

AWS Certified Cloud Practitioner Certification

AWS Certification Path

Professional

Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud



Associate

One year of experience solving problems and implementing solutions using the AWS Cloud



Foundational

Six months of fundamental AWS Cloud and industry knowledge

Specialty

Technical AWS Cloud experience in the Specialty domain as specified in the **exam guide**



Introduction

- The AWS Certified Cloud Practitioner (CLF-C01) examination is intended for individuals who have the knowledge, skills, and abilities to demonstrate basic knowledge of the AWS platform.
 - Available services and their common use cases
 - AWS Cloud architectural principles (at the conceptual level)
 - Account security, and compliance.
 - AWS Cloud economics including: costs, billing, and analysis, and the value proposition of the AWS Cloud

Exam Content

- Response Types There are two types of questions on the examination
 - Multiple choice: Has one correct response and three incorrect responses (distractors).
 - Multiple response: Has two or more correct responses out of five or more options.
- Unanswered questions are scored as incorrect, There is no penalty for guessing.

Content Outline

Domain	Percentage of exam
Domain 1: Cloud Concepts	26%
Domain 2: Security and Compliance	25%
Domain 3: Technology	33%
Domain 4: Billing and Pricing	16%
Total	100%

Exam Result

- The AWS Certified Cloud Practitioner (CLF-C01) examination is a pass or fail exam.
- The examination is scored against a minimum standard established by AWS professionals who are guided by certification industry best practices and guidelines.
- Your results for the examination are reported as a score from 100–1,000, with a minimum passing score of 700.
- Your score shows how you performed on the examination as a whole and whether or not you passed.

Agenda

- Module 1 – Introduction to Amazon Web Services
- Module 2 – Compute in the Cloud
- Module 3 – Global Infrastructure and Security
- Module 4 – Networking
- Module 5 – Storage and Database
- Module 6 – Security
- Module 7 – Monitoring and Analytics
- Module 9 – Migration
- Module 10 – The Cloud Journey

Module 1

Introduction to Amazon Web Services

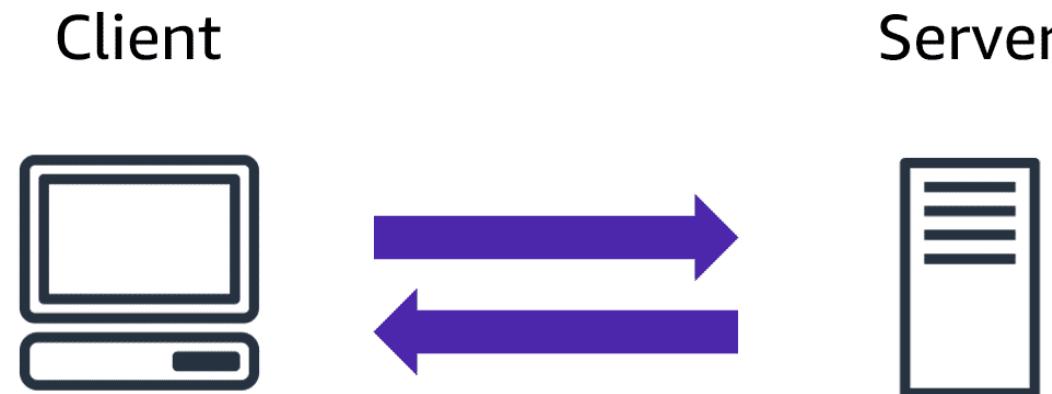
Learning objectives

In this module, you will learn how to:

- Summarize the benefits of AWS.
- Describe differences between traditional delivery and cloud deployments.
- Summarize the pay-as-you-go pricing model.

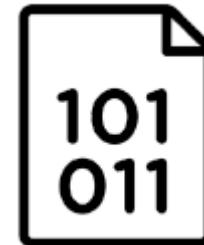
What is a client-server model?

In computing, a **client** can be a web browser or desktop application that a person interacts with to make requests to computer servers. A **server** can be services such as Amazon Elastic Compute Cloud (Amazon EC2), a type of virtual server.



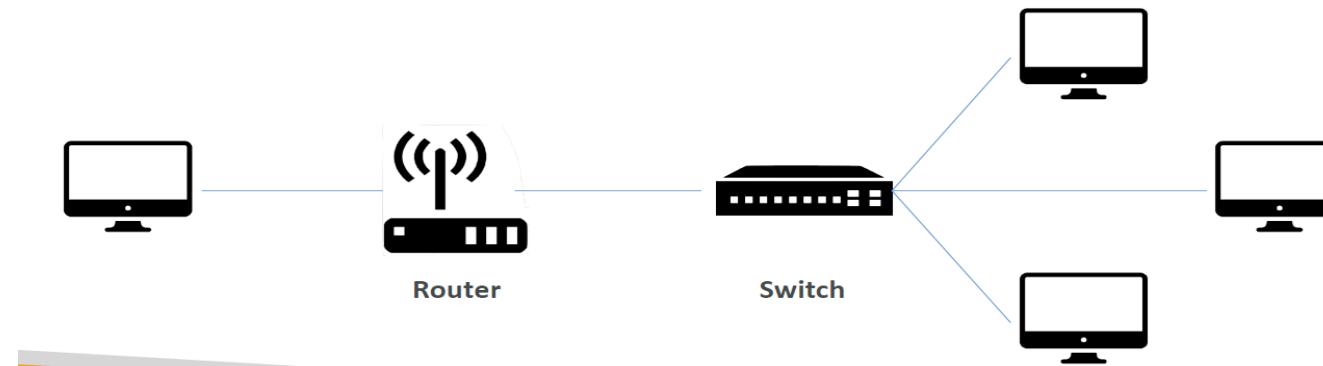
What is a Server composed of?

- Compute: CPU
- Memory: RAM
- Storage: Data
- Network: Routers,
Switch



The Network

- Network: Cables, routers and servers connected with each other
- Router: It forwards the data packets between computer networks
- Switch: Takes a packet and sends it to correct server/client in the network



What is scaling ?

- Scaling is a process OF increasing or decreasing the capacity of a system to meet the increasing demand of serving requests.
 - Vertical scaling
 - Horizontal scaling

Product vs Service

From Google - *A product is a tangible item that is put on the market for **acquisition**, attention, or consumption, while a service is an intangible item, which arises from the output of one or more individuals*

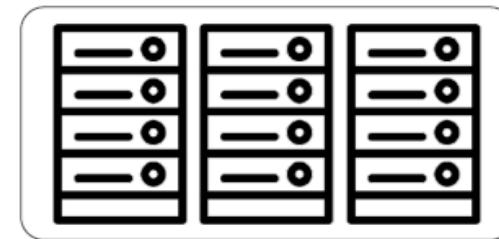
Traditional Approach



Home or Garage



Office



Data center

Problems in the traditional approach

- Pay for the rent for the data center
- Pay for power supply, cooling, maintenance
- Adding and replacing hardware takes time
- Scaling is limited
- 24/7 team required for monitor the infrastructure

Cloud computing

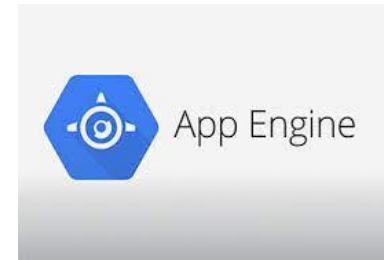
- Cloud computing is the **on-demand** delivery of IT resources **over the internet** with **pay-as-you-go** pricing.
- You can **provision exactly the right size and type of** computing resources required
- All resources can be **accessed instantly**
- Simple way to access Server, Storage, Network, Database, Applications

SaaS vs PaaS vs IaaS

Infrastructure as a Service



Platform as a Service



Software as a service



Deployment models for cloud computing

- The three cloud computing deployment models are cloud-based, on-premises, and hybrid.
- The three cloud computing deployment models are
 - Public cloud
 - Private Cloud
 - Hybrid Cloud

Public Cloud

- Cloud resources owned and operated by a third party cloud service provider over the internet
- Run all parts of the application in the cloud.
- Migrate existing applications to the cloud.
- Design and build new applications in the cloud.



Google Cloud

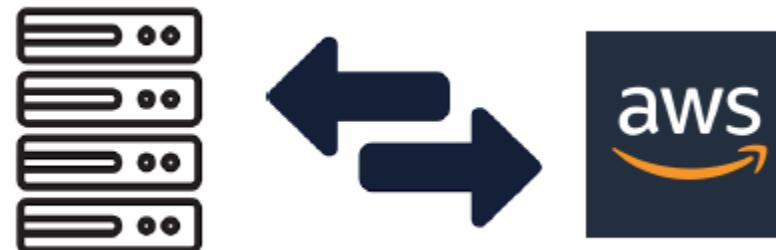
Private Cloud

- Cloud services used by a single organization, not exposed to the public.
- Complete control
- Security for sensitive applications
- Meet specific business needs



Hybrid Cloud

- Keep some servers on premises and extend some capabilities to the Cloud
- Control over sensitive assets in your private infrastructure
- Flexibility and cost effectiveness of the public cloud



6 Advantages of cloud computing

- Trade upfront expense for variable expense.
- Benefit from massive economies of scale.
- Stop guessing capacity.
- Increase speed and agility.
- Stop spending money running and maintaining data centers.
- Go global in minutes.

Module 2

Compute in the Cloud

Learning objectives

In this module, you will learn how to:

- Describe the benefits of Amazon EC2 at a basic level.
- Identify the different Amazon EC2 instance types.
- Differentiate between the various billing options for Amazon EC2.
- Summarize the benefits of Amazon EC2 Auto Scaling.
- Summarize the benefits of Elastic Load Balancing.
- Give an example of the uses for Elastic Load Balancing.
- Summarize the differences between Amazon Simple Notification Service (Amazon SNS) and Amazon Simple Queue Service (Amazon SQS).
- Summarize additional AWS compute options.

Before AWS

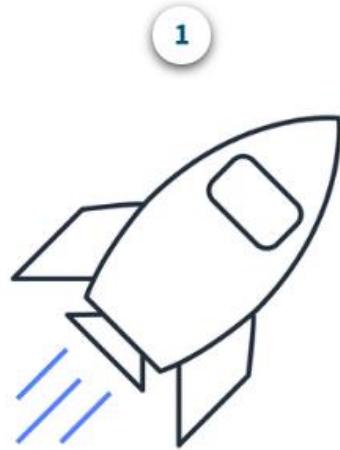
- Imagine you are responsible for the architecture of your company's resources and need to support new websites.
- With traditional on-premises resources, you have to do the following:
 - Spend money upfront to purchase hardware.
 - Wait for the servers to be delivered to you.
 - Install the servers in your physical data center.
 - Make all the necessary configurations.

Amazon Elastic Compute Cloud (Amazon EC2)

- Amazon Elastic Compute Cloud (Amazon EC2) provides secure, resizable compute capacity in the cloud as Amazon EC2 instances.
 - You can provision and launch an Amazon EC2 instance within minutes.
 - You can stop using it when you have finished running a workload.
 - You pay only for the compute time you use when an instance is running, not when it is stopped or terminated.
 - You can save costs by paying only for server capacity that you need or want.



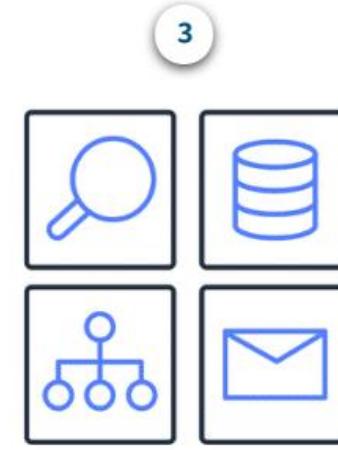
How Amazon EC2 works



Launch



Connect



Use



Amazon EC2 instance types

- Amazon EC2 instance types are optimized for different tasks.
- Consider the specific needs of your workloads and applications.
- This might include requirements for compute, memory, or storage capabilities.
 - General purpose instances
 - Compute optimized instances
 - Memory optimized instances
 - Accelerated computing instances
 - Storage optimized instances

General purpose instances

- **General purpose instances** provide a balance of compute, memory, and networking resources.
- They can be used for a variety of workloads, such as:
 - application servers
 - gaming servers
 - backend servers for enterprise applications
 - small and medium databases

Features

- Intel core i7 processors with 3.2 GHz (4.6 GHz turbo)
- 6 physical / 12 logical cores
- 32 GiB of memory
- Instance storage is available via Amazon Elastic Block Store (EBS)
- Mac instances are dedicated, bare-metal instances which are accessible in the EC2 console as dedicated hosts

Compute optimized instances

- **Compute optimized instances** are ideal for compute-bound applications that benefit from high-performance processors.
- However, the difference is compute optimized applications are ideal for high-performance web servers, compute-intensive applications servers, and dedicated gaming servers.
- The compute optimized instances can be used for batch processing workloads that require processing many transactions in a single group.

Features

- Custom built AWS Graviton2 Processor with 64-bit Arm Neoverse cores
- Support for Enhanced Networking with Up to 25 Gbps of Network bandwidth
- EBS-optimized by default
- Powered by the [AWS Nitro System](#), a combination of dedicated hardware and lightweight hypervisor

Memory optimized instances

- **Memory optimized instances** are designed to deliver fast performance for workloads that process large datasets in memory.
- Before a computer program or application is able to run, it is loaded from storage into memory. This preloading process gives the CPU direct access to the computer program.

Features

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Accelerated computing instances

- **Accelerated computing instances** use hardware accelerators, or coprocessors, to perform some functions more efficiently than is possible in software running on CPUs.
- Examples of these functions include floating-point number calculations, graphics processing, and data pattern matching.

Features

- Up to 8 NVIDIA A100 Tensor Core GPUs
- 400 Gbps instance networking with support for Elastic Fabric Adapter (EFA) and NVIDIA GPUDirect RDMA (remote direct memory access)
- 600 GB/s peer to peer GPU communication with NVIDIA NVSwitch
- 3.0 GHz 2nd Generation Intel Xeon Scalable (Cascade Lake) processors

Storage optimized instances

- **Storage optimized instances** are designed for workloads that require high, sequential read and write access to large datasets on local storage.
- Examples of workloads suitable for storage optimized instances include distributed file systems, data warehousing applications, and high-frequency online transaction processing (OLTP) systems.

Features

- High Frequency Intel Xeon E5-2686 v4 (Broadwell) Processors with base frequency of 2.3 GHz
- Up to 25 Gbps of network bandwidth using Elastic Network Adapter (ENA)-based Enhanced Networking
- High Random I/O performance and High Sequential Read throughput
- Support bare metal instance size for workloads that benefit from direct access to physical processor and memory

Amazon EC2 pricing

- With Amazon EC2, **you pay only for the compute time that you use.**
- Amazon EC2 offers a **variety of pricing options** for different use cases.
 - For example, if your use case can withstand interruptions, you can save with Spot Instances.
 - You can also save by committing early and locking in a minimum level of use with Reserved Instances.

On-Demand

- **On-Demand Instances** are ideal for short-term, irregular workloads that cannot be interrupted.
- No upfront costs or minimum contracts apply. The instances run continuously until you stop them, and you pay for only the compute time you use.

Reserved Instances

- **Reserved Instances** are a billing discount applied to the use of On-Demand Instances in your account.
- You can purchase Standard Reserved and Convertible Reserved Instances for a 1-year or 3-year term, and Scheduled Reserved Instances for a 1-year term.
- Realize greater cost savings with the 3-year option.

