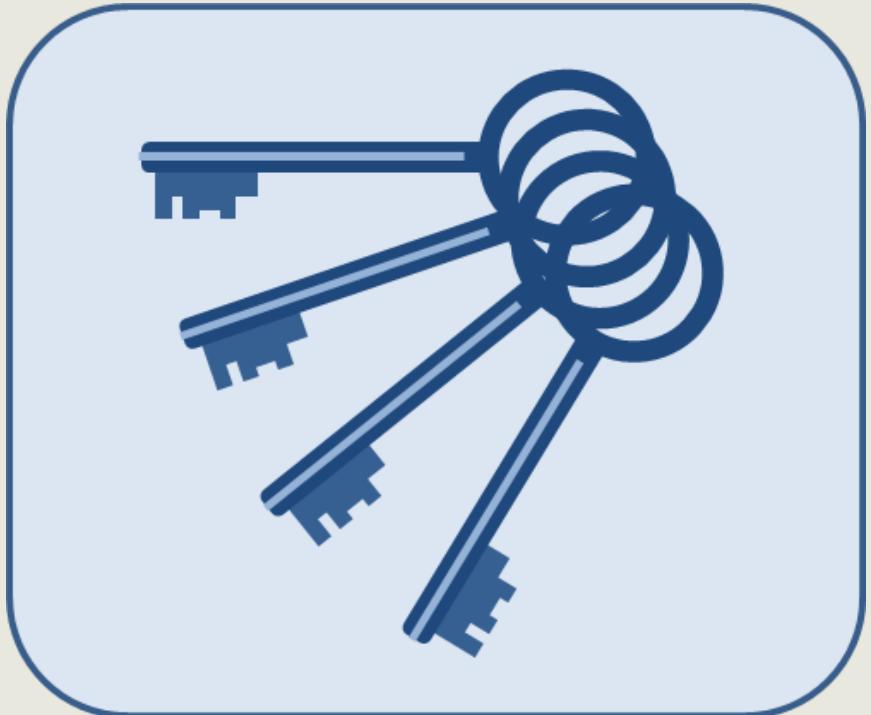
# AWS STS Temporary Credentials

- A web service for creating temporary credentials
  - In your own code
  - Command-line-interface
  - Third-party tools
- Assumes necessary IAM roles with the trusted relationship
- Generates temporary, time-limited permission-based credentials only for a validity period
- Two ways to generate temporary credentials
  - Generate them with the CLI
  - Create from your code

# Bastion (Jump) Hosts

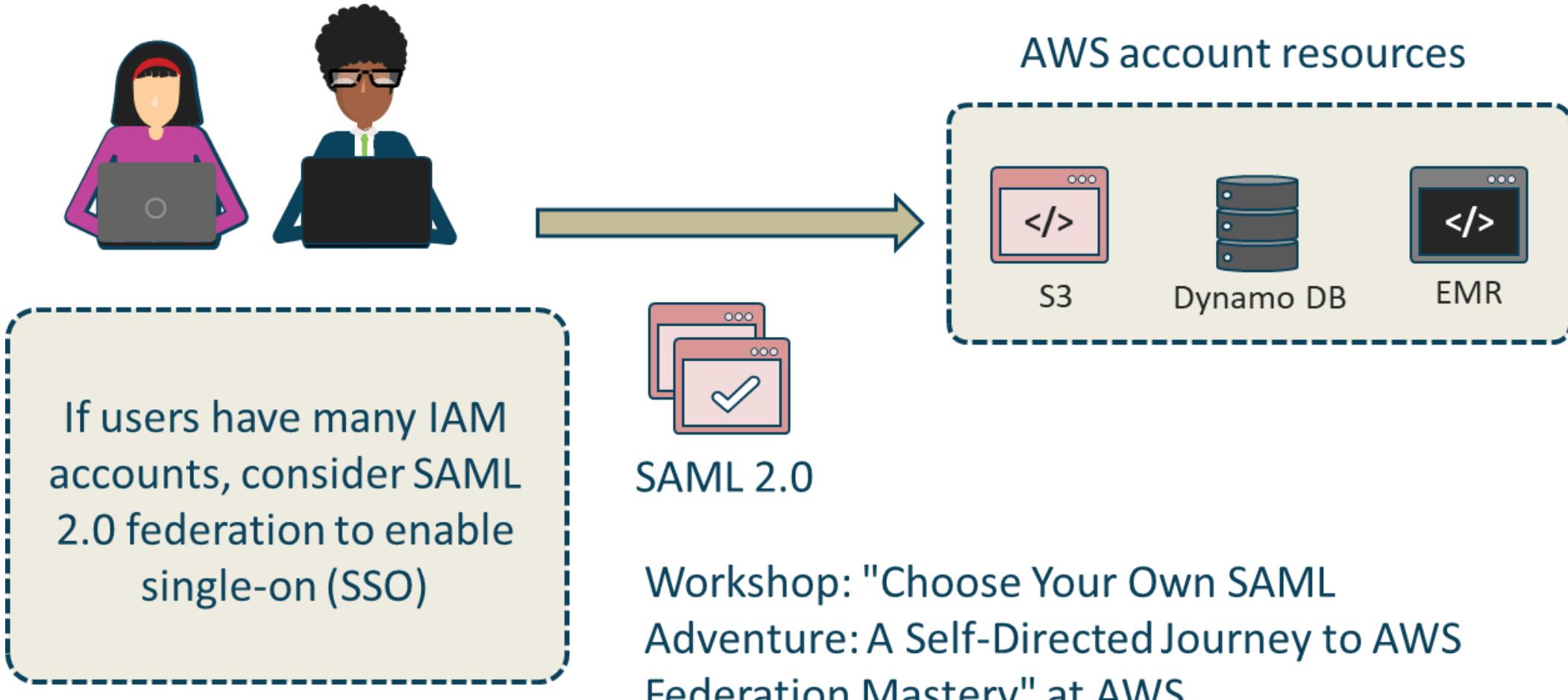


# Access Keys

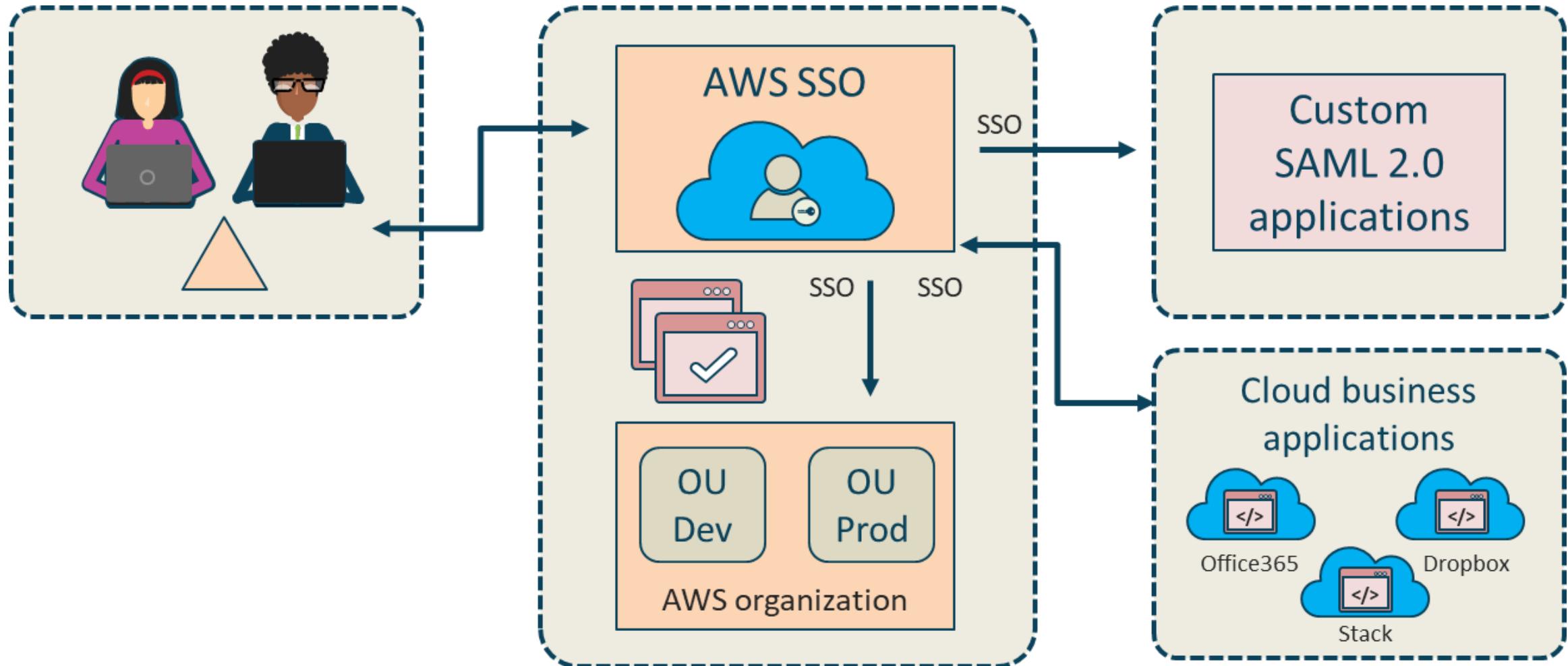


- Applications running outside of AWS will need access keys
- AWS SDKs will have digital signatures performed
- Signing protects message integrity by preventing tampering
- Requests must reach AWS within 15 minutes of the time stamp
- Version 4 also offers Forward Secrecy

# AWS Single-sign on (SSO)



# AWS SSO



# AWS SSO

Your applications

Hi John | [Sign out](#)

Search

			
AWS Management Console (3)	Dropbox	Office365	Slack
 650 ( <a href="#">Account</a> )	>		
 680 ( <a href="#">Account</a> )	>		
 903 ( <a href="#">Account</a> )	>		
<a href="#">SecurityAudit</a>	<		

[Terms of Use](#)

Powered by 

# AWS Cognito

## ▼ Authentication providers 1

Amazon Cognito supports the following authentication methods with Amazon Cognito Sign-In or any public provider. If you allow your users to authenticate using any of these public providers, you can specify your application identifiers here. Warning: Changing the application ID that your identity pool is linked to will prevent existing users from authenticating using Amazon Cognito. [Learn more about public identity providers.](#)

Cognito

Amazon

Apple

Facebook

Google+

Twitter / Digits

OpenID

SAML

Custom

Configure your Cognito Identity Pool to accept users federated with your Cognito User Pool by supplying the User Pool ID and the App Client ID.

User Pool ID

ex: us-east-1\_Ab129faBb



App client id

ex: 7lhkkfbfb4q5kpp90urffao

Add Another Provider

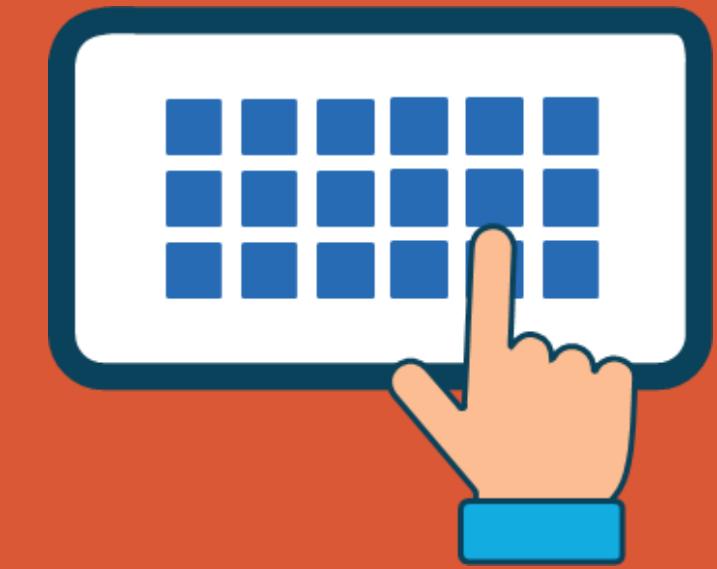
\* Required

Cancel

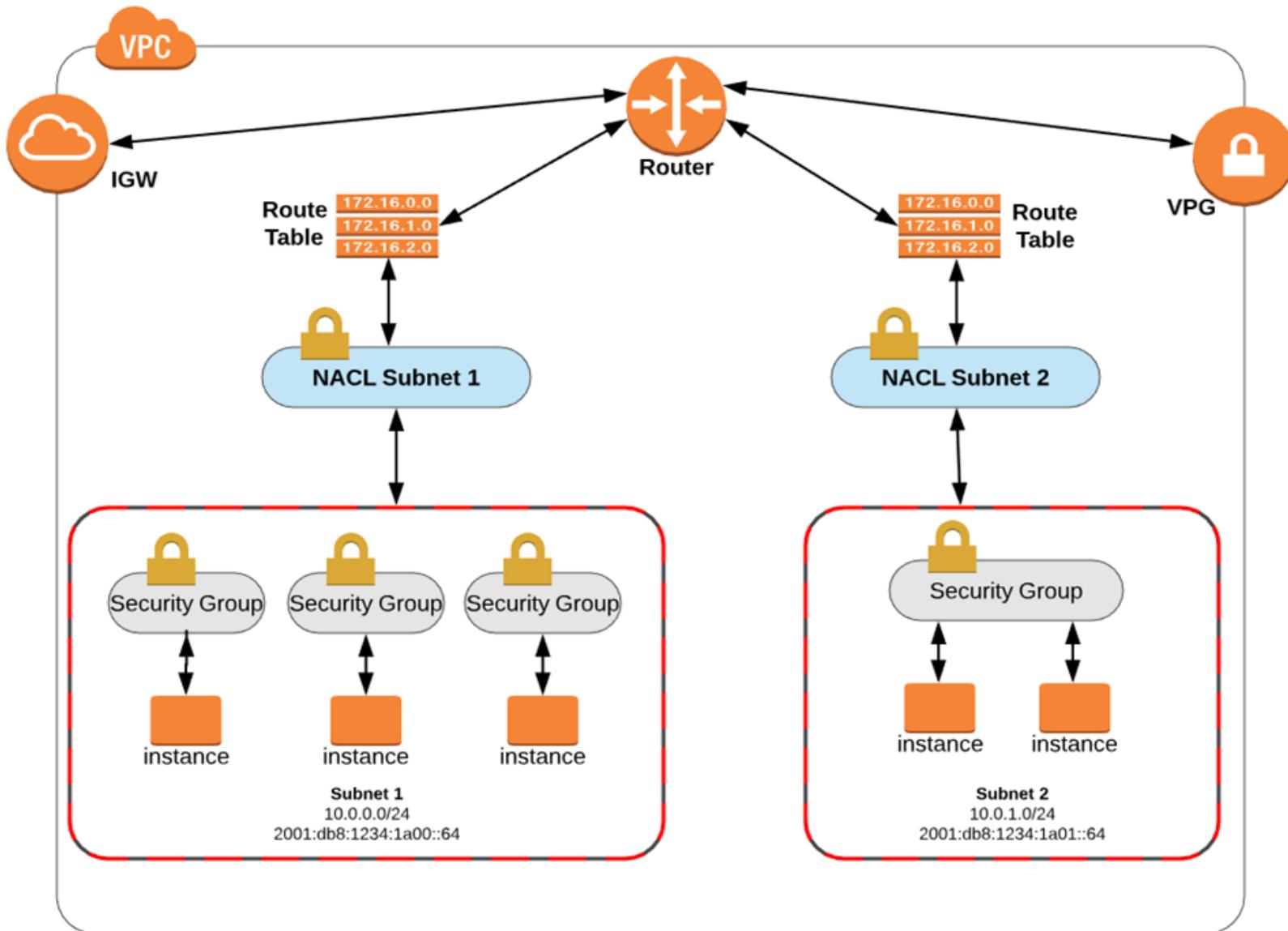
Create Pool

# Network ACLs (NACLs)

- Allow stateless traffic filtering to all inbound or outbound traffic on a VPC subnet
- Apply to all instances in the associated subnet
- Can contain ordered rules to permit or deny traffic (Rules are processed with a numbered order)
- Are agnostic of TCP sessions or UDP/ICMP flows
- Are stateless (static) in that the return traffic must be explicitly allowed in the other NACL
- Work together with security groups and can permit or deny traffic before it reaches the interfaces

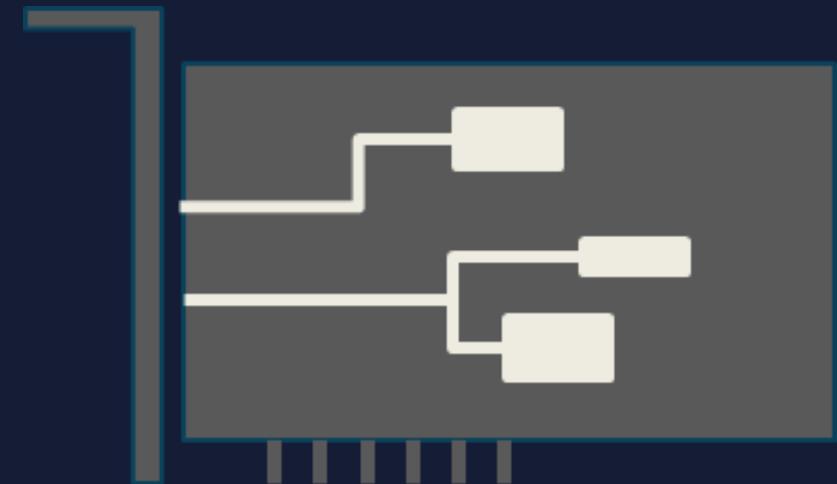


# Network ACLs (NACLs)



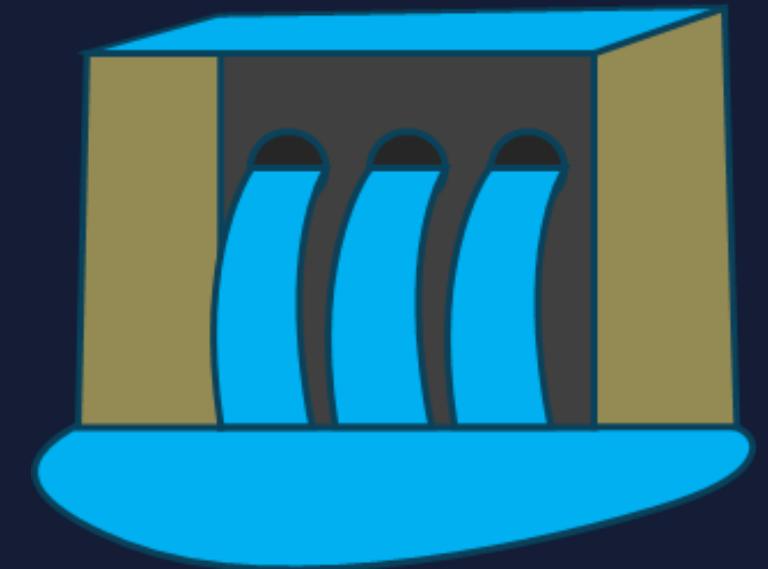
# Security Groups

- Apply to individual EC2 instances in a subnet
- Layer 3/4 **stateful** virtual “Allow Only” firewalls – **no explicit deny rules**
- Operate at the hypervisor level attached to the virtual elastic network interfaces (eth0)
- ALL EC2 instances are launched with the default SG unless otherwise designated
- An unchanged Default SG will allow communication between **all** resources **within** the security group **AND** all outbound traffic - all other traffic is implicitly denied



# Security Groups

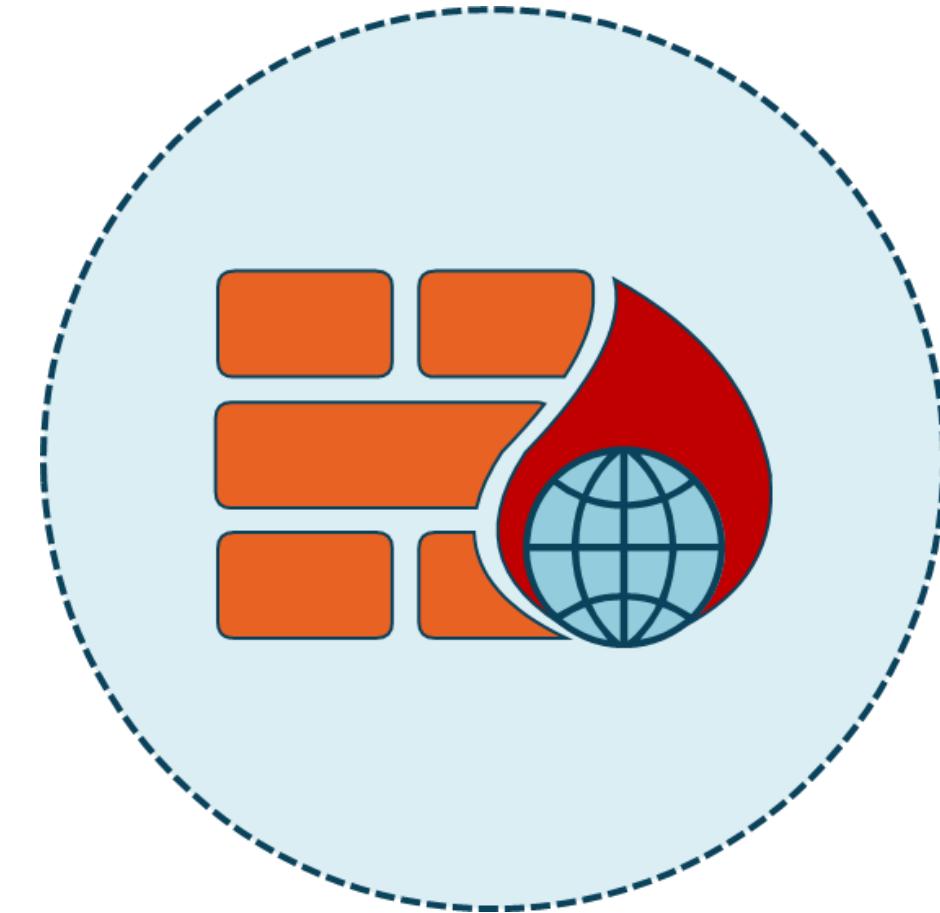
- Return traffic is automatically allowed (with Shield Standard inspection)
- All rules **in all applied security groups** are evaluated before a decision is made
- You can only create a limited number of security groups on every VPC that you have
- There is also a limit on the number of rules you can add to one security group
- There is a limited number of security groups that you can use with a network interface



# Web Application Firewall

Control and monitor HTTP/HTTPS requests forwarded to CloudFront (CDN), Application Elastic Load Balancer (ELB) or an API Gateway

- Allow all requests except for ones you designate (permissive)
- Block all requests except for ones you designate (restrictive)
- Count the requests that match the properties that you specify



# Web Application Firewall

## Matching Condition Sets

- Country of request origin
- Originating IPv4 and IPv6 addresses
- Values in HTTP request headers
- Lengths of URIs, arguments, fields, field counts
- Literal or regex string patterns
- Presence of SQL injection (SQLi) code
- Presence of Cross-site Scripting (XSS) code
- Presence of Cross-site request forgery (XSRF) code

# Web Application Firewall

The screenshot shows the AWS WAF interface for creating a new web ACL. The top navigation bar includes the AWS logo, 'Services' dropdown, 'Resource Groups' dropdown, a bell icon, and a user account 'mjshannawstest'. The breadcrumb path 'AWS WAF > Web ACLs > Create web ACL' is visible. On the left, a vertical sidebar lists five steps: Step 1 (selected), Step 2, Step 3, Step 4, and Step 5. Step 1 is titled 'Describe web ACL and associate it to AWS resources'. The main content area is titled 'Add managed rule groups' with an 'Info' link and a 'Close' button. It contains four expandable sections: 'AWS managed rule groups', 'Cyber Security Cloud Inc. managed rule groups', 'Fortinet managed rule groups', and 'GeoGuard managed rule groups'. At the bottom right are 'Cancel' and 'Add rules' buttons.