Spot Instances

- **Spot Instances** are ideal for workloads with flexible start and end times, or that can withstand interruptions.
- Spot Instances use unused Amazon EC2 computing capacity and offer you cost savings at up to 90% off of On-Demand prices.

Amazon EC2 Savings Plans

- **Amazon EC2 Savings Plans** enable you to reduce your compute costs by committing to a consistent amount of compute usage for a 1-year or 3-year term.
- This term commitment results in savings of up to 72% over On-Demand costs.

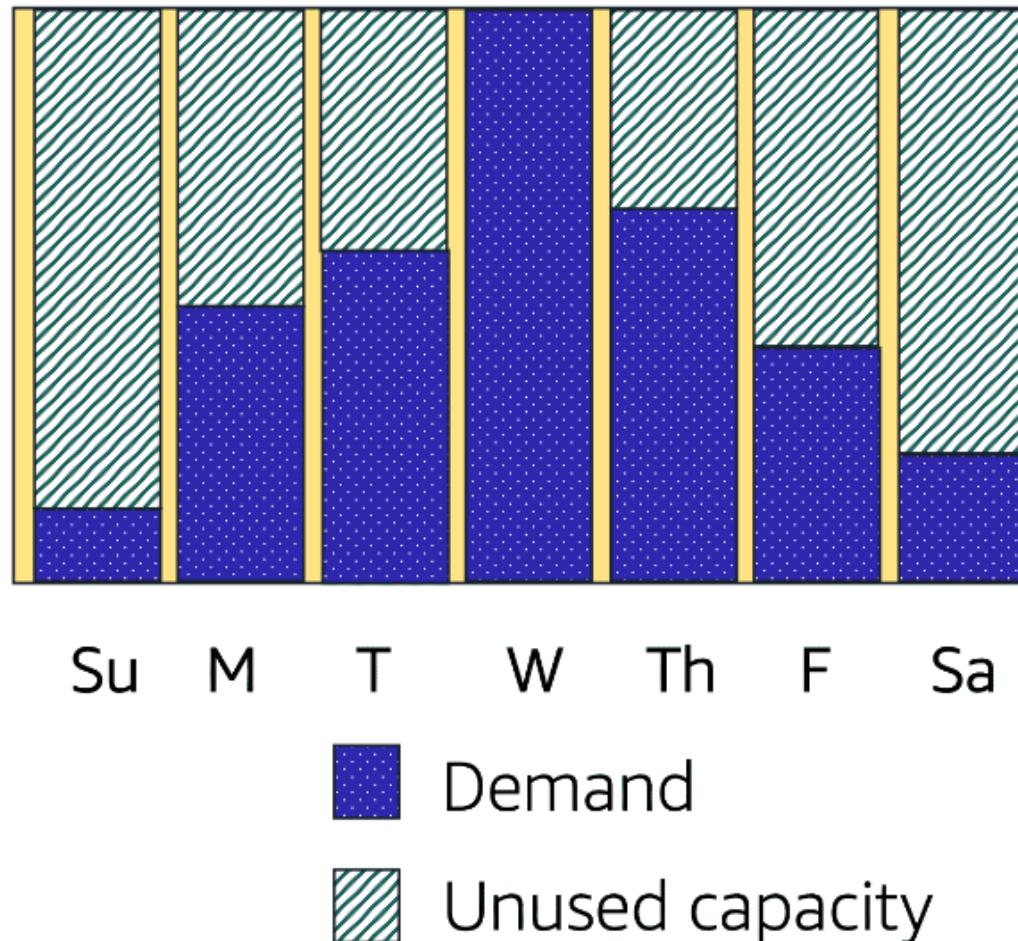
Dedicated vs Shared Hosts

- **Dedicated Hosts** are physical servers with Amazon EC2 instance capacity that is fully dedicated to your use.
- You can purchase On-Demand Dedicated Hosts and Dedicated Hosts Reservations.
- Of all the Amazon EC2 options that were covered, Dedicated Hosts are the most expensive.

Scaling

- **Scalability** involves beginning with only the resources you need and designing your architecture to automatically respond to changing demand by scaling out or in.
- As a result, you pay for only the resources you use. You don't have to worry about a lack of computing capacity to meet your customers' needs.

Why auto scaling ?



Amazon EC2 Auto Scaling

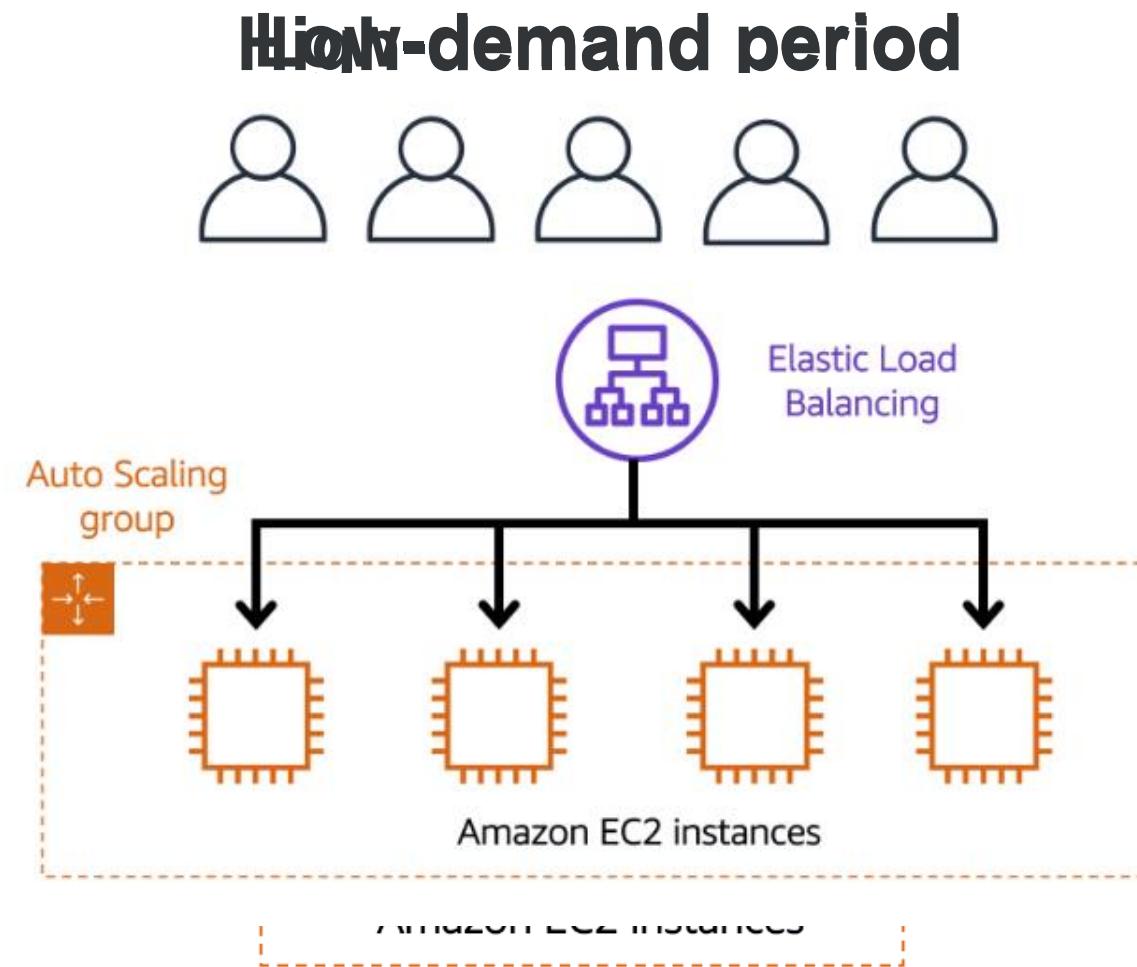
- Amazon EC2 Auto Scaling enables you to ***automatically*** add or remove Amazon EC2 instances in response to ***changing application demand***.
- By automatically scaling your instances in and out as needed, you are able to maintain a greater sense of application availability.
- Within Amazon EC2 Auto Scaling, you can use two approaches: dynamic scaling and predictive scaling.

Elastic Load Balancing

- **Elastic Load Balancing** is the AWS service that automatically distributes incoming application traffic across multiple resources, such as Amazon EC2 instances.
- A load balancer acts as a single point of contact for all incoming web traffic to your Auto Scaling group.

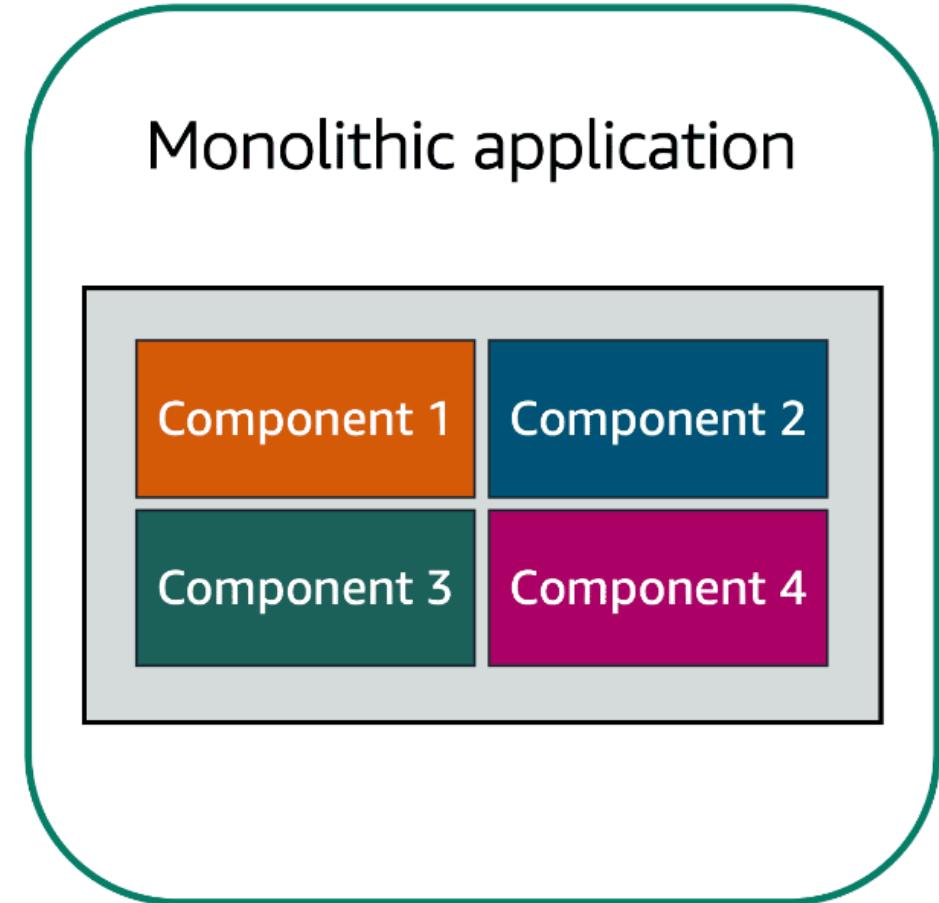


ASG and ELB in action



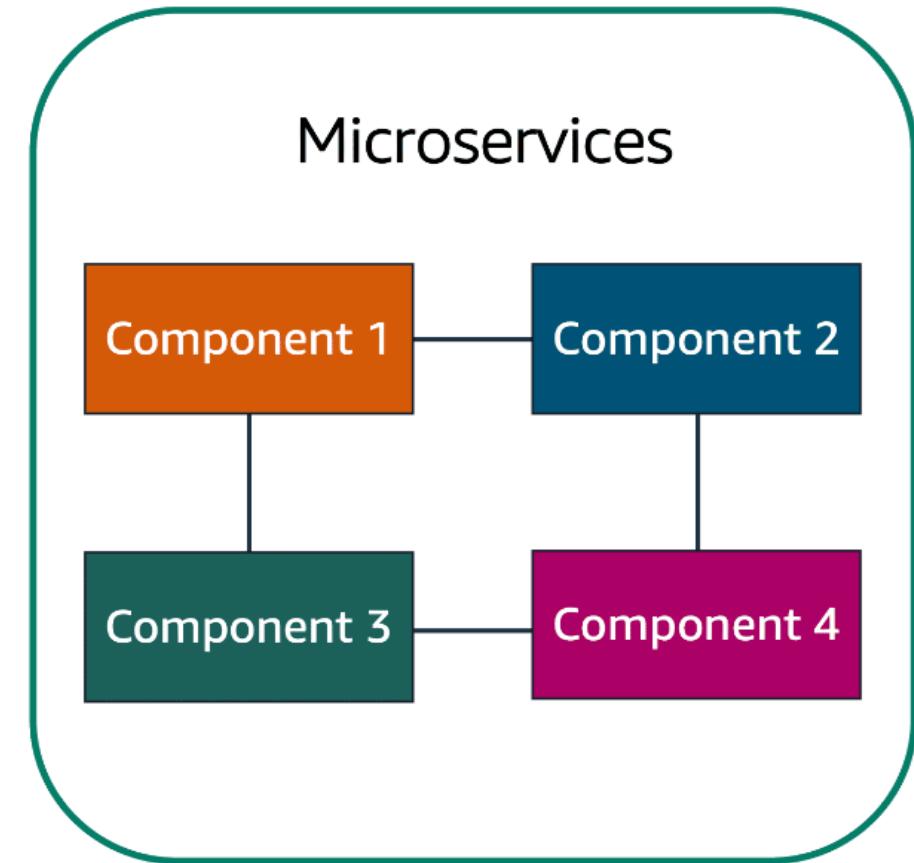
Monolithic applications

- Applications are made of multiple components.
Components might include databases, servers, the user interface, business logic etc
- The components communicate with each other to transmit data, fulfill requests, and keep the application running.
- In this approach to application architecture, if a single component fails, other components fail, and possibly the entire application fails.