AWS WAF > Web ACLs > Create web ACL

Step 1  
Describe web ACL and associate it to AWS resources

Step 2  
Add rules and rule groups: Add managed rule groups

Step 3  
Set rule priority

Step 4  
Configure metrics

Step 5  
Review and create web ACL

## Add managed rule groups Info

Managed rule groups are created and maintained for you by AWS and AWS Marketplace sellers.

- ▶ **AWS managed rule groups**
- ▶ **Cyber Security Cloud Inc. managed rule groups**
- ▶ **Fortinet managed rule groups**
- ▶ **GeoGuard managed rule groups**

[Cancel](#) [Add rules](#)

# Web Application Firewall

Name	Capacity	Action
<b>Admin protection</b> Contains rules that allow you to block external access to exposed admin pages. This may be useful if you are running third-party software or would like to reduce the risk of a malicious actor gaining administrative access to your application.	100	<input type="checkbox"/> Add to web ACL
<b>Amazon IP reputation list</b> This group contains rules that are based on Amazon threat intelligence. This is useful if you would like to block sources associated with bots or other threats.	25	<input type="checkbox"/> Add to web ACL
<b>Core rule set</b> Contains rules that are generally applicable to web applications. This provides protection against exploitation of a wide range of vulnerabilities, including those described in OWASP publications and common Common Vulnerabilities and Exposures (CVE).	700	<input type="checkbox"/> Add to web ACL
<b>Known bad inputs</b> Contains rules that allow you to block request patterns that are known to be invalid and are associated with exploitation or discovery of vulnerabilities. This can help reduce the risk of a malicious actor discovering a vulnerable application.	200	<input type="checkbox"/> Add to web ACL
<b>Linux operating system</b> Contains rules that block request patterns associated with exploitation of vulnerabilities specific to Linux, including LFI attacks. This can help prevent attacks that expose file contents or execute code for which the attacker should not have had access.	200	<input type="checkbox"/> Add to web ACL
<b>PHP application</b>		

# AWS Shield

## Standard and Advanced Options

- DDoS protection provided at no extra cost
- Basic protection against common DoS floods and exploits
- Additional protection from known DDoS attacks
- Most common DDoS comes from botnet servers
- **Combined with NACLs, SGs, and WAF for layered defense**



# Amazon Inspector



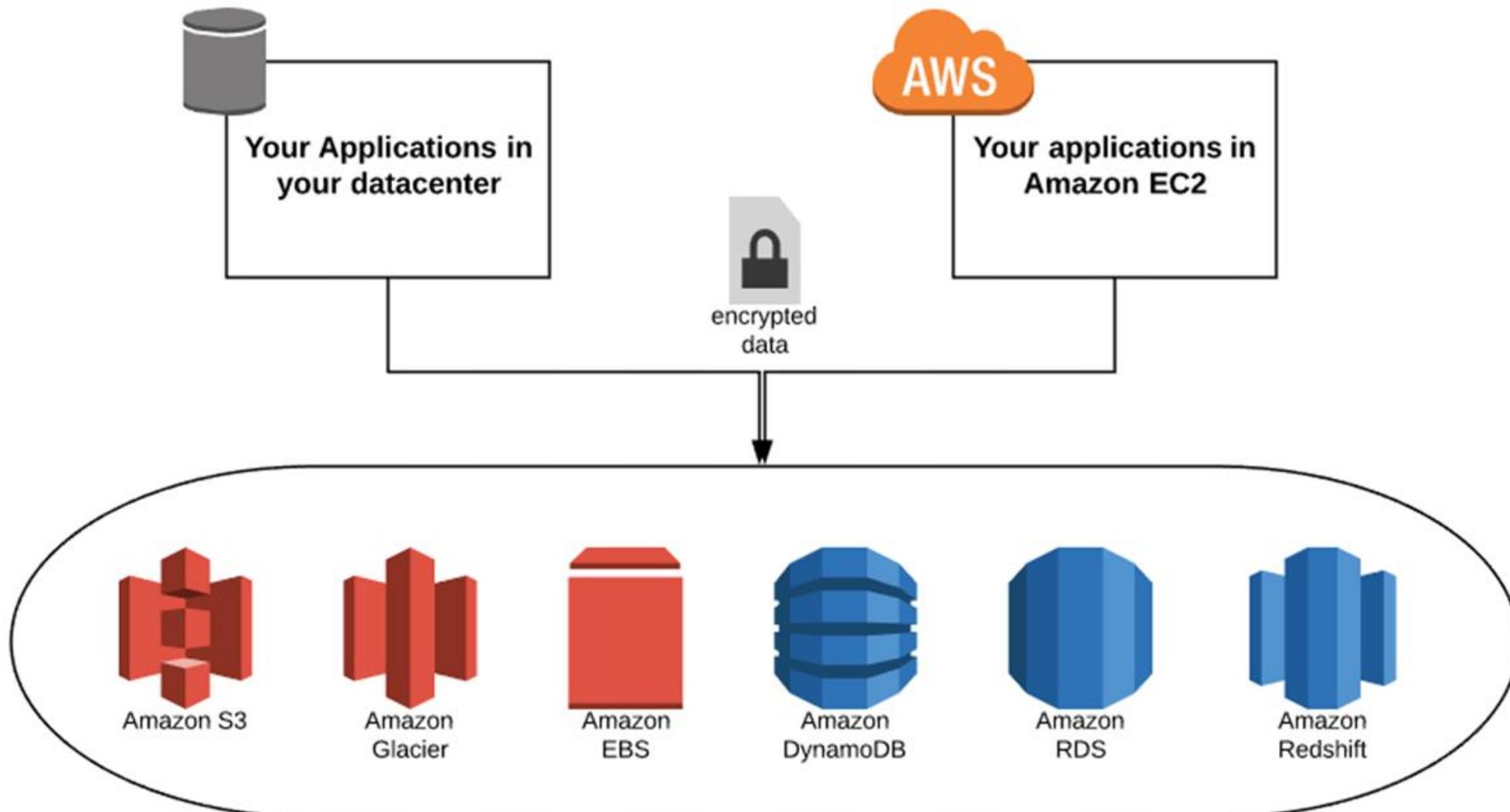
- AWS discourages running assessment tool except in certain circumstances
- Amazon Inspector is an automated security assessment service that enhances security and compliance of applications running on AWS
- Inspector automatically evaluates applications for vulnerabilities and nonconformity with best practices and a knowledgebase of 100's of rules
  - Produces a detailed list of security findings
  - Results available through console or API
  - Generates various meaningful reports

# GuardDuty

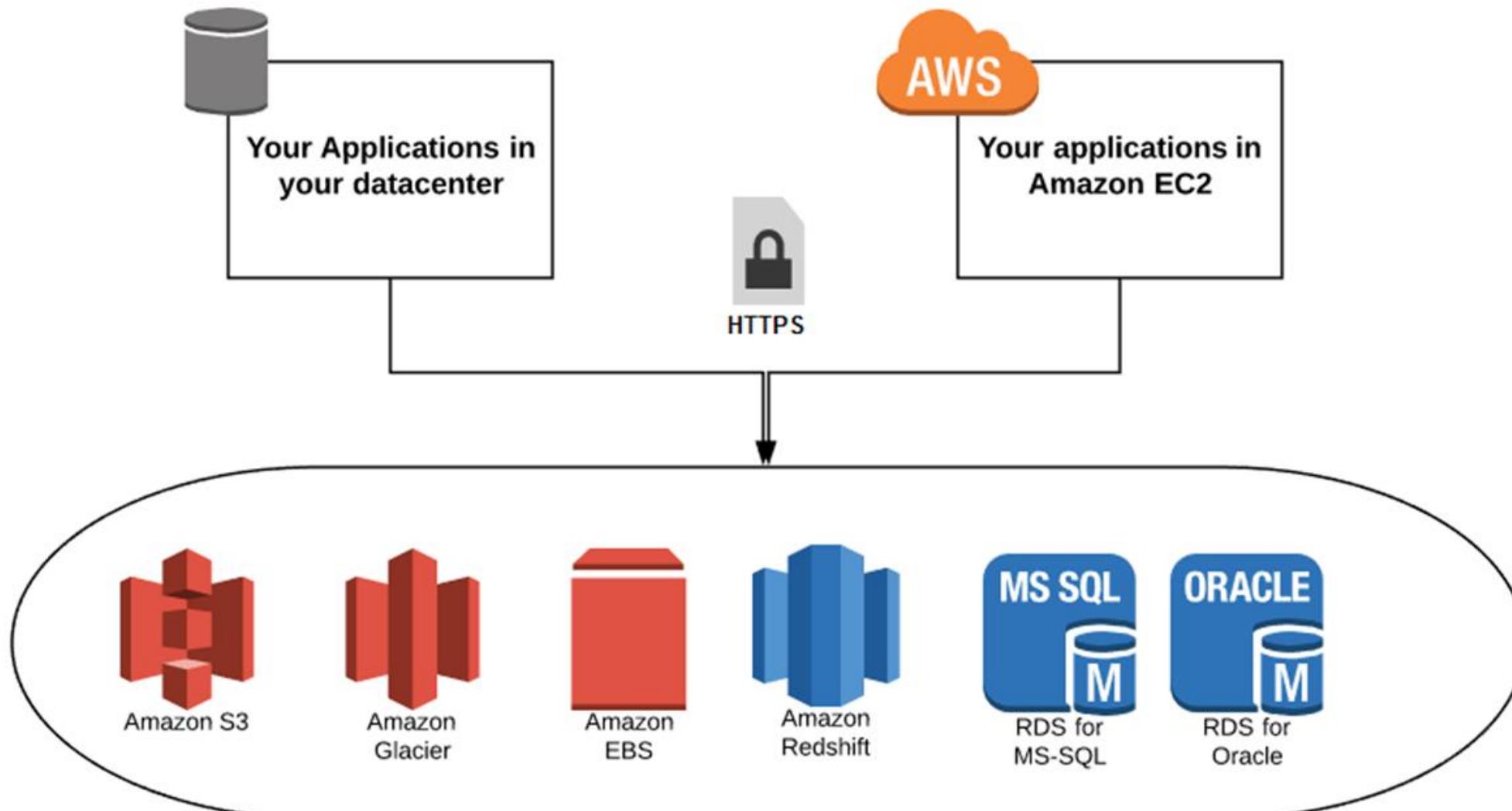
- Fully-managed threat detection service
- Looks for anomalies and unauthorized actions
- Monitors for zero-day activities
- Produces well-defined "findings"
- Uses proprietary machine learning and AI algorithms
- Based on a partnership with several companies including Trend, Crowdstrike, and Rapid7



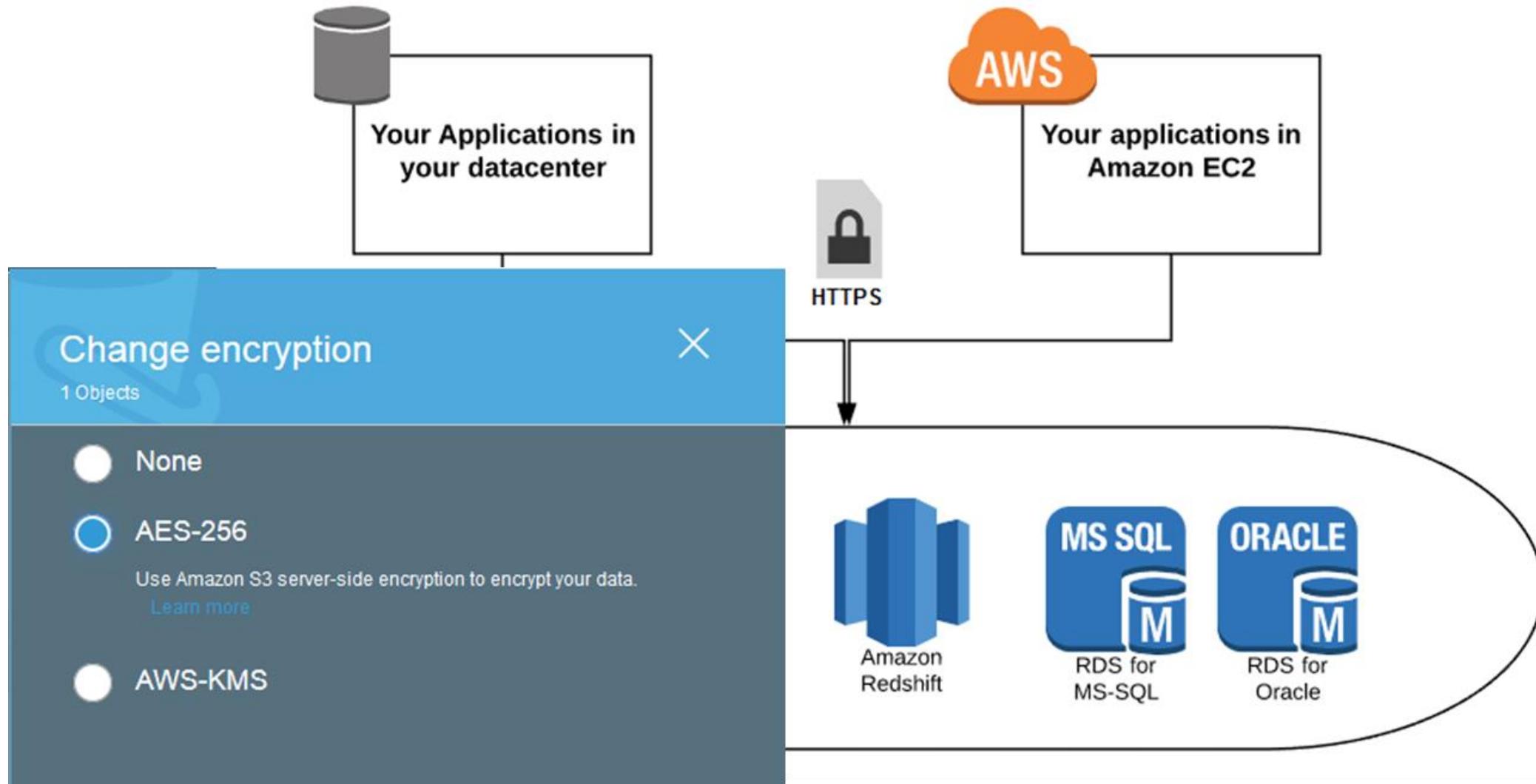
# Client-side Encryption



# Server-side Encryption



# Server-side Encryption (i.e., SS3 SSE)

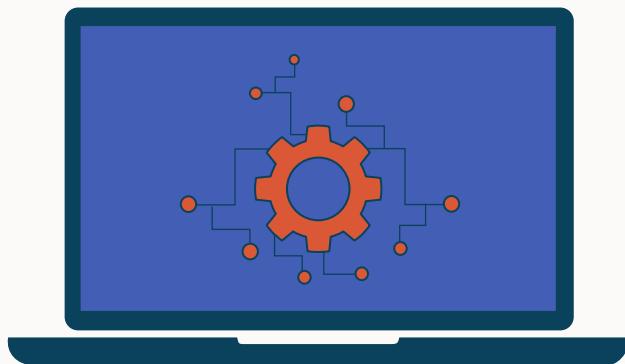


# AWS KMS



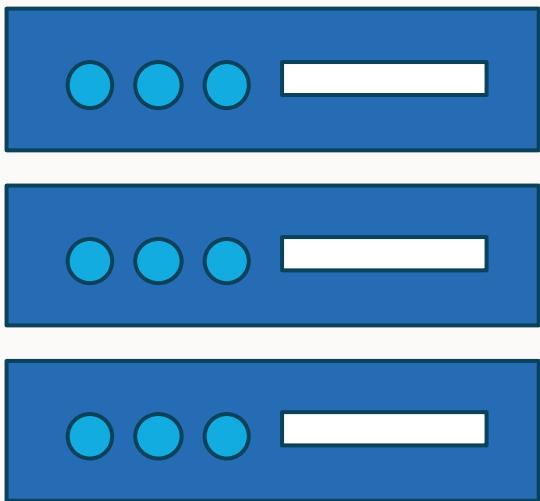
- Customer Master Keys (CMKs) are the main resource of the KMS service
- You can use a CMK to encrypt and decrypt up to 4 KB (4096 bytes) of data
- Typically, you use CMKs to generate, encrypt, and decrypt the data keys that you use outside of AWS KMS to encrypt your data
- There are three types of CMKs in AWS accounts:
  - Customer-managed
  - AWS-managed
  - AWS-owned

# AWS Compute Services Survey



- EC2
- Lightsail
- Elastic Beanstalk
- Lambda
- Elastic Container Service (ECS)

# Deploying EC2 Instances



- EC2 is a service that delivers resizable and secure compute capacity in the AWS cloud
- Makes rapid web-scale cloud computing easier by using a simple web service interface
- Provides control of your resources running on an established computing infrastructure

# EC2 Instances

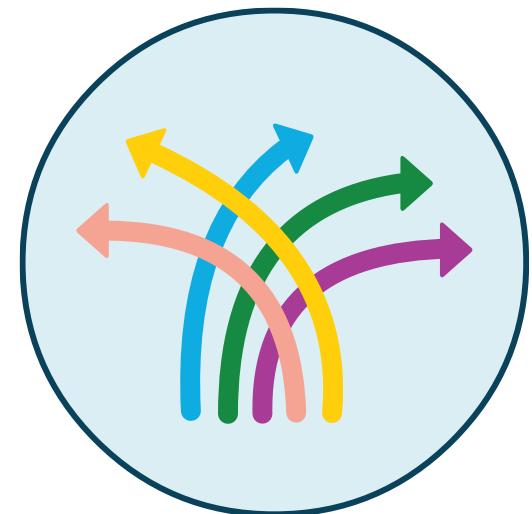


- Increase or decrease capacity within minutes
- EC2 allows you to select flexible configurations
- Securely integrated with most AWS services
- Highly available, reliable, and durable

# Convertible Reserved Instances

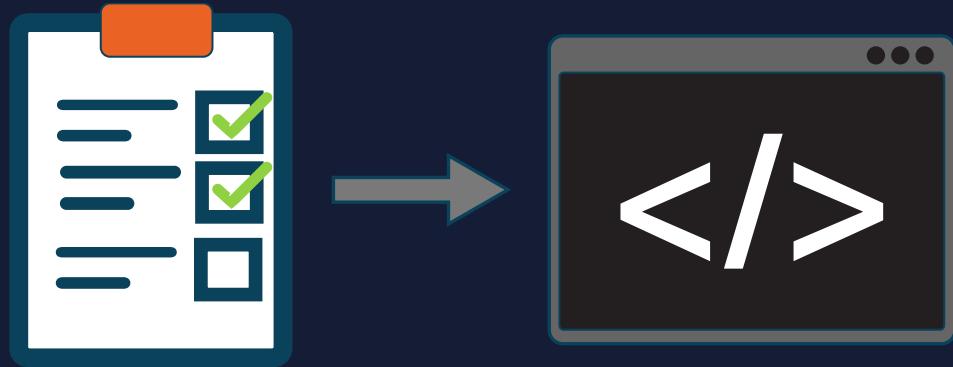
## More flexible

- Convertible RIs give you even more flexibility
- Offers a significant discount (typically 45% compared to On-Demand)
- They allow you to change the instance family and other parameters associated with a Reserved Instance at any time



# Elastic Beanstalk

## The traditional Dev platform



- AWS Elastic Beanstalk is an easy-to-use service for deploying, monitoring and scaling web applications and services developed on several different platforms and applications
  - Choose your platform (Generic Docker, Preconfigured, Preconfigured Docker)
  - Upload an application or use a sample code from AWS
  - Run it

# Elastic Beanstalk

Application information

Application name

Up to 100 Unicode characters, not including forward slash (/).