Microservices

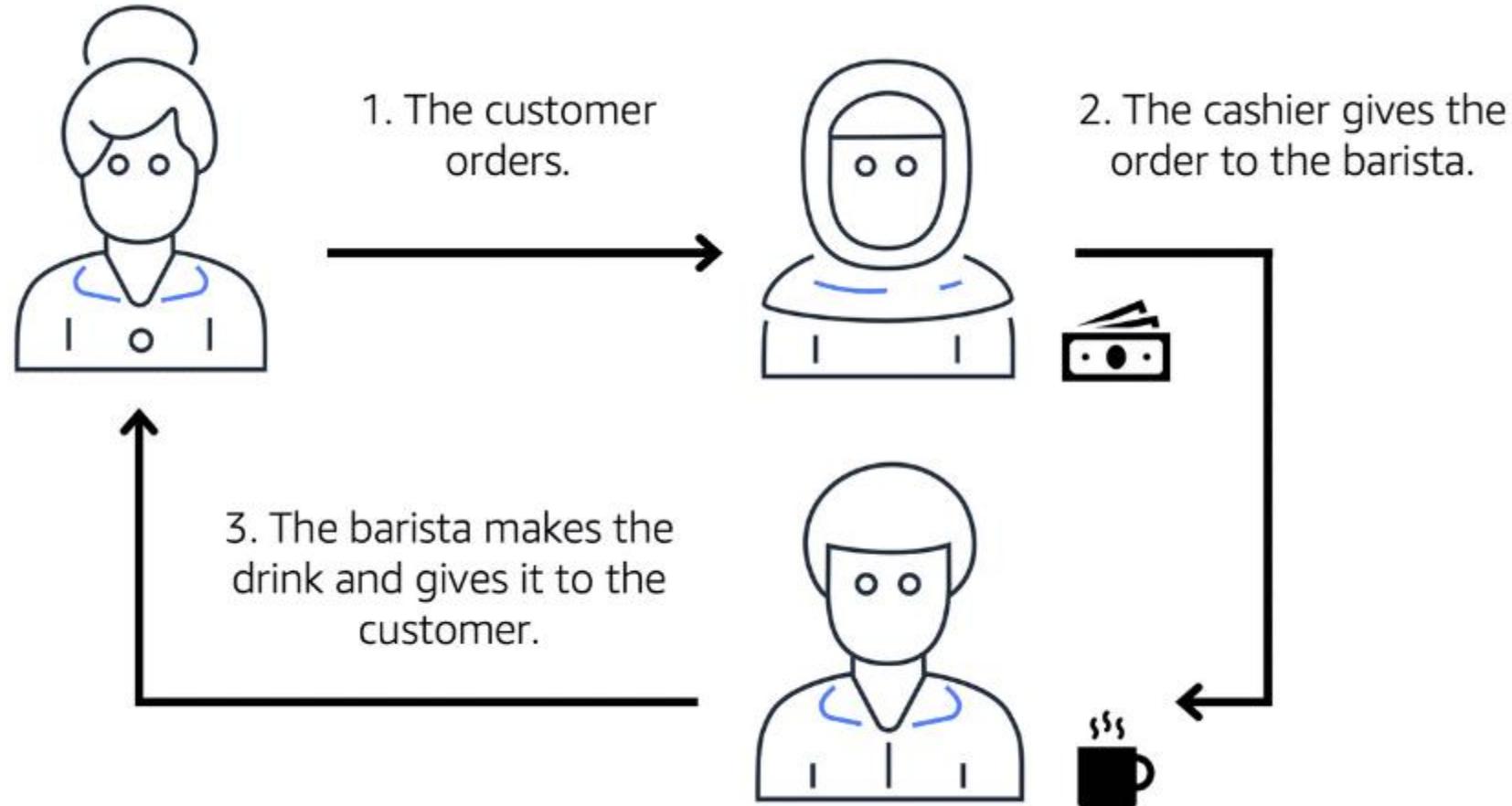
- In a microservices approach, application components are loosely coupled.
- In this case, if a single component fails, the other components continue to work because they are communicating with each other.
- When designing applications on AWS, you can take a microservices approach with services and components that fulfill different functions.



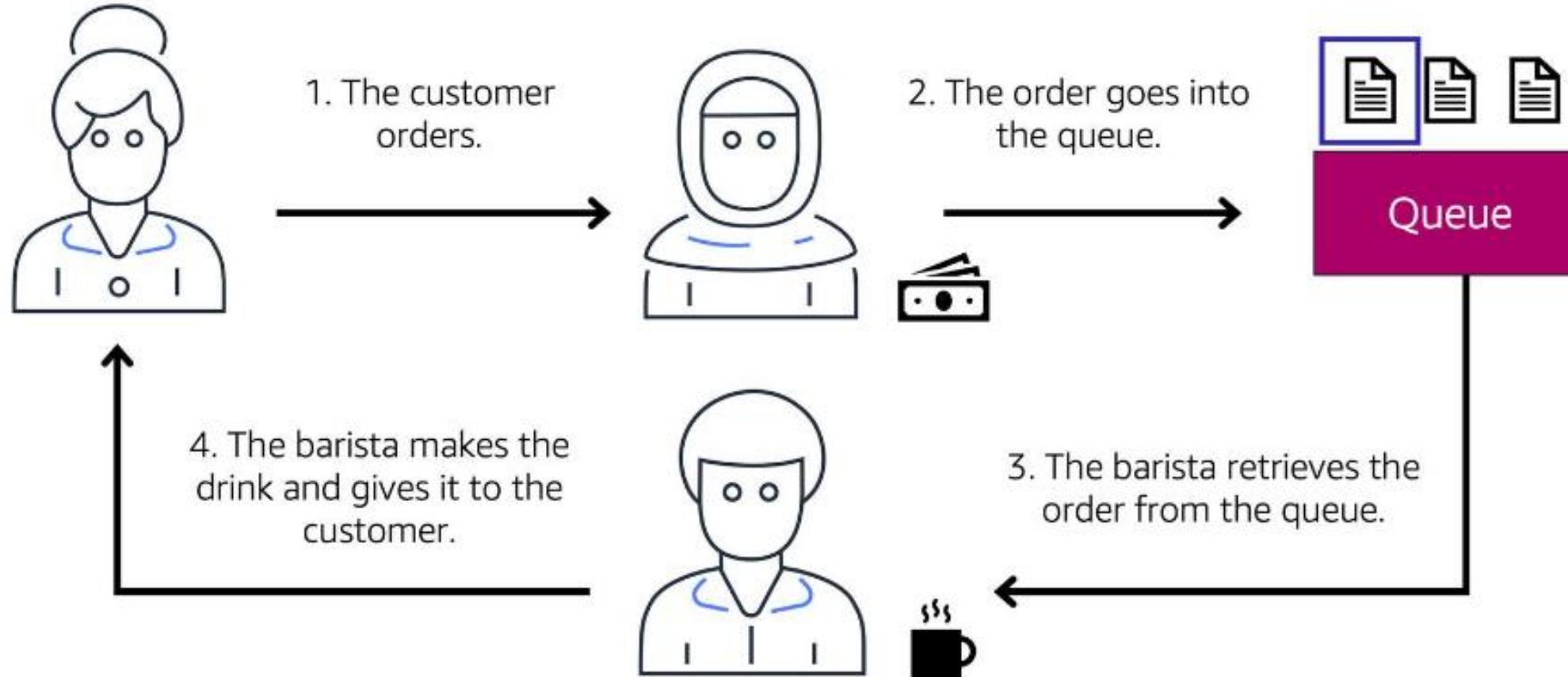
Event driven architecture

- Difference between synchronous and asynchronous calls
- Why event driven ?
 - Loose coupling
 - Different components can scale independently
 - Agility
 - Fault isolation

Example: Fulfilling an order



Example: Orders in a queue



Amazon Simple Notification Service (Amazon SNS)

- **Amazon Simple Notification Service (Amazon SNS)** is a publish /subscribe service.
- Using Amazon SNS topics, a publisher publishes messages to subscribers.
- In Amazon SNS, subscribers can be web servers, email addresses, AWS Lambda functions, or several other options.

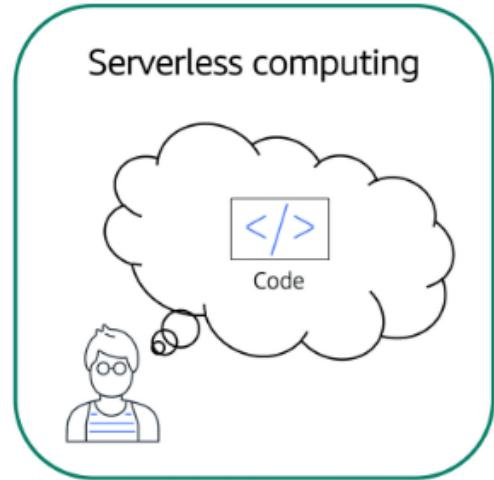
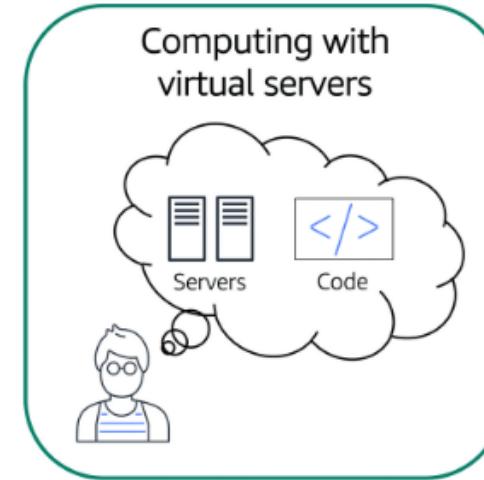
Amazon Simple Queue Service (Amazon SQS)

- **Amazon Simple Queue Service (Amazon SQS)** is a message queuing service.
- Using Amazon SQS, you can send, store, and receive messages between software components, without losing messages or requiring other services to be available.
- A user or service retrieves a message from the queue, processes it, and then deletes it from the queue.
- For decoupled applications and microservices, Amazon SQS enables you to send, store, and retrieve messages between components.
- This decoupled approach enables the separate components to work more efficiently and independently.



Serverless computing

- The term “serverless” means that your code still runs on servers
- However you do not need to provision or manage these servers.
- With serverless computing, you can focus more on innovating new products and features instead of maintaining servers.



AWS Lambda

- **AWS Lambda** is a service that lets you run code without needing to provision or manage servers.
- While using AWS Lambda, you pay only for the compute time that you consume.
- Charges apply only when your code is running. You can also run code for virtually any type of application or backend service, all with zero administration.



How AWS Lambda works

- You upload your code to Lambda.
- You set your code to trigger from an event source, such as AWS services, mobile applications, or HTTP endpoints.
- Lambda runs your code only when triggered.
- You pay only for the compute time that you use.



Upload code to Lambda.



Set code to trigger from an event source.



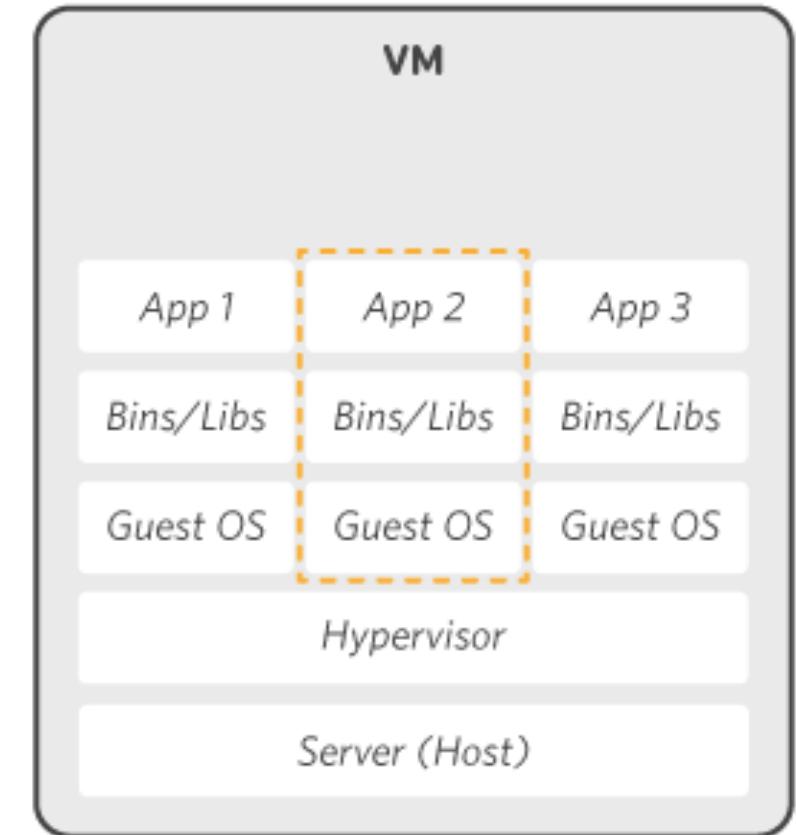
Code runs only when triggered.



Pay only for the compute time you use.

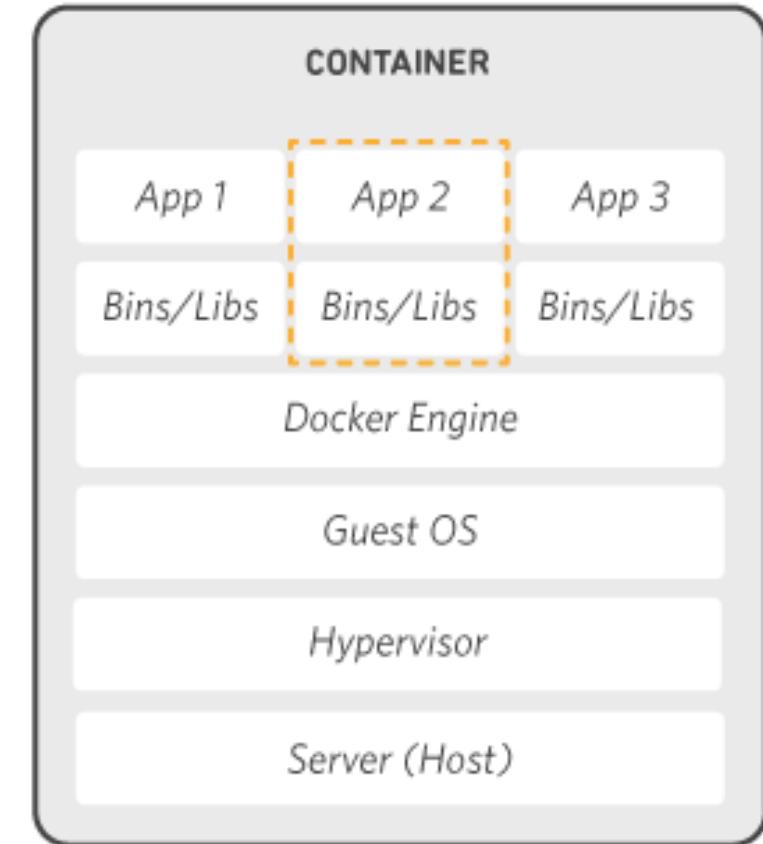
Virtualization

- Virtualization is a software-based (or virtual) representation of applications, servers, storage and networks.
- It is achieved by using a Hypervisor
 - Eg - VMWare, Xen, KVM