Base configuration

Platform

-- Choose a platform --

Generic

- Docker
- Multi-container Docker

Preconfigured

- Elastic Beanstalk Packer Builder
- Go
- .NET (Windows/IIS)
- Java
- Node.js
- Ruby
- PHP
- Python
- Tomcat

Application code

Preconfigured – Docker

- GlassFish
- Go
- Python

[Cancel](#) [Configure more options](#) [Create application](#)

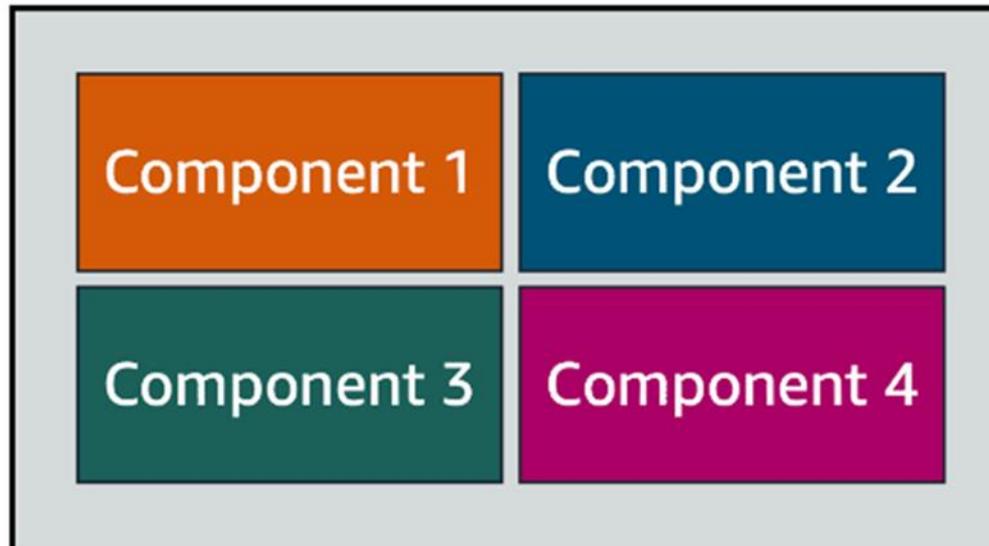
# AWS Lambda

- AWS Lambda lets you run code without deploying or managing servers
- You pay only for the compute time you consume and there is no charge when your code is not running
- You can run code for virtually any type of application or backend service—all with zero administration

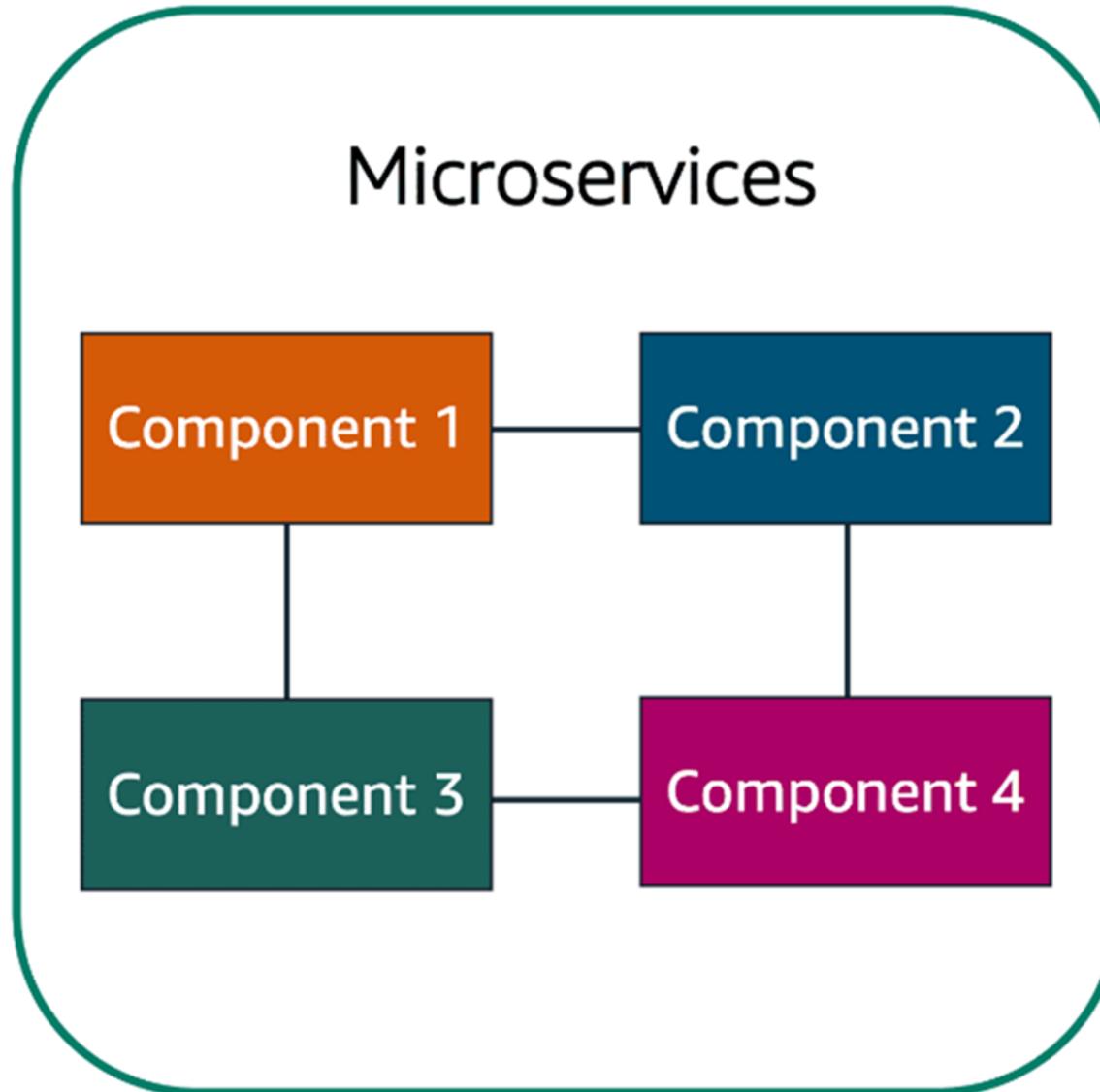


# Monolithic Application Types

Monolithic application



# Microservices



# SNS and SQS

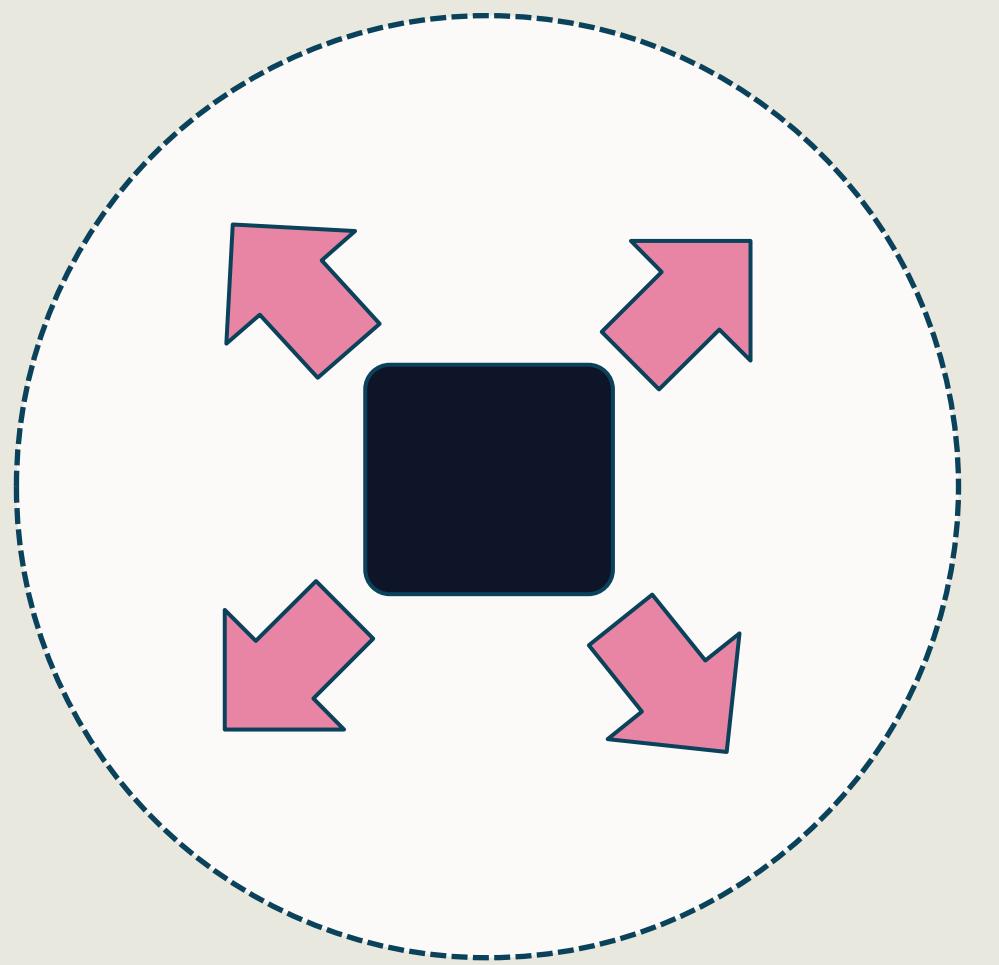
- Amazon **Simple Notification Service (SNS)** is a publish/subscribe service
- Using Amazon SNS topics, a publisher distributes messages to subscribers
  - Consider a coffee shop where the cashier provides coffee orders to the barista who makes the drinks
- Amazon **Simple Queue Service (SQS)** is a message queuing service that lets you send, store, and receive messages between software components, without losing messages or requiring other services to be available

# Containers



- A container is a discrete environment within an operating system where one or more applications can run, typically assigned all the resources and dependencies needed to function properly
- Docker is the most common platform for developing “containerized” applications
- Amazon Elastic Container Service (Amazon ECS) is a fully managed container orchestration service
- AWS Fargate is the preferred way for customers to run containers on AWS across both ECS and EKS

# Auto Scaling

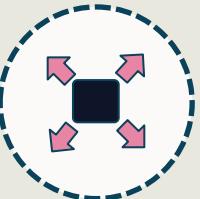


- Auto Scaling monitors applications and automatically modifies capacity to retain stable and predictable performance at the lowest cost
- You can build scaling plans for O/S instances, fleets, tasks, database tables, indexes, and replicas
- **Dynamic or Predictive scaling**

# Auto Scaling



Rapidly configure scaling feature with high visibility



Automate and optimize balance of availability and costs

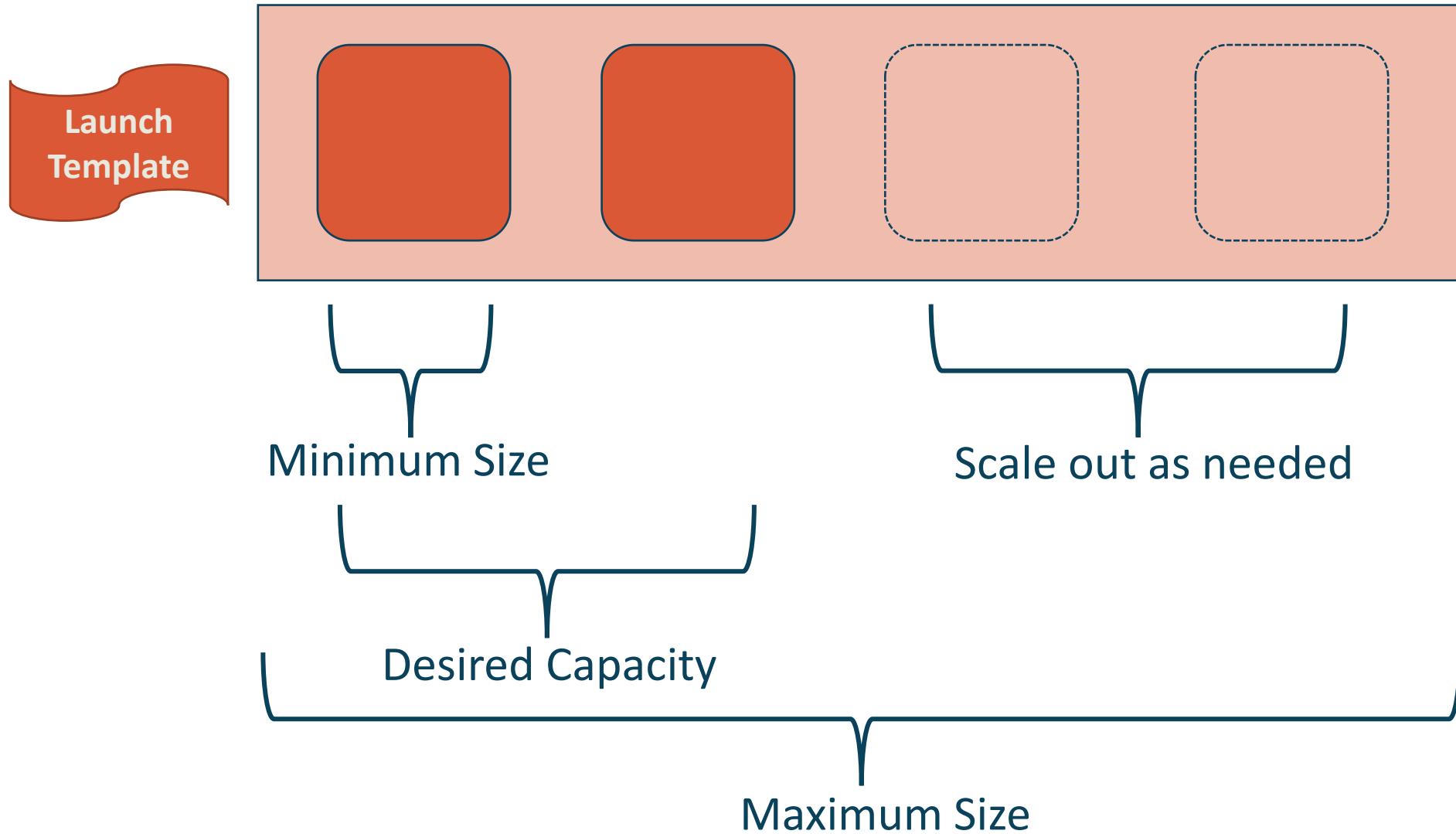


Constantly monitors to ensure desired performance levels

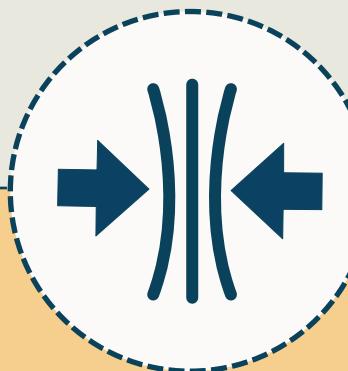


Automatically remove excess capacity to avoid overspending

# Auto Scaling Group



# Elastic Load Balancing (ELB)



- Elastic Load Balancing (ELB) automatically dispenses incoming traffic across several targets including **EC2 instances, IP addresses, containers, and Lambda functions**
- They can be public-facing or internal
- **Application** Load Balancer is for load balancing HTTP and HTTPS traffic for delivering modern application architectures
- **Network** Load Balancer is for TCP, UDP, and TLS traffic routing traffic to VPCs optimized for high-speed, low-latency traffic
- **Gateway** Load Balancer is used for virtual appliances and testing the marketplace

# AWS CloudFormation



Offers common language to templatize the cloud environment



Infrastructure-as-code deployment with stacks



Configuration is in simple text file format



Serves as the “single source of truth” for environment



Safe, secure, and repeatable

# AWS Cloud Formation

Template Name	Description	View	View in Designer	Launch
A single Amazon EC2 in an Amazon VPC	Creates a VPC and adds an Amazon EC2 instance with an Elastic IP address and a security group.	<a href="#">View</a>	<a href="#">View in Designer</a>	<a href="#">Launch Stack</a>
Amazon VPC with static routing to an existing VPN	Creates a private subnet with a VPN connection that uses static routing to an existing VPN endpoint.	<a href="#">View</a>	<a href="#">View in Designer</a>	<a href="#">Launch Stack</a>
Autoscaling and load-balancing website in an Amazon VPC	Creates a load balancing, auto scaling sample website in an existing VPC.	<a href="#">View</a>	<a href="#">View in Designer</a>	<a href="#">Launch Stack</a>
Amazon VPC with DNS and public IP addresses	Creates a VPC with DNS support and public IP addresses enabled.	<a href="#">View</a>	<a href="#">View in Designer</a>	<a href="#">Launch Stack</a>
Publicly accessible Amazon EC2 instances that are in an Auto Scaling group	Creates a load balancing, autoscaling group with instances that are directly accessible from the Internet.	<a href="#">View</a>	<a href="#">View in Designer</a>	<a href="#">Launch Stack</a>
Amazon EC2 with multiple dynamic IP addresses in an Amazon VPC	Creates an Amazon EC2 instance with multiple dynamic IP addresses in a VPC.	<a href="#">View</a>	<a href="#">View in Designer</a>	<a href="#">Launch Stack</a>

# AWS Cloud Formation

The screenshot shows the AWS CloudFormation console interface. At the top, there's a navigation bar with the AWS logo, 'Services' dropdown, 'Resource Groups' dropdown, and a user profile icon. Below the navigation is a toolbar with file operations like 'New', 'Open', 'Save', and 'Close'. A title bar indicates 'File: "template1"'.

The main area contains a visual representation of a CloudFormation stack. It includes several resources represented by icons: two orange rectangular blocks labeled 'PublicSub...', a red rounded rectangle labeled 'PublicSub...', and a red circle with a lock icon labeled 'PublicLo... SecurityGroup'. Arrows show dependencies between these resources.

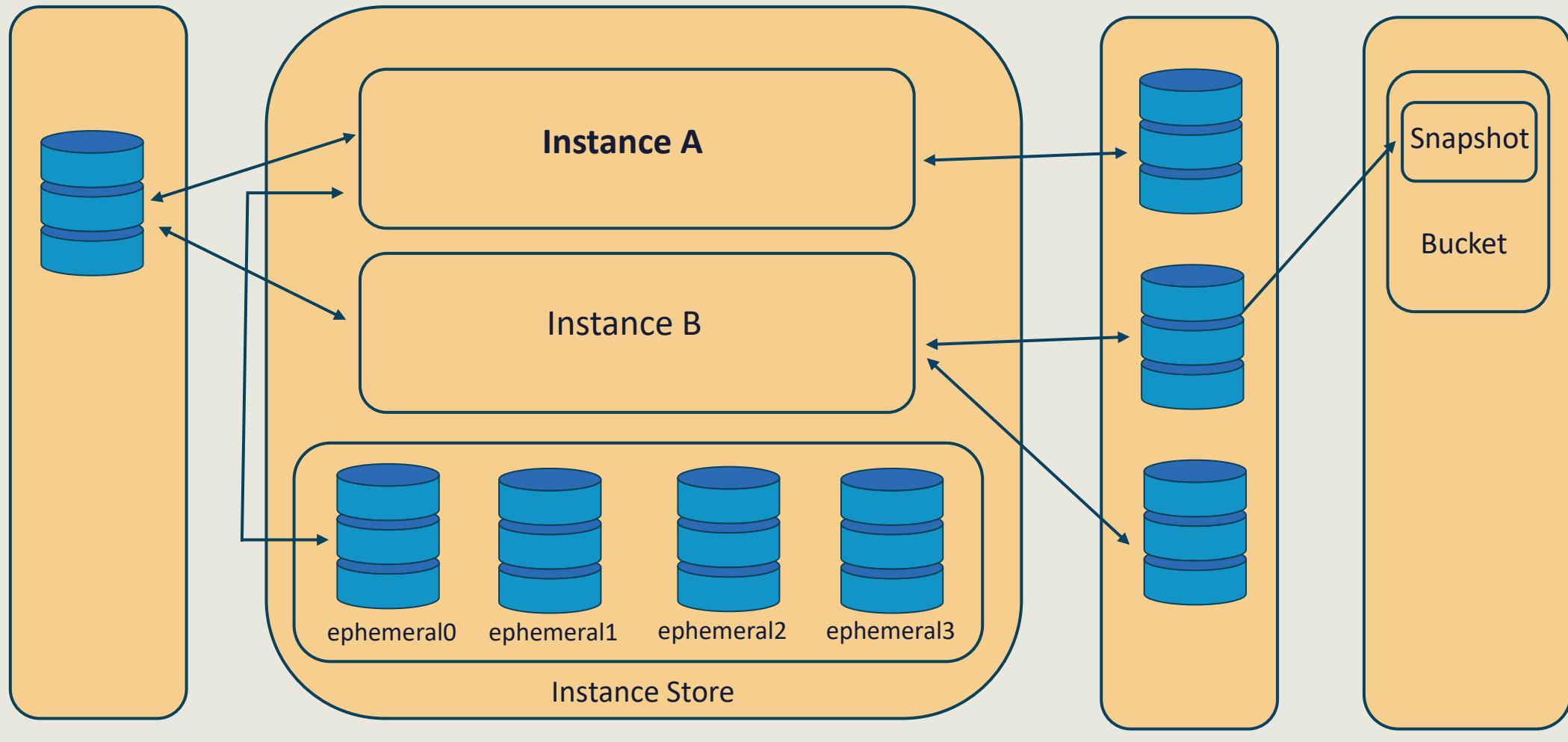
At the bottom, there's a code editor window titled 'temp...' containing the CloudFormation template JSON. The code defines parameters for 'KeyName' and 'SSHLocation'. The 'Choose template language:' dropdown at the top right offers options for 'JSON' (selected) and 'YAML'.

```
1 {
2   "AWSTemplateFormatVersion": "2010-09-09",
3   "Description": "AWS CloudFormation Sample Template VPC_AutoScaling_With_Public_IPs.template: Sample template showing how to create a load
4   "Parameters": {
5     "KeyName": {
6       "Description": "Name of an existing EC2 KeyPair to enable SSH access to the instances",
7       "Type": "AWS::EC2::KeyPair::KeyName",
8       "ConstraintDescription": "must be the name of an existing EC2 KeyPair."
9     },
10    "SSHLocation": {
11      "Description": "Lockdown SSH access to the bastion host (default can be accessed from anywhere)",
12      "Type": "String",
13      "Default": "0.0.0.0/0"
14    }
}
```

# Elastic Block Storage (EBS)

- Amazon EBS offers persistent block storage volumes for use with Amazon EC2 instances in the AWS Cloud
- Each Amazon EBS volume is automatically replicated within its Availability Zone to protect you from component failure, offering high availability and durability
- EBS volumes offer the consistent and low-latency performance needed to run your workloads