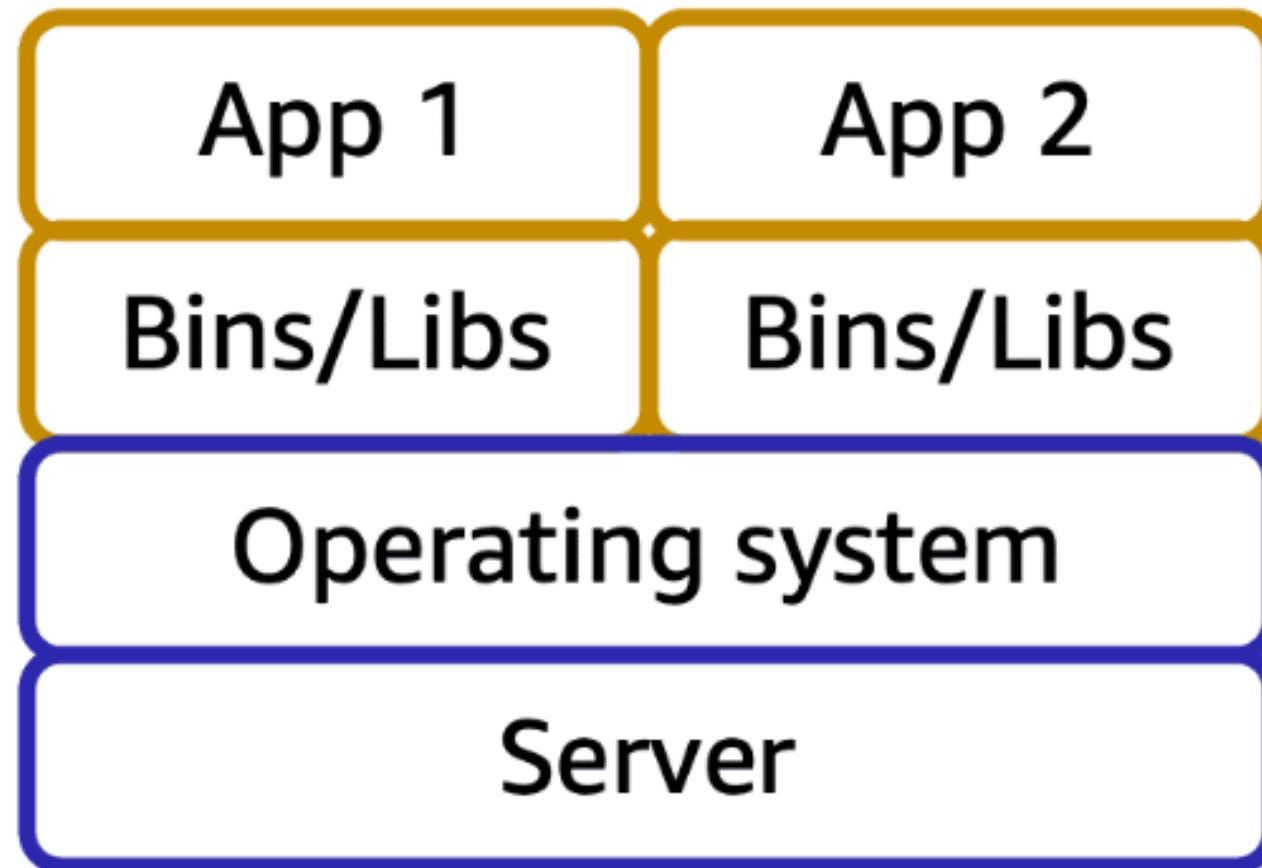


Containers

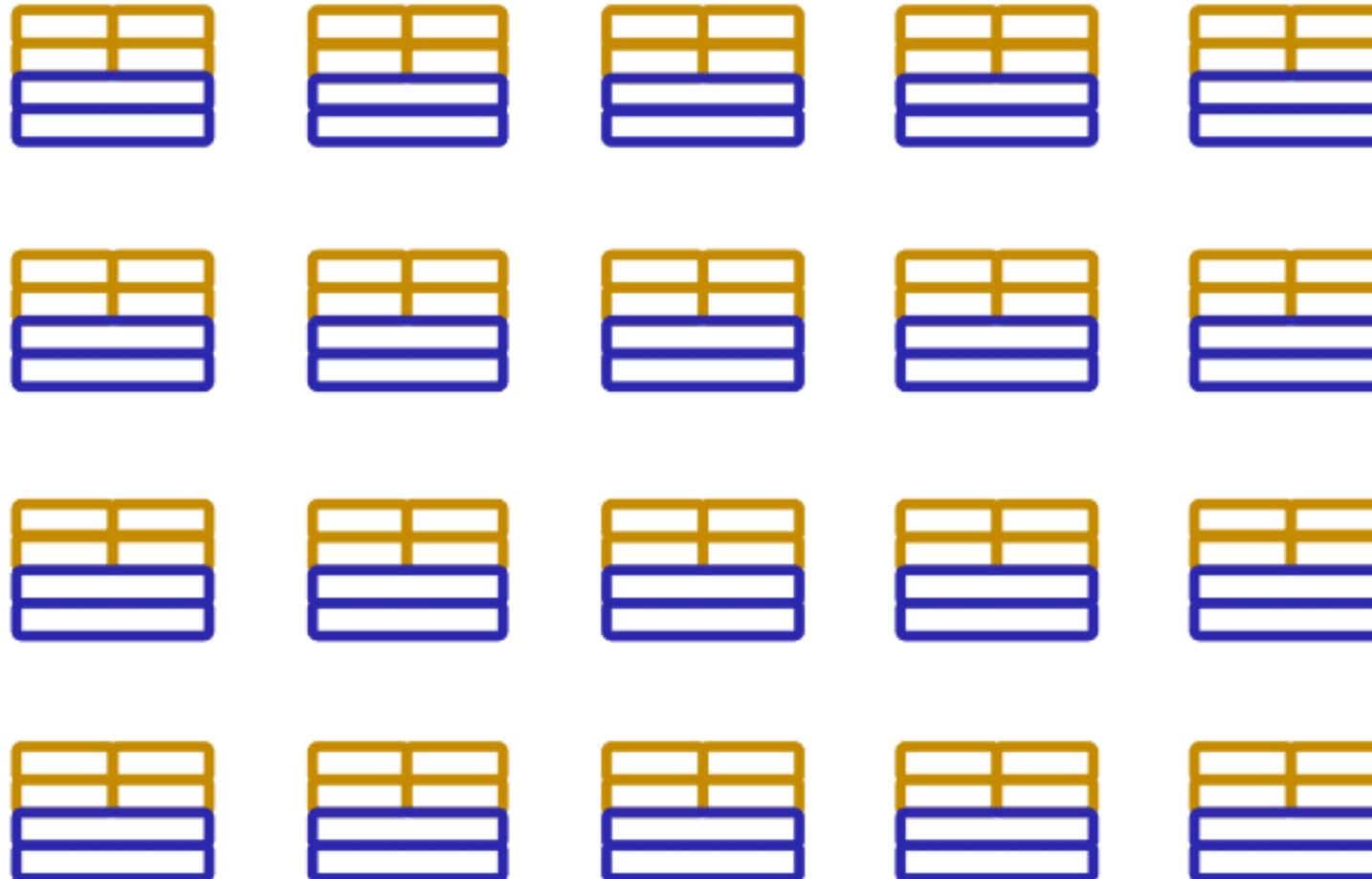
- **Containers** provide you with a standard way to package your application's code and dependencies into a single object.
- You can also use containers for processes and workflows in which there are essential requirements for security, reliability, and scalability.



One host with multiple containers



Tens of hosts with hundreds of containers



Amazon Elastic Container Service (Amazon ECS)

- Amazon Elastic Container Service (Amazon ECS) is a highly scalable, high-performance container management system that enables you to run and scale containerized applications on AWS.
- Amazon ECS supports Docker containers. Docker is a software platform that enables you to build, test, and deploy applications quickly.

Amazon Elastic Kubernetes Service (Amazon EKS)

- Amazon Elastic Kubernetes Service (Amazon EKS) is a fully managed service that you can use to run Kubernetes on AWS.
- Kubernetes is open-source software that enables you to deploy and manage containerized applications at scale.

AWS Fargate

- **AWS Fargate** is a serverless compute engine for containers. It works with both Amazon ECS and Amazon EKS.
- AWS Fargate manages your server infrastructure for you.

Summary

In this module, you will learn how to:

- Describe the benefits of Amazon EC2 at a basic level.
- Identify the different Amazon EC2 instance types.
- Differentiate between the various billing options for Amazon EC2.
- Summarize the benefits of Amazon EC2 Auto Scaling.
- Summarize the benefits of Elastic Load Balancing.
- Give an example of the uses for Elastic Load Balancing.
- Summarize the differences between Amazon Simple Notification Service (Amazon SNS) and Amazon Simple Queue Service (Amazon SQS).
- Summarize additional AWS compute options.

MODULE 3

GLOBAL INFRASTRUCTURE AND RELIABILITY

Learning objectives

In this module, you will learn how to:

- Summarize the benefits of the AWS Global Infrastructure.
- Describe the basic concept of Availability Zones.
- Describe the benefits of Amazon CloudFront and edge locations.
- Compare different methods for provisioning AWS services.

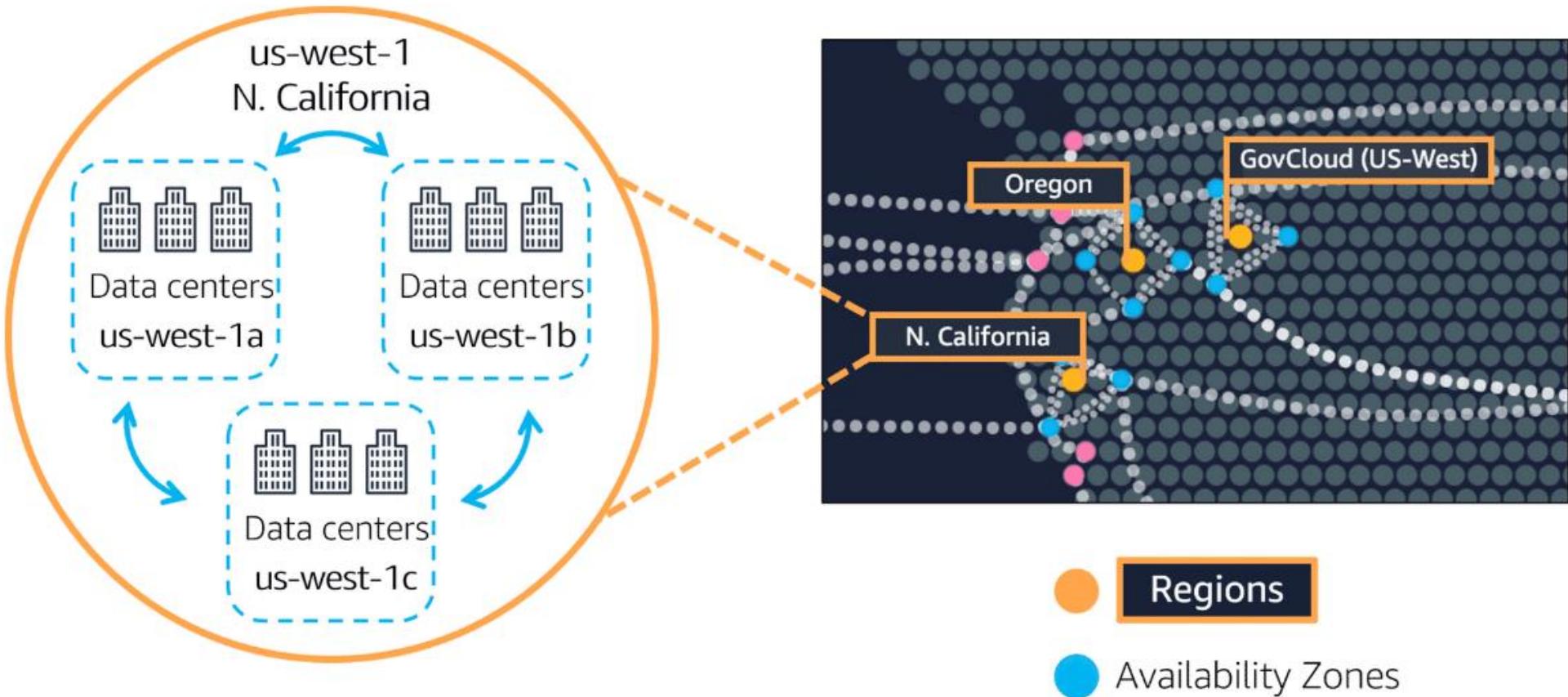
AWS Region and Availability Zone

- AWS has the concept of a **Region**, which is a **physical location** around the world where we cluster data centers.
- There are many AWS regions available across the globe
- An Availability Zone (AZ) is one or more discrete **data centers** with redundant power, networking, and connectivity in an AWS Region.

Selecting a Region

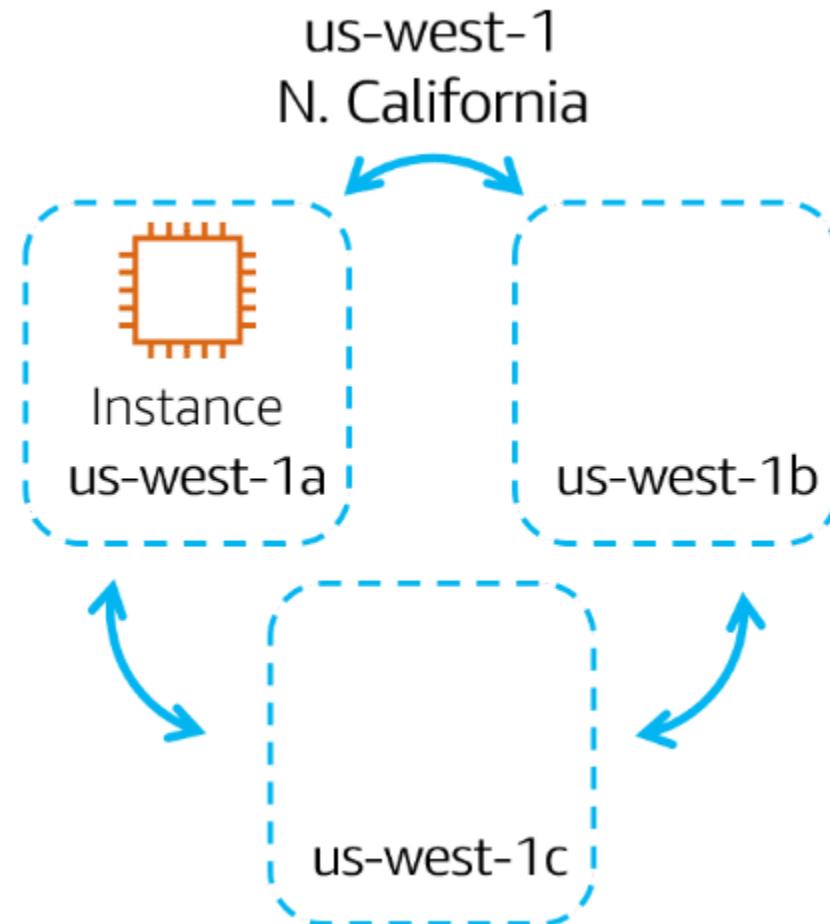
- When determining the right Region for your services, data, and applications, consider the following four business factors.
 - **Compliance** with data governance and **legal** requirements
 - **Proximity** to your customers
 - **Available services** within a Region
 - **Pricing**