# Amazon Block Storage (HDD and SDD)



Amazon EFS

Host Computer

Amazon EBS

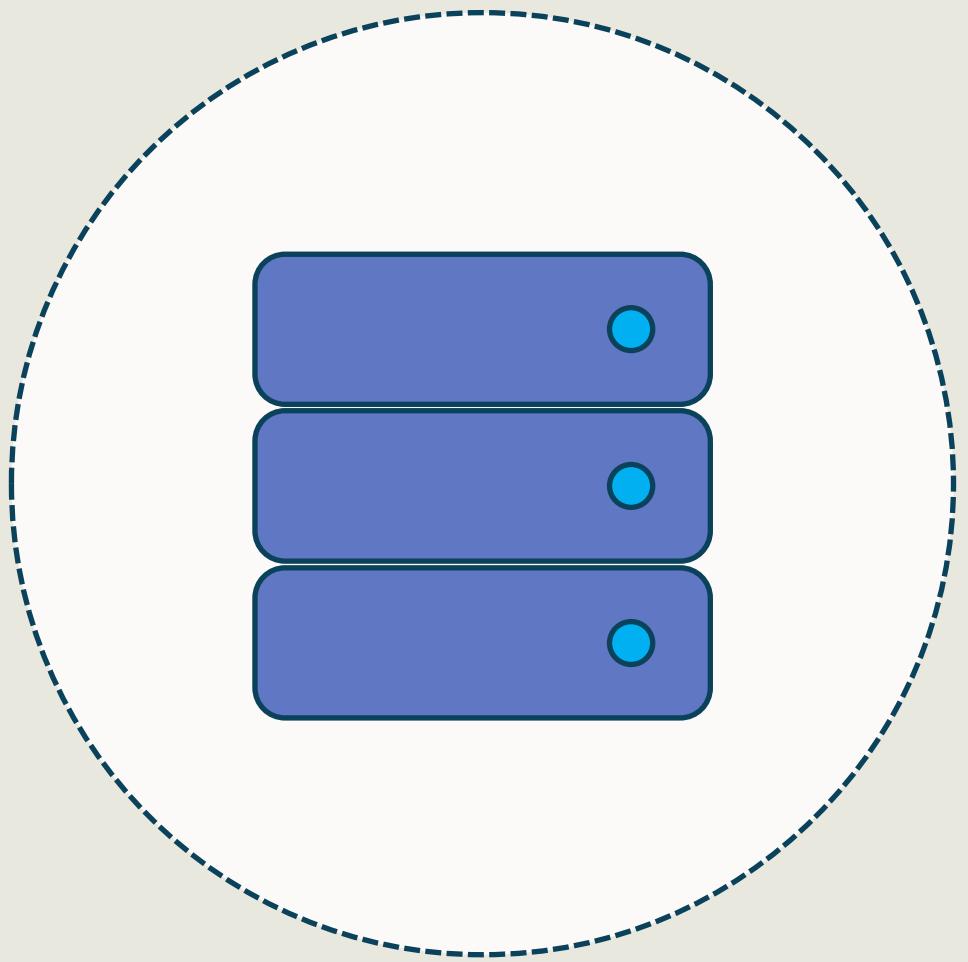
Amazon S3

# **Amazon Elastic File System (Amazon EFS)**



- Amazon Elastic File System (Amazon EFS) provides a simple, scalable, elastic file system for Linux-based workloads for use with AWS Cloud services and on-premises resources
- It is built to scale on demand to petabytes without disrupting applications, growing and shrinking automatically as you add and remove files
- EFS is a fully managed service that requires no changes to your existing applications and tools, providing access through a standard file system interface for seamless integration

# Working with Simple Storage Service (S3)



- S3 is object-based storage that is constructed to store and get unlimited volumes of data from anywhere on the Internet
- It provides a highly-available, extremely durable, and enormously scalable data storage infrastructure at very low cost

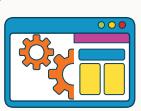
# Overview of S3



Simple web service interface



Store and retrieve any amount of data at any time



Easily build applications that use Internet storage



Designed to be highly flexible and scalable

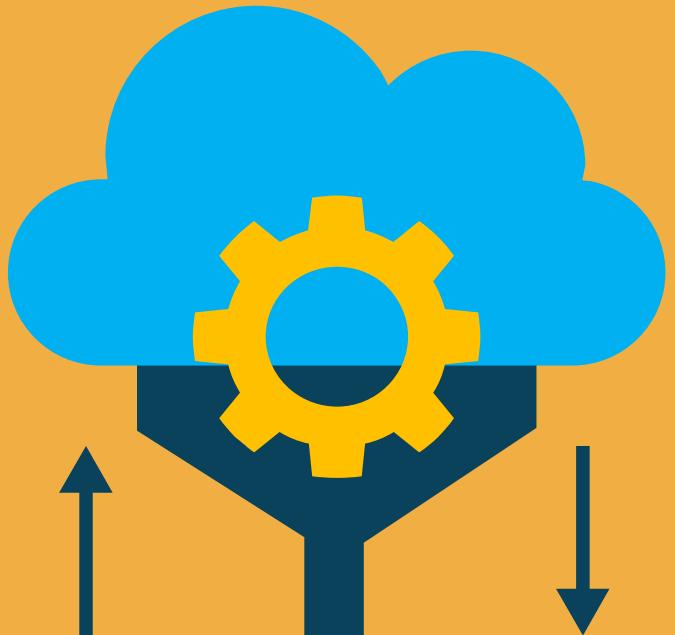


Makes the job easier for CDN developers

# S3 Storage Plans (Tiers)

Standard	I-T	S-I A or 1 Z-I A	Glacier or Deep Archive
Eleven 9's durability	Three 9's of availability	Infrequent Access but rapid access when needed	Eleven 9's durability
Four 9's of availability	11 - 9's of durability	Lower per GB storage prices and retrieval fee	Data archiving with flexible access options
Low-cost throughput	Cheaper than Standard S3	Lower throughput	Can store data for as little as \$0.004 per gigabyte per month

# Storage Gateway



- AWS Storage Gateway is a hybrid storage service that enables your on-premises applications to seamlessly use AWS cloud storage
- You can use the service for backup and archiving, disaster recovery, cloud data processing, storage tiering, and migration
- Can be appliance-based or in a hypervisor
- Often used in conjunction with Direct Connect 10 Gbps

# Survey of AWS Database Services

Database type	Use cases	AWS service
Relational	Traditional applications, ERP, CRM, e-commerce	 <a href="#">Amazon Aurora</a>  <a href="#">Amazon RDS</a>  <a href="#">Amazon Redshift</a>
Key-value	High-traffic web apps, e-commerce systems, gaming applications	 <a href="#">Amazon DynamoDB</a>
In-memory	Caching, session management, gaming leaderboards, geospatial applications	 <a href="#">Amazon ElastiCache for Memcached</a>  <a href="#">Amazon ElastiCache for Redis</a>
Document	Content management, catalogs, user profiles	 <a href="#">Amazon DocumentDB</a>
Wide column	High scale industrial apps for equipment maintenance, fleet management, and route optimization	 * <a href="#">Amazon Managed Apache Cassandra Service</a>
Graph	Fraud detection, social networking, recommendation engines	 <a href="#">Amazon Neptune</a>
Time series	IoT applications, DevOps, industrial telemetry	 <a href="#">Amazon Timestream</a>
Ledger	Systems of record, supply chain, registrations, banking transactions	 <a href="#">Amazon QLDB</a>

# AWS Relational Database Services (RDS)

- Amazon Relational Database Service (RDS) is a managed service for setting up, operating, and scaling a cloud-based relational database
- RDS is available on several database instance types that are optimized for memory, performance or I/O
- Can choose from Amazon Aurora, PostgreSQL, MySQL, MariaDB, **Oracle Database**, and SQL Server
- **Use the AWS Database Migration Service to migrate or replicate your existing databases to Amazon RDS**

# AWS Relational Database Services (RDS)

Step 1 RDS > Create database

Step 2 Select engine

Step 3 Choose use case

Step 4 Specify DB details

Step 5 Configure advanced settings

## Select engine

**Engine options**

- Amazon Aurora  
**Amazon Aurora**
- MySQL  

- MariaDB  

- PostgreSQL  

- Oracle  
**ORACLE®**
- Microsoft SQL Server  


**MySQL**

MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.

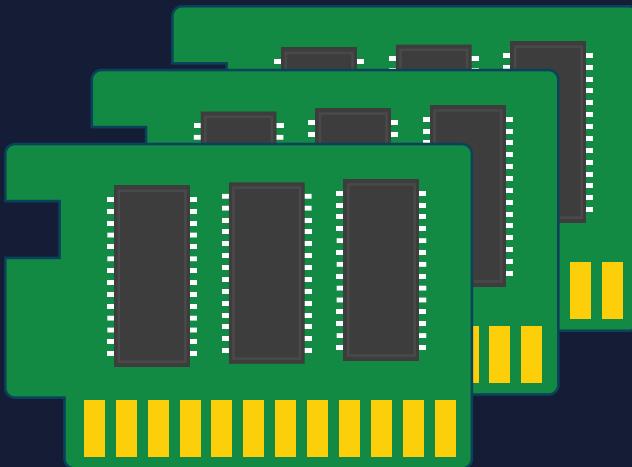
# DynamoDB



- Amazon DynamoDB is a key-value and document database (NoSQL) that provides single-digit millisecond performance at any scale
- It is a fully managed, multi-region, multi-master database with built-in security, backup and restore, and in-memory caching for internet-scale applications
- It can handle more than 10 trillion requests per day and support peaks of more than 20 million requests per second
- Over 100,000 AWS clients use DynamoDB as their key-value and document database

# Amazon ElastiCache

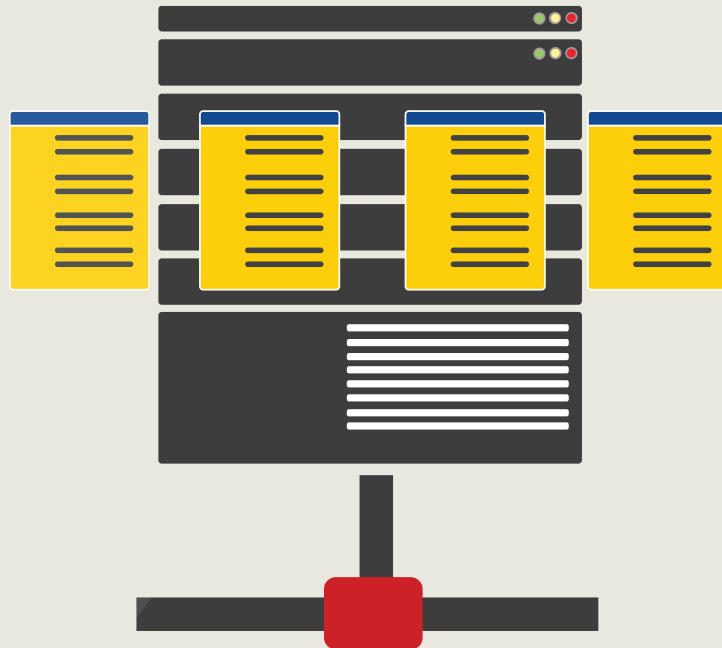
Redis or Memcached



- Amazon ElastiCache is a web service that makes it easy to deploy, operate, and scale an in-memory cache in the cloud
- The service improves the performance of web applications by empowering one to retrieve information from fast, managed, in-memory caches, instead of relying entirely on slower disk-based databases
- Amazon ElastiCache supports Redis and Memcached open-source in-memory caching engines

# Amazon Redshift

## Data Warehousing and Lakes



- Amazon Redshift clusters provide a fast, scalable data warehouse for cost-effective analysis of data across data warehouses and data lakes
- Redshift ML uses machine learning, massively parallel query execution, and columnar storage on high-performance disks
- High security is provided using a 4-key nested encryption model

# The Snow Family

- **Snowcone** is a portable, rugged, and secure data box used to collect, process, and transfer up to 8 terabytes of data to AWS, either offline by shipping the device, or online with an AWS DataSync solution
- **Snowball** is a data migration and edge computing device that comes in two device options: Compute Optimized and Storage Optimized
  - Snowball Edge Storage Optimized devices offer 40 vCPUs of compute capacity combined with 80 terabytes of usable block or Amazon S3-compatible object storage
- **Snowmobile** moves up to 100 PB of data in a 45-foot-long rugged shipping container and is ideal for multi-petabyte or Exabyte-scale digital media migrations and data center shutdowns



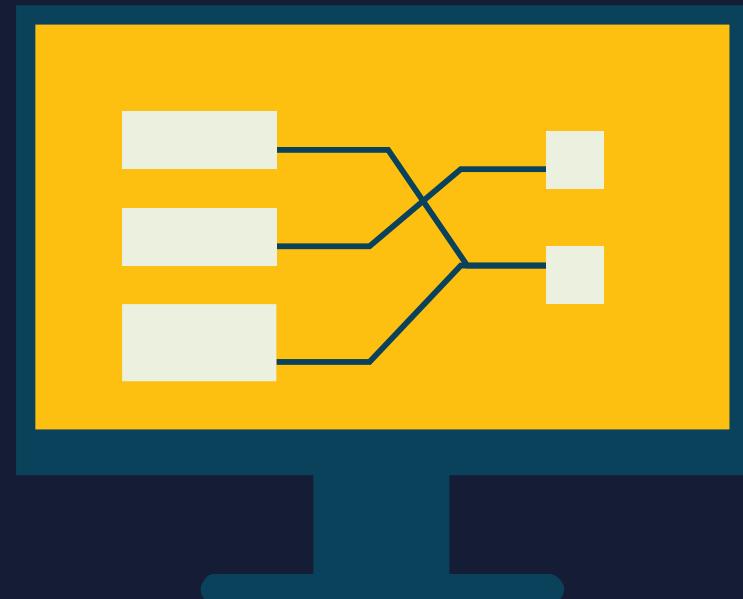
# CloudWatch

- Amazon CloudWatch is used for management and governance
- It is a monitoring and management service designed for developers, system operators, site reliability engineers (SRE), and managers
- CloudWatch offers data, meaningful metrics, and actionable insights to:
  - Monitor applications
  - Recognize and respond to system-wide performance changes
  - Optimize resource utilization
  - Gain a unified view of operational health



# CloudWatch Use Cases

- Monitor critical metrics and logs, visualize application and infrastructure stacks, generate alarms, and correlate metrics and logs to recognize and resolve the root cause of performance issues
- Monitor applications and Trigger automated CloudWatch Alarms and Lambda workflows to enhance the customer experience
- Explore, analyze, and visualize logs instantly to optimize resources, leverage CloudWatch Alarms to automate capacity, and do resource planning for Auto Scaling



# CloudWatch Dashboards

AWS Services

CloudWatch Dashboards MyDashboard Alarms ALARM INSUFFICIENT OK Billing Events Rules Event Buses Logs Insights Metrics Favorites + Add a dashboard

Add to this dashboard

Select a widget type to configure and add to this dashboard.

**Line**  
Compare metrics over time

**Stacked area**  
Compare the total over time

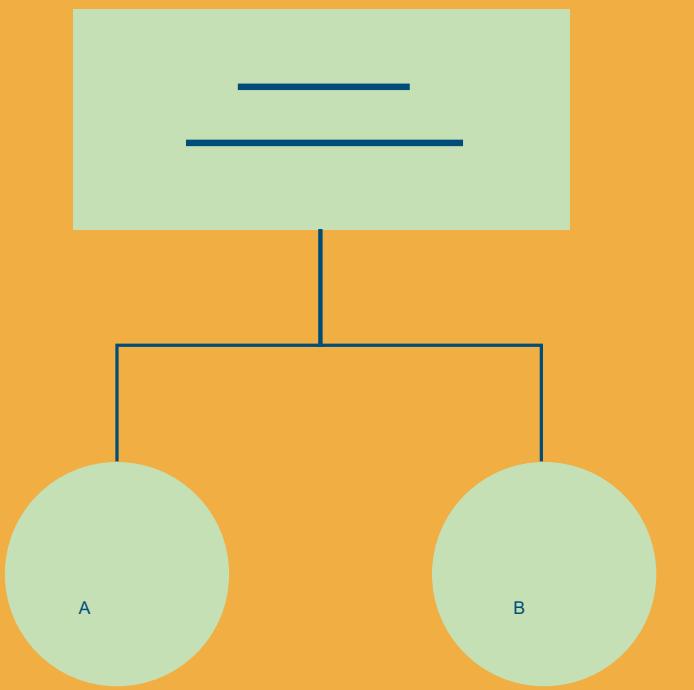
**Number**  
Instantly see the latest value for a metric

**Text**  
Free text with markdown formatting

**Query results**  
Explore results from Logs Insights

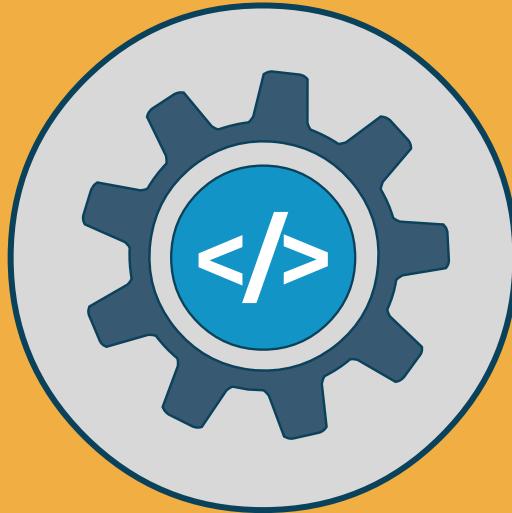
Cancel Configure

# CloudTrail



- With CloudTrail, customers can log, continuously monitor, and retain account activity related to all API calls across the AWS infrastructure
- Within CloudTrail, CloudTrail Insights can be enabled where CloudTrail can automatically detect unusual API activities in AWS accounts
- **Example:** CloudTrail Insights could detect that a higher number of Amazon EC2 instances than usual have recently launched in an account or abnormal account activity has occurred then review the full event details to determine which actions need to be taken next

# CloudTrail Use Cases



- Exam: CloudTrail is one of the most common tools for getting insights into security events at AWS
- Detect that a higher number of Amazon EC2 instances than usual have recently launched
- Identify which users and accounts called AWS, the source IP address from which the calls were made, and when the calls occurred
- Create a workflow to add a specific policy to an Amazon S3 bucket when CloudTrail logs an API call that makes that bucket public
- Connect your VPC to CloudTrail by defining an interface VPC endpoint for CloudTrail

# AWS X-Ray



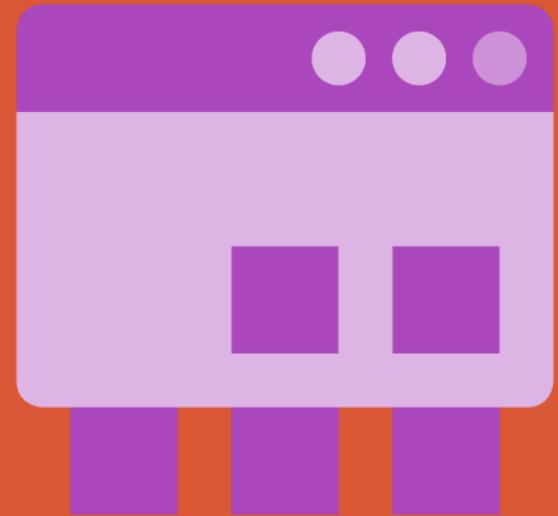
- Assists developers in analyzing and debugging production, distributed applications (such as microservices)
- Better understand how your application and its underlying services are performing
- Identify and troubleshoot the root cause of performance issues and errors
- Get an end-to-end view of requests that traverse through the application and display a map of the application's underlying components

# AWS CodeCommit

AWS CodeCommit is a secure, highly scalable, fully managed source control service that hosts private Git repositories

Q: An iOS app developer wants to move their code to the AWS Cloud, which service or resource would best facilitate this effort?

A: AWS CodeCommit



# AWS SageMaker

- AWS SageMaker takes advantage of Amazon's two decades of practice developing real-world machine-learning (ML) applications, including:
  - Product recommendations
  - Personalization
  - Intelligent shopping
  - Robotics
  - Voice-assisted devices



# AWS SageMaker

## Business analysts

Make ML predictions using a visual interface with **SageMaker Canvas**

## Data scientists

Prepare data and build, train, and deploy models with **SageMaker Studio**

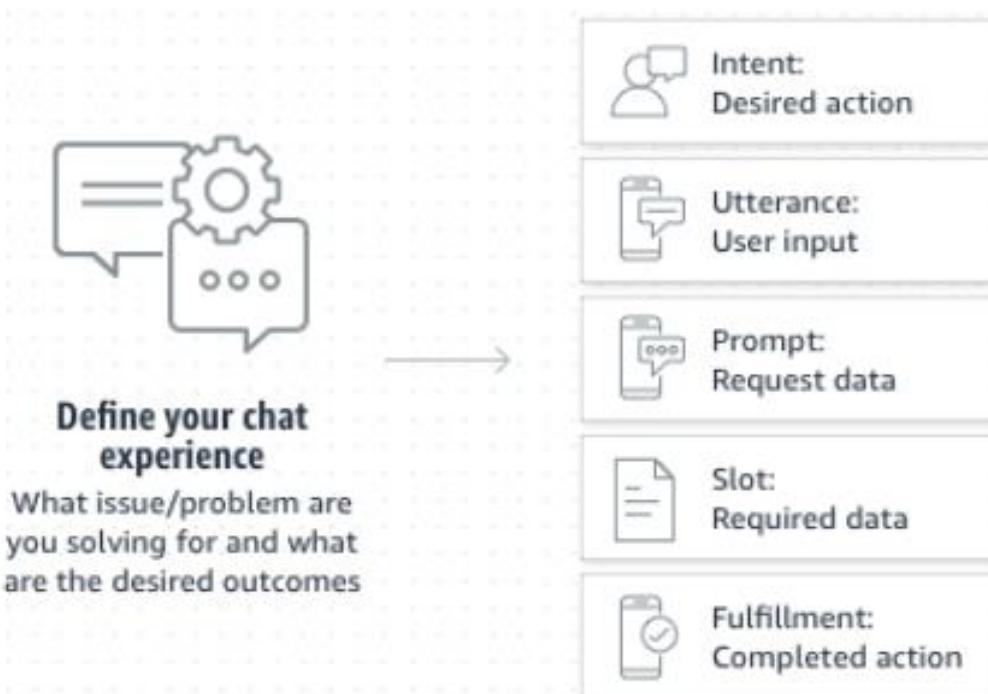
## ML engineers

Deploy and manage models at scale with **SageMaker MLOps**

# Amazon LEX

## Chatbots in the Cloud

Amazon Lex is a fully managed artificial intelligence (AI) service with advanced natural language models to design, build, test, and deploy conversational interfaces in applications



# Amazon Kinesis

- Makes it easy to gather, process, and analyze real-time, streaming data so you can get well-timed insights and react quickly to new data
- Offers abilities to cost-effectively process streaming data at any scale
- Provides flexibility to select the best tools for your application
- Allows you to consume real-time data such as video, audio, application logs, website clickstreams, and IoT telemetry data for machine learning, analytics, and other applications
- Enables you to process and analyze data as it arrives and respond rapidly instead of having to wait until all the data is collected

# Cloud Endure

- Disaster Recovery is an automated IT resilience solution that assists in recovering your environment from unexpected outages, data corruption, ransomware, or other malicious attacks
- AWS Application Migration Service (CloudEndure Migration) simplifies, accelerates, and automates migrations from physical, virtual, and cloud-based infrastructure to AWS
- AWS Elastic Disaster Recovery (CloudEndure Disaster Recovery) reduces downtime and data loss by offering fast, dependable recovery of physical, virtual, and cloud-based servers into AWS in the event of IT disruptions