Availability Zones

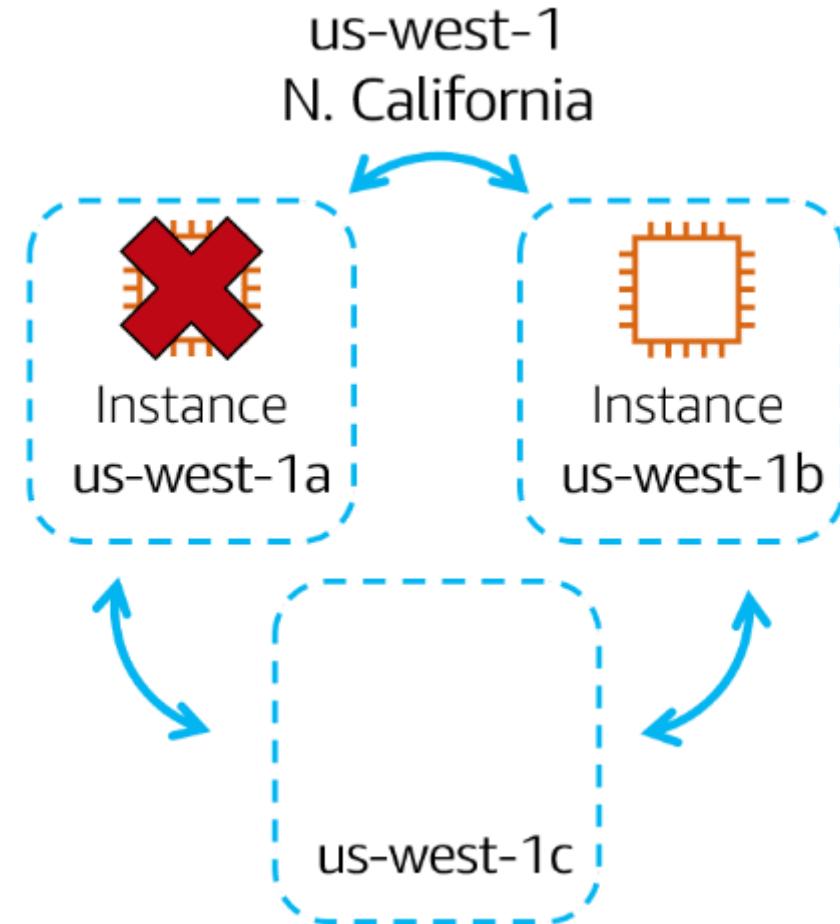
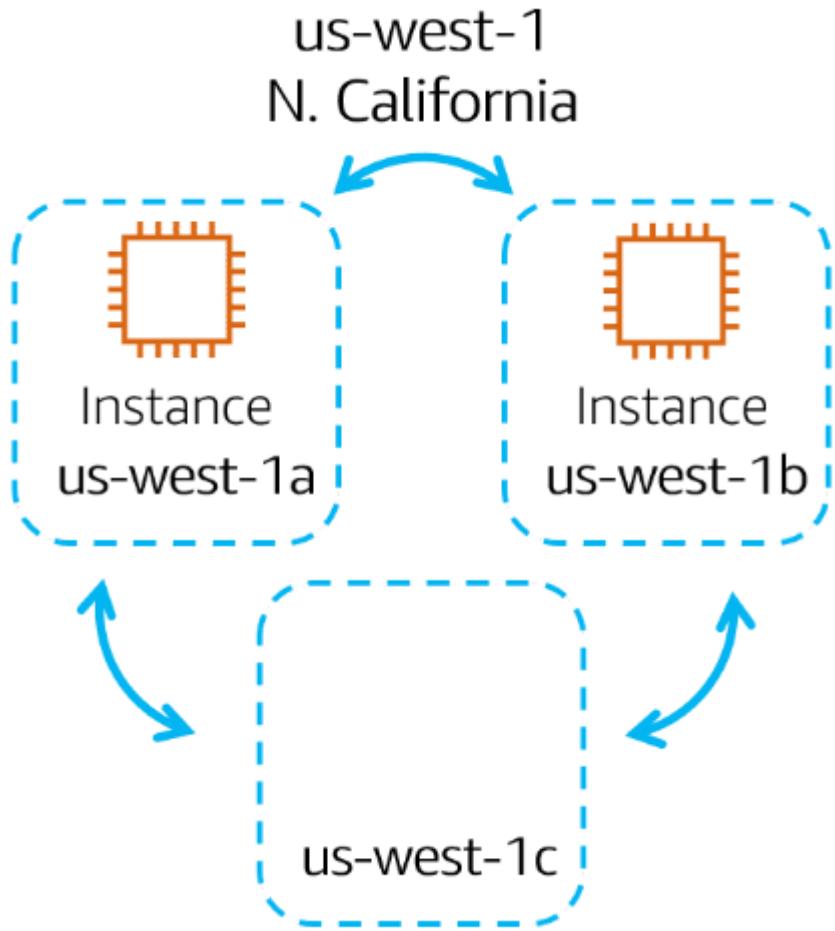




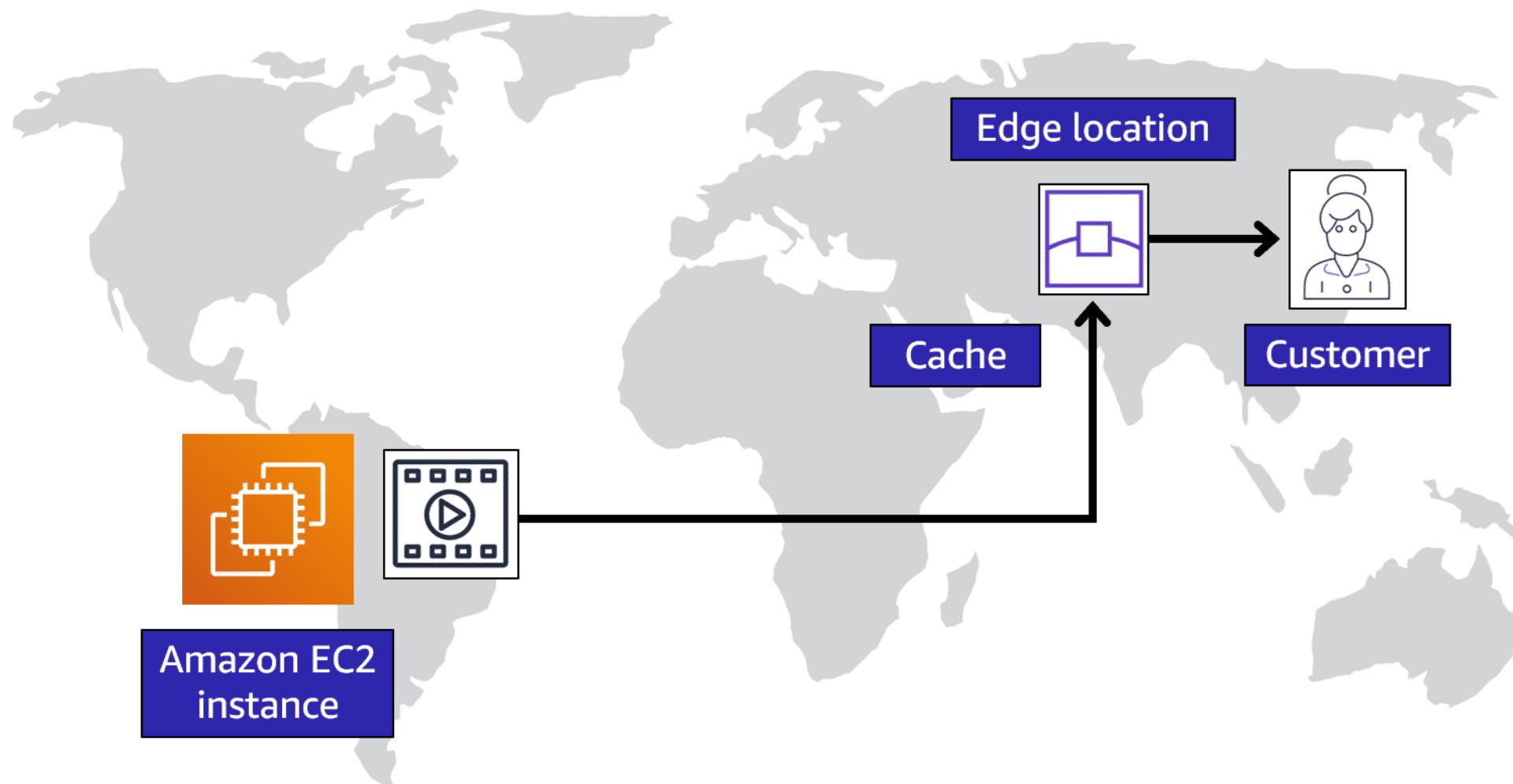
Amazon EC2 instance in a single Availability Zone



Amazon EC2 instances in multiple Availability Zones



Edge locations



Ways to interact with AWS services

- AWS Management Console

The **AWS Management Console** is a web-based interface for accessing and managing AWS services.

- AWS Command Line Interface

WS CLI enables you to control multiple AWS services directly from the command line within one tool.

- Software Development Kit

SDKs make it easier for you to use AWS services through an API designed for your programming language or platform.

AWS Elastic Beanstalk

- With **AWS Elastic Beanstalk**, you provide code and configuration settings, and Elastic Beanstalk deploys the resources necessary to perform the following tasks:
 - Adjust capacity
 - Load balancing
 - Automatic scaling
 - Application health monitoring

AWS CloudFormation

- With **AWS CloudFormation**, you can treat your infrastructure as code.
- This means that you can build an environment by writing lines of code instead of using the AWS Management Console to individually provision resources.
- AWS CloudFormation provisions your resources in a safe, repeatable manner, enabling you to frequently build your infrastructure and applications without having to perform manual actions.

Additional Resources

- [Global Infrastructure](#)
- [Interactive map of the AWS Global Infrastructure](#)
- [Regions and Availability Zones](#)
- [AWS Networking and Content Delivery Blog](#)
- [Tools to Build on AWS](#)
- [AWS Customer Stories: Content Delivery](#)

Module 4

Networking

Learning objectives

In this module, you will learn how to:

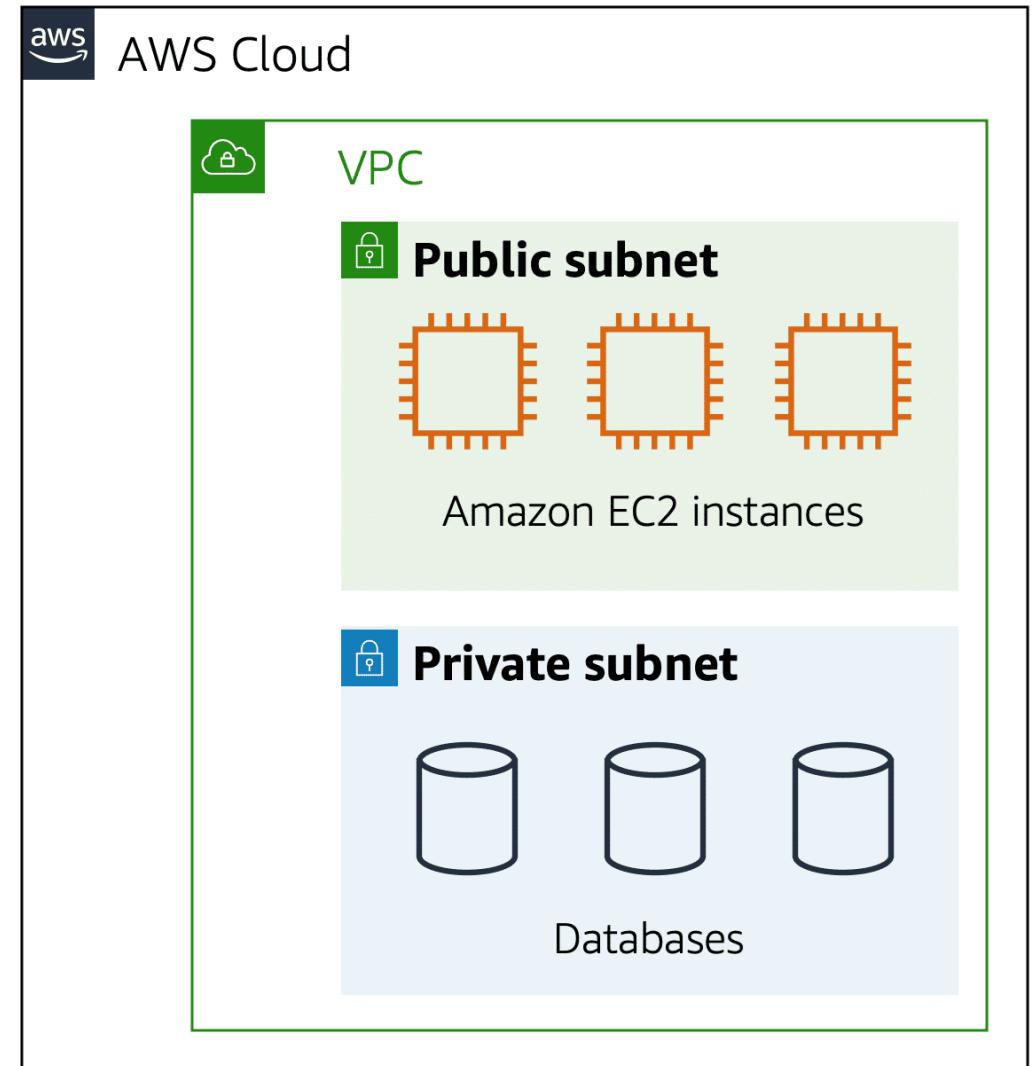
- Describe the basic concepts of networking.
- Describe the difference between public and private networking resources.
- Explain a virtual private gateway using a real life scenario.
- Explain a virtual private network (VPN) using a real life scenario.
- Describe the benefit of AWS Direct Connect.
- Describe the benefit of hybrid deployments.
- Describe the layers of security used in an IT strategy.
- Describe the services customers use to interact with the AWS global network.

Amazon Virtual Private Cloud (Amazon VPC)

- **Amazon Virtual Private Cloud (Amazon VPC)** enables you to provision an **isolated section** of the AWS Cloud.
- In this isolated section, you can **launch resources in a virtual network** that you define.
- Within a virtual private cloud (VPC), you can **organize your resources into subnets**.
- A subnet is a **section of a VPC that can contain resources** such as Amazon EC2 instances.

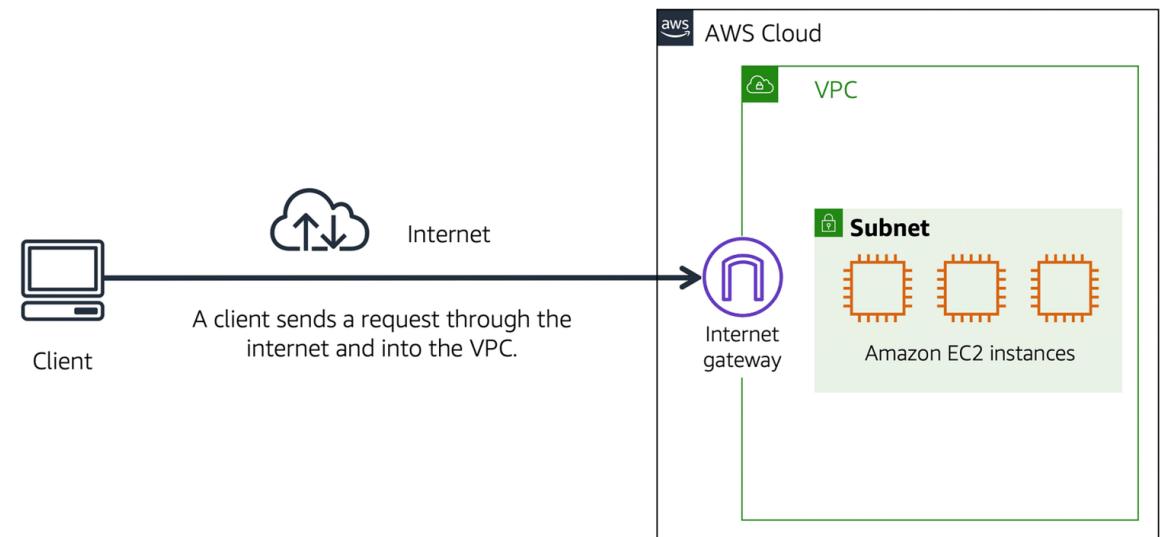
Subnets

- A subnet is a section of a VPC in which you can group resources based on security or operational needs. Subnets can be public or private.
 - **Public subnets** contain resources that need to be accessible by the public, such as an online store's website.
 - **Private subnets** contain resources that should be accessible only through your private network, such as a database that contains customers' personal information and order histories.



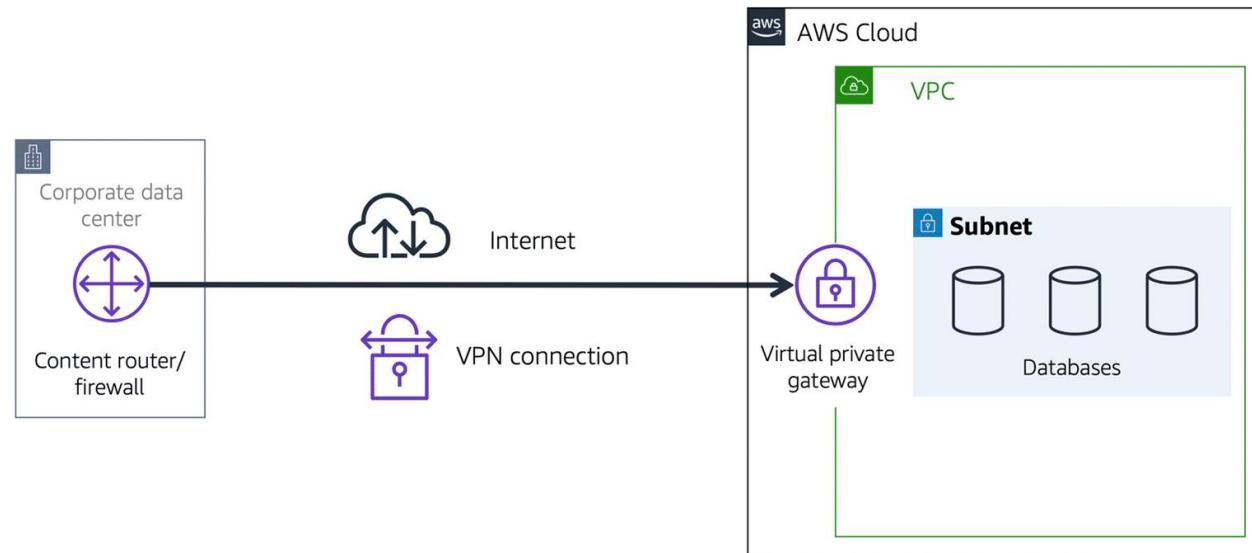
Internet gateway

- To allow public traffic from the internet to access your VPC, you attach an **internet gateway** to the VPC.
- An internet gateway is a connection between a VPC and the internet.
- Without an internet gateway, no one can access the resources within your VPC.



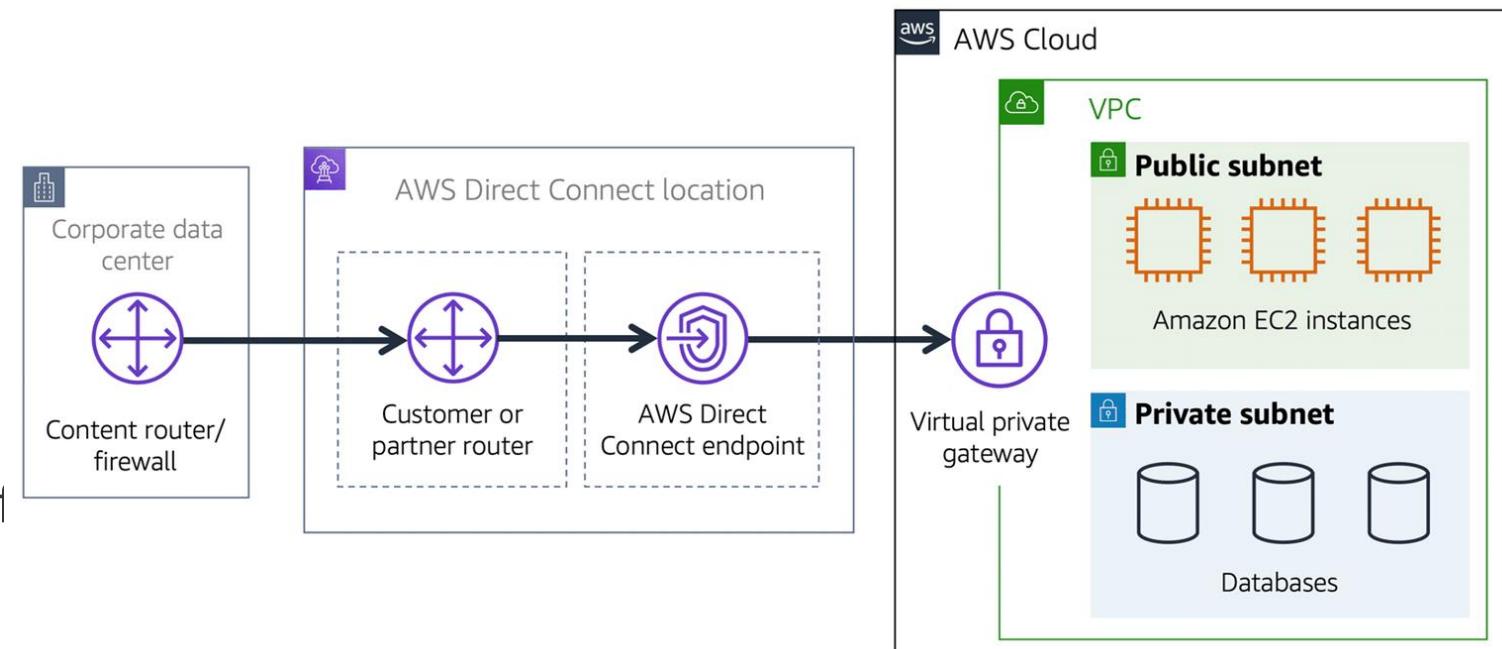
Virtual private gateway

- A **virtual private gateway** is a logical, fully redundant distributed edge routing function that sits at the edge of your VPC. As it is capable of terminating **VPN** connections from your on-prem or customer environments, the VPG is the **VPN** concentrator on the Amazon side of the Site-to-Site **VPN** connection.



AWS Direct Connect

- **AWS Direct Connect** is a service that enables you to **establish a dedicated private connection** between your data center and a VPC.
- The private connection that AWS Direct Connect provides helps you to reduce network costs and increase the amount of bandwidth that can travel through your network.

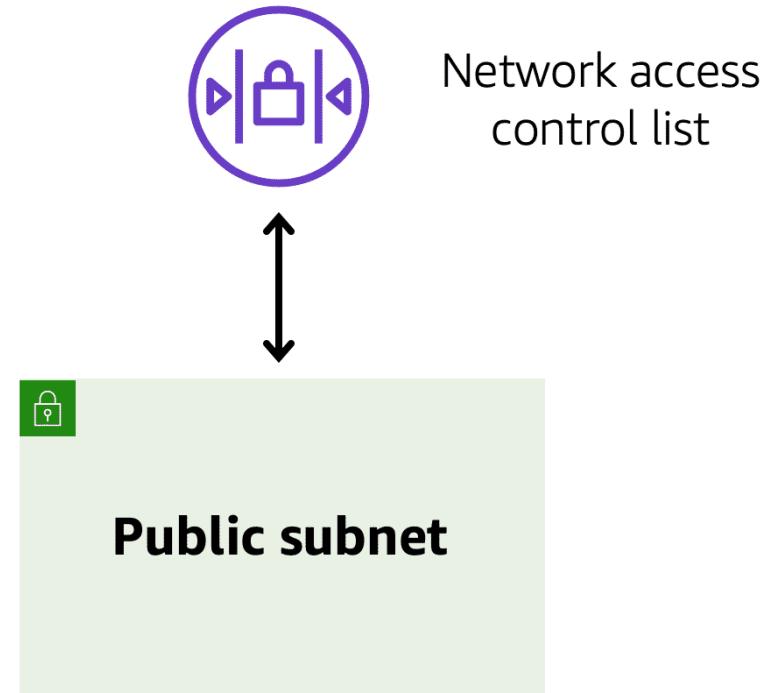


Network traffic in a VPC

- When a customer requests data from an application hosted in the AWS Cloud, this request is sent as a packet. A **packet** is a unit of data sent over the internet or a network.
- It enters into a VPC through an internet gateway. Before a packet can enter into a subnet or exit from a subnet, it checks for permissions.
- These permissions indicate who sent the packet and how the packet is trying to communicate with the resources in a subnet.

Network access control lists (ACLs)

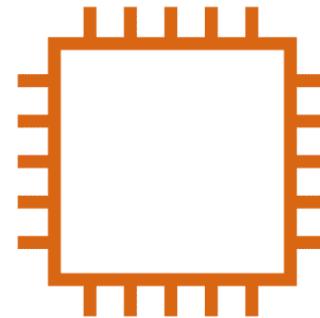
- A network access control list (ACL) is a **virtual firewall** that controls inbound and outbound traffic at the subnet level.



Security groups

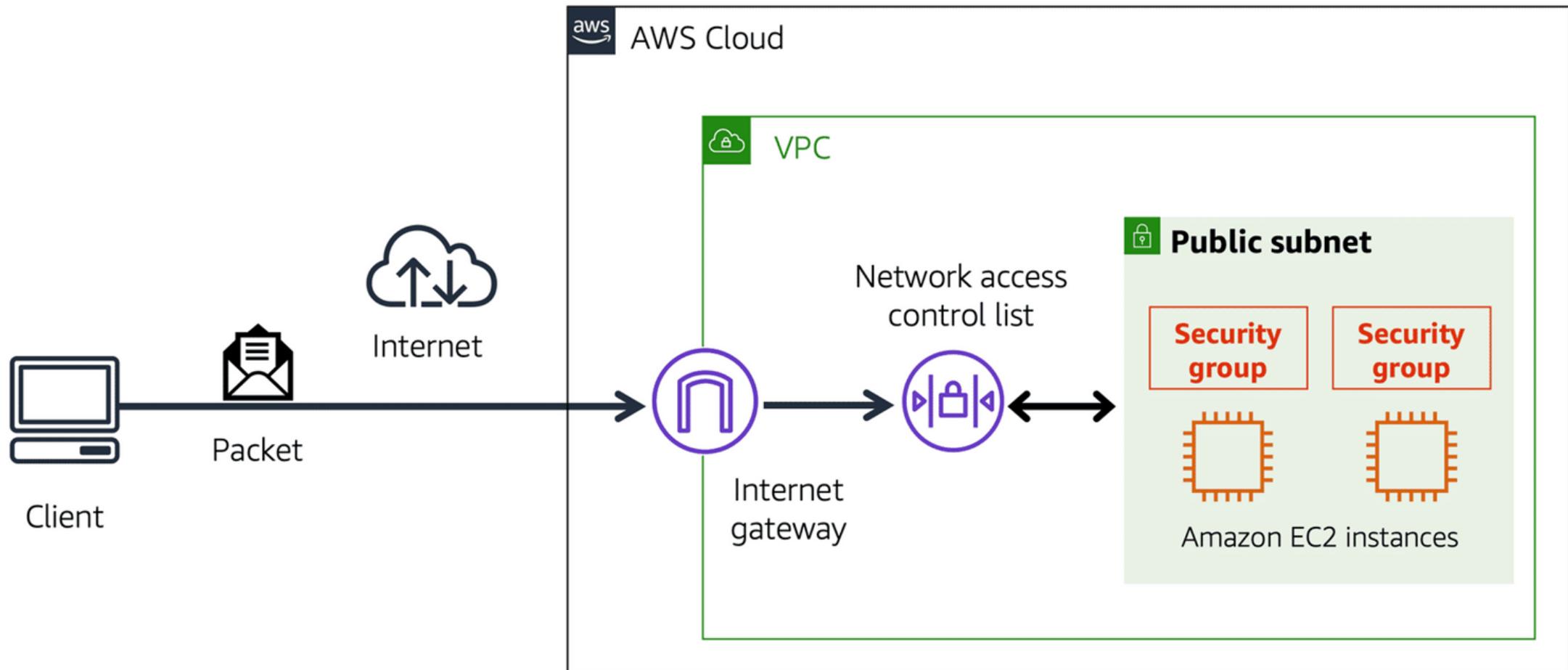
- A security group is a **virtual firewall** that controls inbound and outbound traffic for an Amazon **EC2 instance**.

Security group



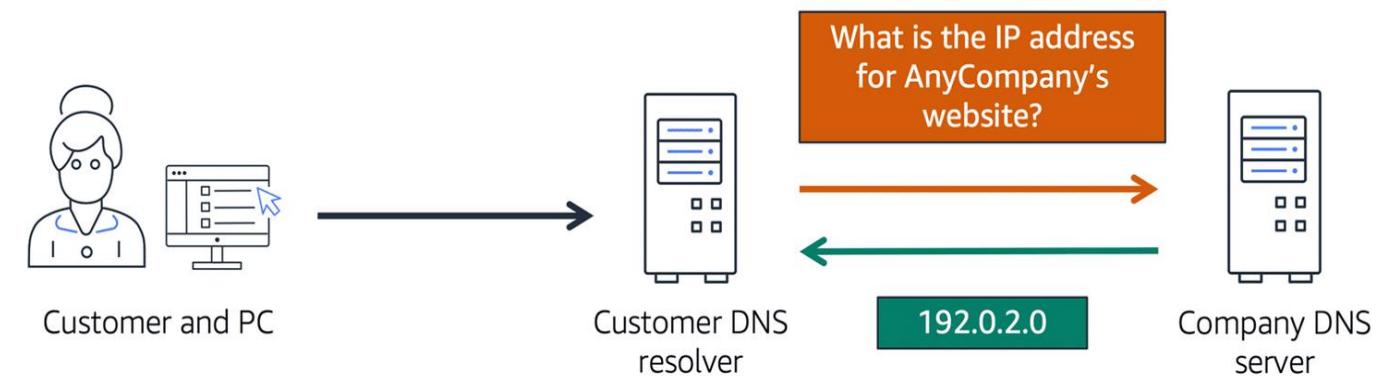
Amazon EC2 instance

NACLs vs Security Groups



Domain Name System (DNS)

- **Domain Name System (DNS) resolution.** DNS resolution involves a customer DNS resolver communicating with a company DNS server.
- You can think of DNS as being the phone book of the internet. DNS resolution is the process of translating a domain name to an IP address.



Amazon Route 53

- **Amazon Route 53** is a DNS web service. It gives developers and businesses a reliable way to route end users to internet applications hosted in AWS.
- Amazon Route 53 connects user requests to infrastructure running in AWS (such as Amazon EC2 instances and load balancers). It can route users to infrastructure outside of AWS.

Additional resources

- [Networking and Content Delivery on AWS](#)
- [AWS Networking & Content Delivery Blog](#)
- [Amazon Virtual Private Cloud](#)
- [What is Amazon VPC?](#)
- [How Amazon VPC works](#)

Module 5

Storage and Databases

Learning objectives

In this module, you will learn how to:

- Summarize the basic concept of storage and databases.
- Describe the benefits of Amazon Elastic Block Store (Amazon EBS).
- Describe the benefits of Amazon Simple Storage Service (Amazon S3).
- Describe the benefits of Amazon Elastic File System (Amazon EFS).
- Summarize various storage solutions.
- Describe the benefits of Amazon Relational Database Service (Amazon RDS).
- Describe the benefits of Amazon DynamoDB.
- Summarize various database services.

Instance stores

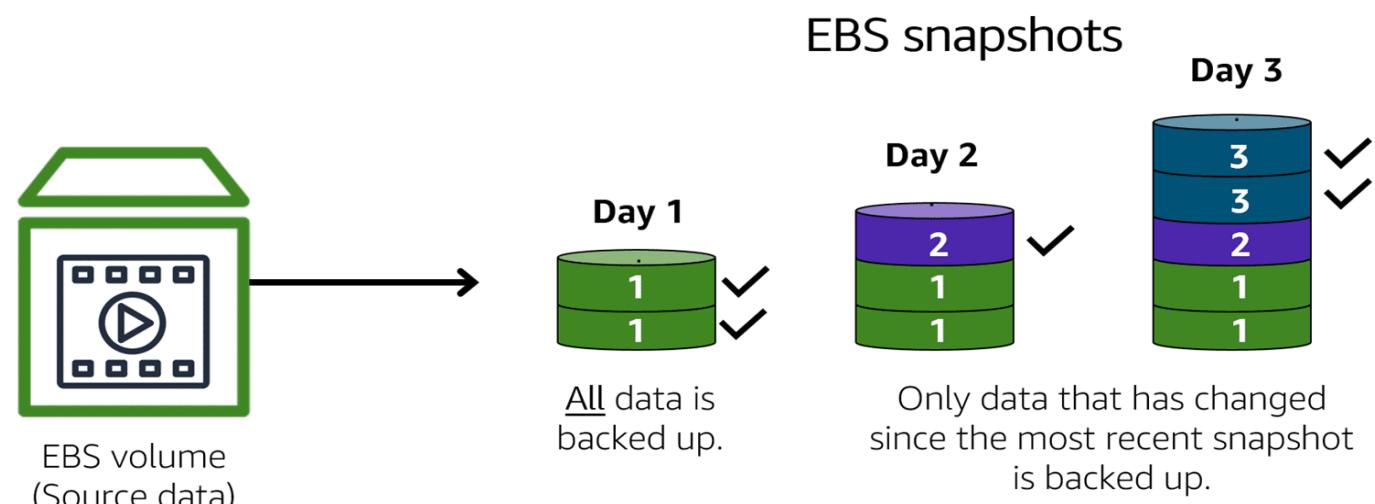
- An **instance store** provides **temporary block-level** storage for an Amazon EC2 instance.
- An instance store is disk storage that is physically attached to the host computer for an EC2 instance, and therefore has the same lifespan as the instance.
- When the **instance is stopped or terminated, you lose any data** in the instance store.

Instance Amazon Elastic Block Store

- **Amazon Elastic Block Store (Amazon EBS)** is a service that provides **block-level storage** volumes that you can use with Amazon EC2 instances. **If you stop or terminate an Amazon EC2 instance, all the data on the attached EBS volume remains available.**
- EBS volumes are for data that needs to persist, it's important to back up the data. You can take incremental backups of EBS volumes by creating Amazon EBS snapshots.

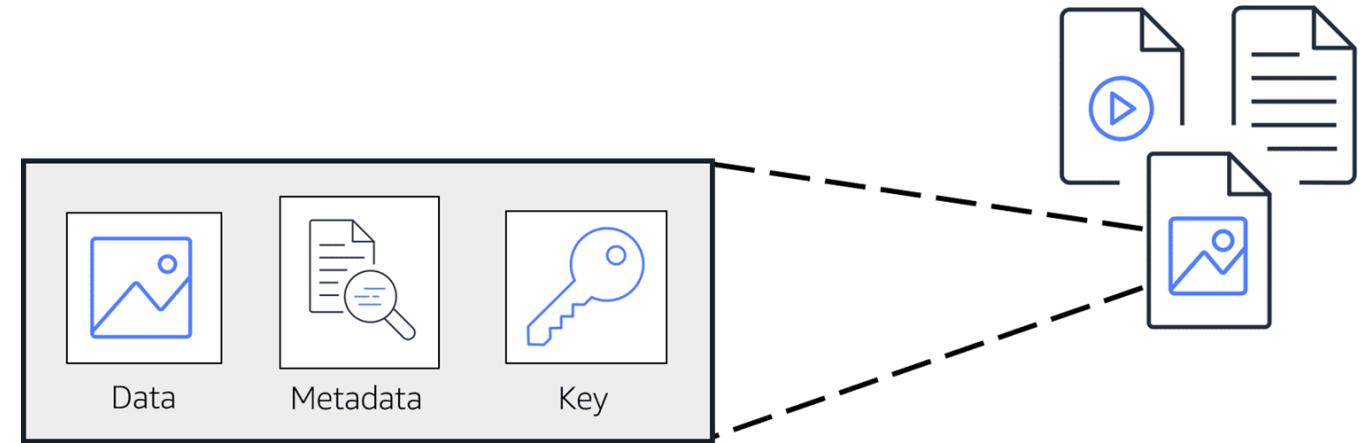
Amazon EBS snapshots

- An **EBS snapshot** is an **incremental backup**. This means that the first backup taken of a volume copies all the data. For subsequent backups, only the blocks of data that have changed since the most recent snapshot are saved.
- Incremental backups are different from full backups, in which all the data in a storage volume copies each time a backup occurs. The full backup includes data that has not changed since the most recent backup.



Object Storage

- In **object storage**, each object consists of data, metadata, and a key.
- The data might be an image, video, text document, or any other type of file. Metadata contains information about what the data is, how it is used, the object size, and so on. An object's key is its unique identifier.



Amazon Simple Storage Service (Amazon S3)

- **Amazon Simple Storage Service (Amazon S3)** is a service that provides **object-level storage**. Amazon S3 stores data as objects in buckets.
- You can upload any type of file to Amazon S3, such as images, videos, text files, and so on.
- Amazon S3 offers unlimited storage space. **The maximum file size for an object in Amazon S3 is 5 TB.**
- For objects larger than **100 megabytes**, customers should consider using the **Multipart Upload capability**.

Amazon S3 storage classes

- With Amazon S3, you pay only for what you use. You can choose from [a range of storage classes](#) to select a fit for your business and cost needs.
- When selecting an Amazon S3 storage class, consider these two factors
 - How often you plan to retrieve your data
 - How available you need your data to be

Amazon S3 storage classes

- S3 Standard
 - Designed for frequently accessed data
 - Stores data in a minimum of three Availability Zones
- S3 Standard-Infrequent Access (S3 Standard-IA)
 - Ideal for infrequently accessed data
 - Similar to S3 Standard but has a lower storage price and higher retrieval price
- S3 One Zone-Infrequent Access (S3 One Zone-IA)
 - Stores data in a single Availability Zone
 - Has a lower storage price than S3 Standard-IA

Amazon S3 storage classes

- S3 Intelligent-Tiering
 - Ideal for data with unknown or changing access patterns
 - Requires a small monthly monitoring and automation fee per object
- S3 Glacier
 - Low-cost storage designed for data archiving
 - Able to retrieve objects within a few minutes to hours
- S3 Glacier Deep Archive
 - Lowest-cost object storage class ideal for archiving
 - Able to retrieve objects within 12 hours

Amazon Elastic File Storage

- **Amazon Elastic File System (Amazon EFS)** is a **scalable file system** used with AWS Cloud services and on-premises resources.
- As you add and remove files, Amazon EFS grows and shrinks automatically.
- It can scale on demand to petabytes without disrupting applications.

Amazon EBS Vs Amazon EFS

- An Amazon EBS volume stores data in a **single** Availability Zone.
- To attach an Amazon EC2 instance to an EBS volume, both the Amazon EC2 instance and the EBS volume must reside within the same Availability Zone.
- Amazon EFS is a regional service. It stores data in and across **multiple** Availability Zones.
- The duplicate storage enables you to access data concurrently from all the Availability Zones in the Region where a file system is located. Additionally, on-premises servers can access Amazon EFS using AWS Direct Connect.

Relational databases

- In a **relational database**, data is stored in a way that relates it to other pieces of data.
- Relational databases use **structured query language (SQL)** to store and query data.

ID	Product name	Size	Price
1	Medium roast ground coffee	12 oz.	\$5.30
2	Dark roast ground coffee	20 oz.	\$9.27

Amazon Relational Database Service

- **Amazon Relational Database Service (Amazon RDS)** is a service that enables you to run relational databases in the AWS Cloud.
- Amazon RDS is a **managed service that automates tasks such as hardware provisioning, database setup, patching, and backups.**
- Amazon RDS database engines offer encryption at rest (protecting data while it is stored) and encryption in transit (protecting data while it is being sent and received).

Amazon RDS database engines

- Amazon RDS is available on six database engines, which optimize for memory, performance, or input/output (I/O). Supported database engines include:
 - Amazon Aurora
 - PostgreSQL
 - MySQL
 - MariaDB
 - Oracle Database
 - Microsoft SQL Server

Non relational (NoSQL) databases

- **nonrelational database**, use structures other than rows and columns to organize data
 - key-value store
 - document store
 - column-oriented database
 - graph database

Amazon DynamoDB

- Amazon DynamoDB is a key-value database service. It delivers single-digit millisecond performance at any scale
- DynamoDB is serverless, which means that you do not have to provision, patch, or manage servers. .
- As the size of your database shrinks or grows, DynamoDB automatically scales to adjust for changes in capacity while maintaining consistent performance.

Key	Value
1	Name: John Doe Address: 123 Any Street Favorite drink: Medium latte
2	Name: Mary Major Address: 100 Main Street Birthday: July 5, 1994

Amazon Redshift

- **Amazon Redshift** is a data warehousing service that you can use for big data analytics. It offers the ability to collect data from many sources and helps you to understand relationships and trends across your data.

AWS Database Migration Service (AWS DMS)

- **AWS Database Migration Service (AWS DMS)** enables you to migrate relational databases, nonrelational databases, and other types of data stores.
- With AWS DMS, you move data between a source database and a target database.
- The source and target databases can be of the same type or different types. During the migration, your source database remains operational, reducing downtime for any applications that rely on the database.

Additional database services

- Amazon DocumentDB
- Amazon Neptune
- Amazon Quantum Ledger Database (Amazon QLDB)
- Amazon Managed Blockchain
- Amazon ElastiCache
- Amazon DynamoDB Accelerator (DAX)

Additional resources

- [Cloud Storage on AWS](#)
- [AWS Storage Blog](#)
- [Hands-On Tutorials: Storage](#)
- [AWS Customer Stories: Storage](#)
- [AWS Database Migration Service](#)
- [Databases on AWS](#)
- [Category Deep Dive: Databases](#)
- [AWS Database Blog](#)
- [AWS Customer Stories: Databases](#)

Module 6

Security

Learning objectives

In this module, you will learn how to:

- Explain the benefits of the shared responsibility model.
- Describe multi-factor authentication (MFA).
- Differentiate between the AWS Identity and Access Management (IAM) security levels.
- Explain the main benefits of AWS Organizations.
- Describe security policies at a basic level.
- Summarize the benefits of compliance with AWS.
- Explain additional AWS security services at a basic level.

Shared responsibility model

- AWS is responsible for some parts of your environment and you (the customer) are responsible for other parts. This concept is known as the **shared responsibility model**.
- The shared responsibility model divides into customer responsibilities (commonly referred to as “security in the cloud”) and AWS responsibilities (commonly referred to as “security of the cloud”).

Shared responsibility model

CUSTOMERS	CUSTOMER DATA		
	PLATFORM, APPLICATIONS, IDENTITY AND ACCESS MANAGEMENT		
	OPERATING SYSTEMS, NETWORK AND FIREWALL CONFIGURATION		
	CLIENT-SIDE DATA ENCRYPTION		SERVER-SIDE ENCRYPTION
			NETWORKING TRAFFIC PROTECTION

AWS	SOFTWARE				
	COMPUTE	STORAGE	DATABASE	NETWORKING	
	HARDWARE/AWS GLOBAL INFRASTRUCTURE				
	REGIONS		AVAILABILITY ZONES	EDGE LOCATIONS	

Customers: Security in the cloud

- Customers are responsible **for the security of everything that they create and put *in* the AWS Cloud.**
- When using AWS services, you, the customer, maintain complete control over your content.
- You also **control how access rights are granted, managed, and revoked.**

AWS: Security of the cloud

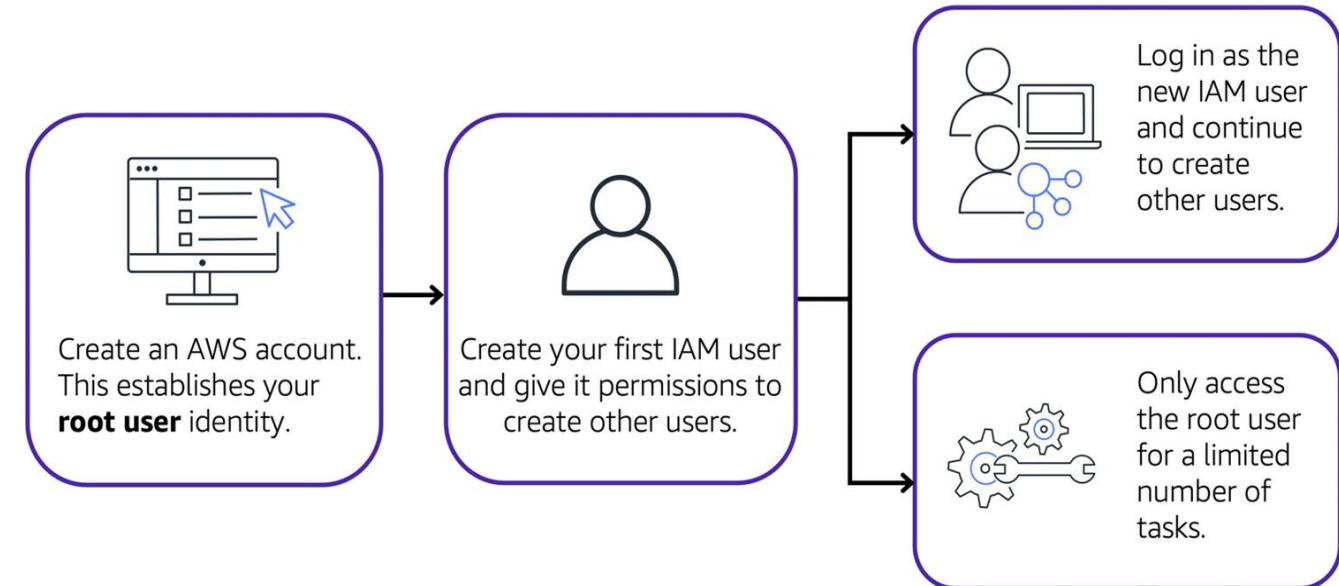
- AWS is responsible for **security of the cloud**.
- AWS manages the security of the cloud, specifically the physical infrastructure that hosts your resources, which include:
 - **Physical security of data centers**
 - **Hardware and software infrastructure**
 - **Network infrastructure**
 - **Virtualization infrastructure**

AWS Identity and Access Management (IAM)

- **AWS Identity and Access Management (IAM)** enables you to manage access to AWS services and resources securely.
- IAM gives you the flexibility to configure access based on your company's specific operational and security needs.
 - IAM users, groups, and roles
 - IAM policies
 - Multi-factor authentication

AWS account root user

- When you first create an AWS account, you begin with an identity known as the root user.
- The root user is accessed by signing in with the email address and password that you used to create your AWS account.



IAM policies

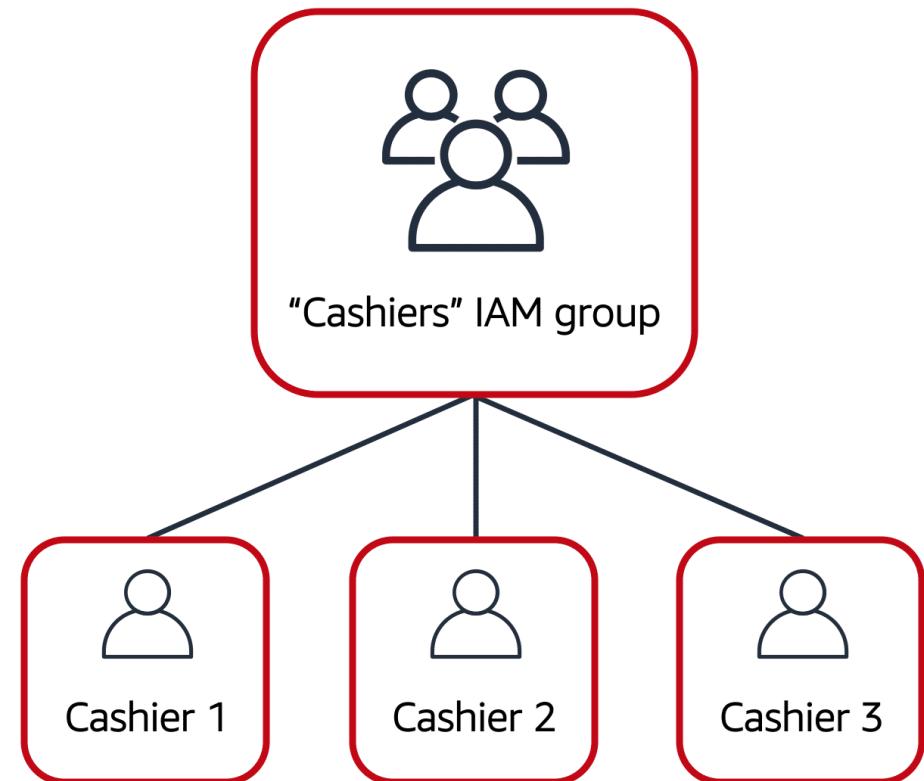
- An **IAM policy** is a document that **allows or denies permissions to AWS services and resources.**
- IAM policies enable you to customize users' levels of access to resources. For example, you can allow users to access all of the Amazon S3 buckets within your AWS account, or only a specific bucket.

Example: IAM policies

```
{  
    "Version": "2012-10-17",  
    "Statement": {  
        "Effect": "Allow",  
        "Action": "s3>ListObject",  
        "Resource": "arn:aws:s3:::  
AWSDOC-EXAMPLE-BUCKET"  
    }  
}
```

IAM groups

- An IAM group is a **collection of IAM users**. When you assign an IAM policy to a group, all users in the group are granted permissions specified by the policy.



IAM roles

- An **IAM role is an identity that you can assume to gain temporary access to permissions.**
- Before an IAM user, application, or service can assume an IAM role, they must be granted permissions to switch to the role.
- When someone assumes an IAM role, they abandon all previous permissions that they had under a previous role and assume the permissions of the new role.

Multi-factor authentication

- In IAM, multi-factor authentication (MFA) provides an extra layer of security for your AWS account.

IAM user ID: AIDACKCEVSQ6C2EXAMPLE

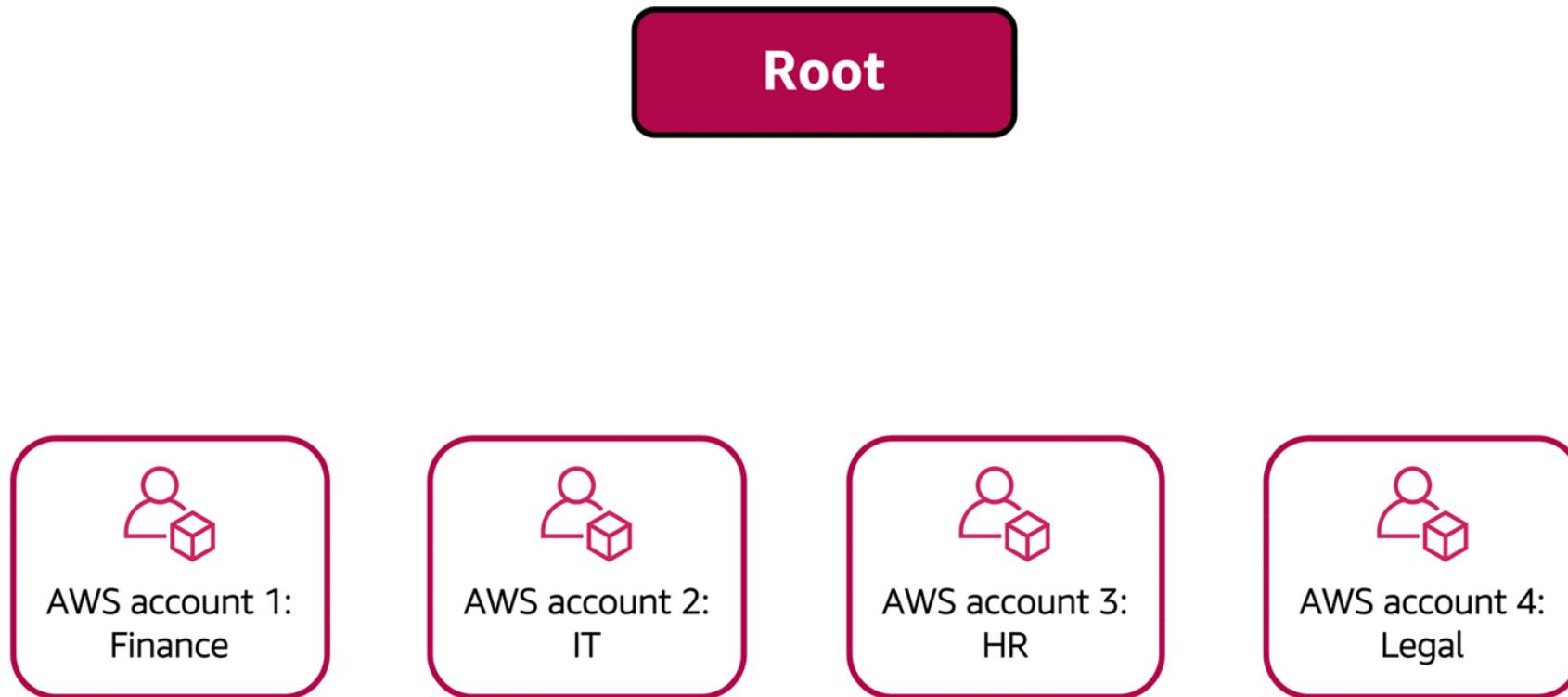
Password: ****



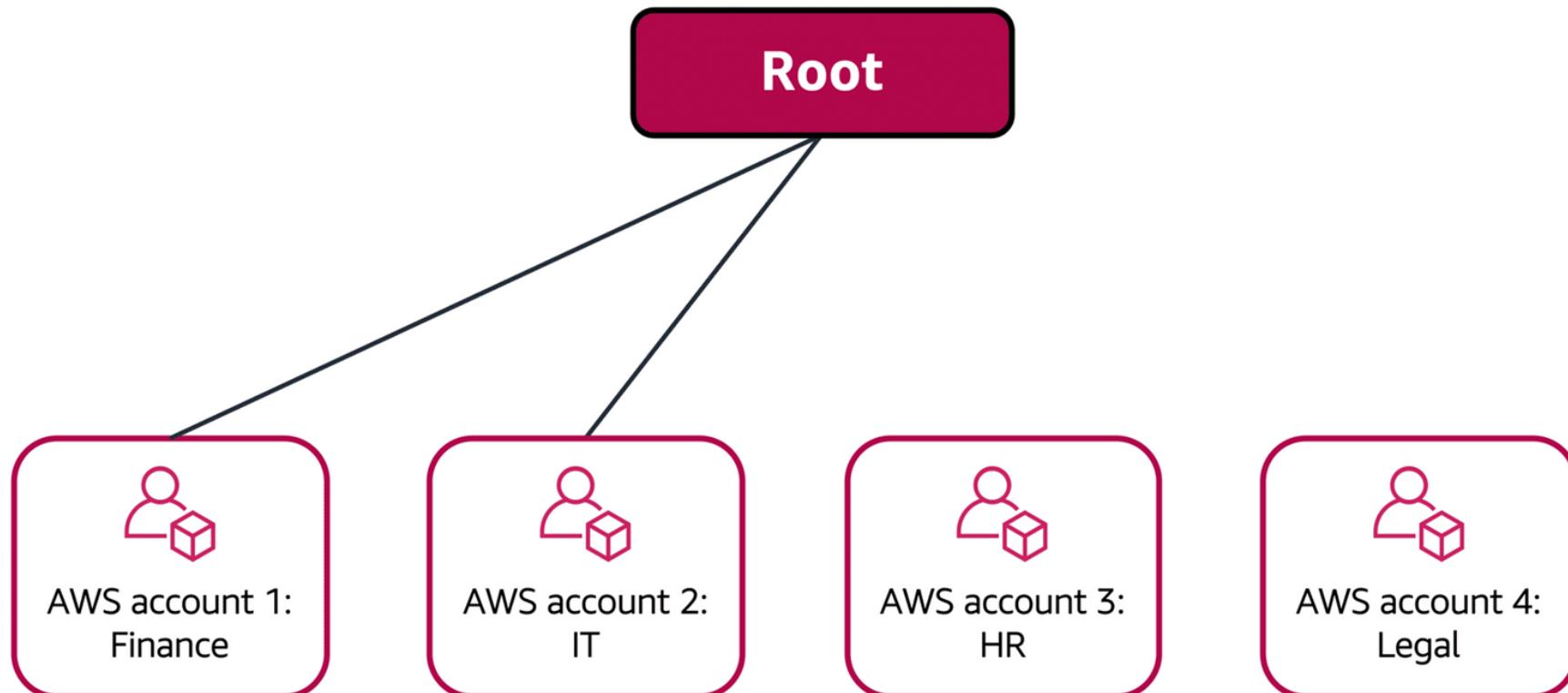
AWS Organizations

- You can use **AWS Organizations** to **consolidate and manage multiple AWS accounts within a central location.**
- When you create an organization, AWS Organizations automatically creates a **root**, which is the parent container for all the accounts in your organization.
- In AWS Organizations, you can centrally control permissions for the accounts in your organization by using **service control policies (SCPs)**.
- **Organizational units** - In AWS Organizations, you can **group accounts into organizational units (OUs)** to make it easier to manage accounts with similar business or security requirements. When you apply a policy to an OU, all the accounts in the OU automatically inherit the permissions specified in the policy.

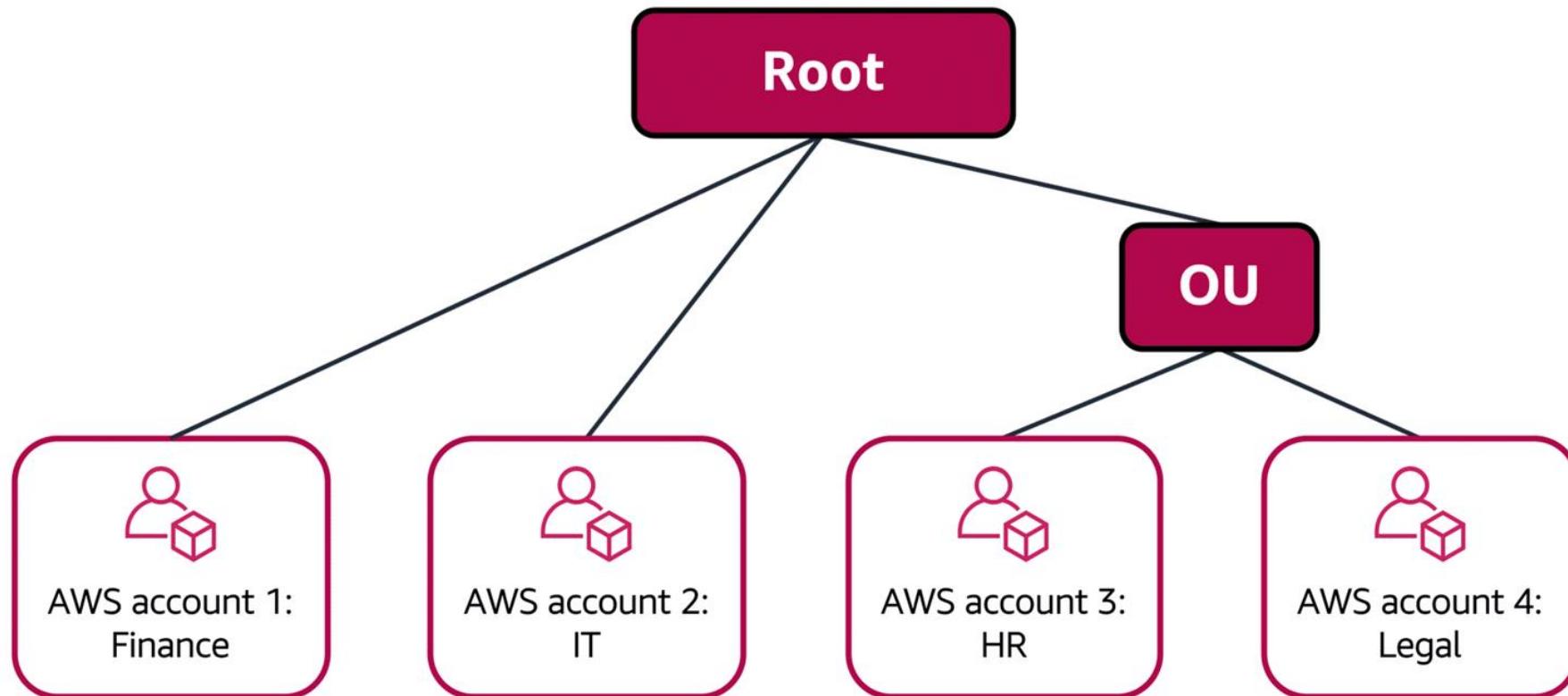
Example: AWS Organizations



Example: AWS Organizations

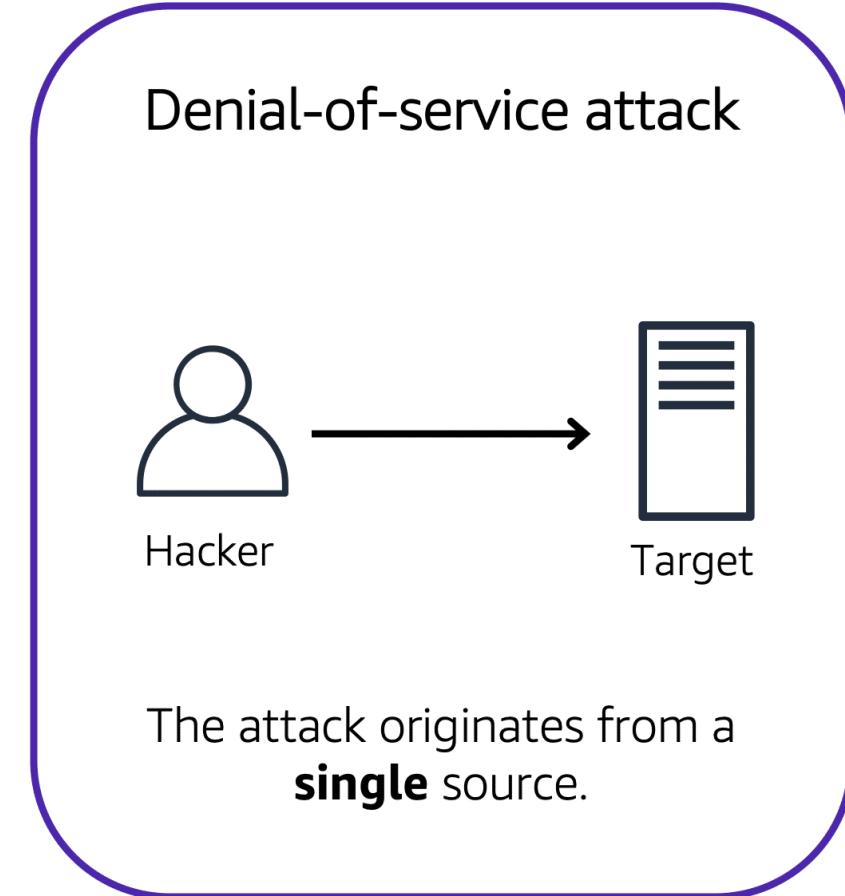


Example: AWS Organizations



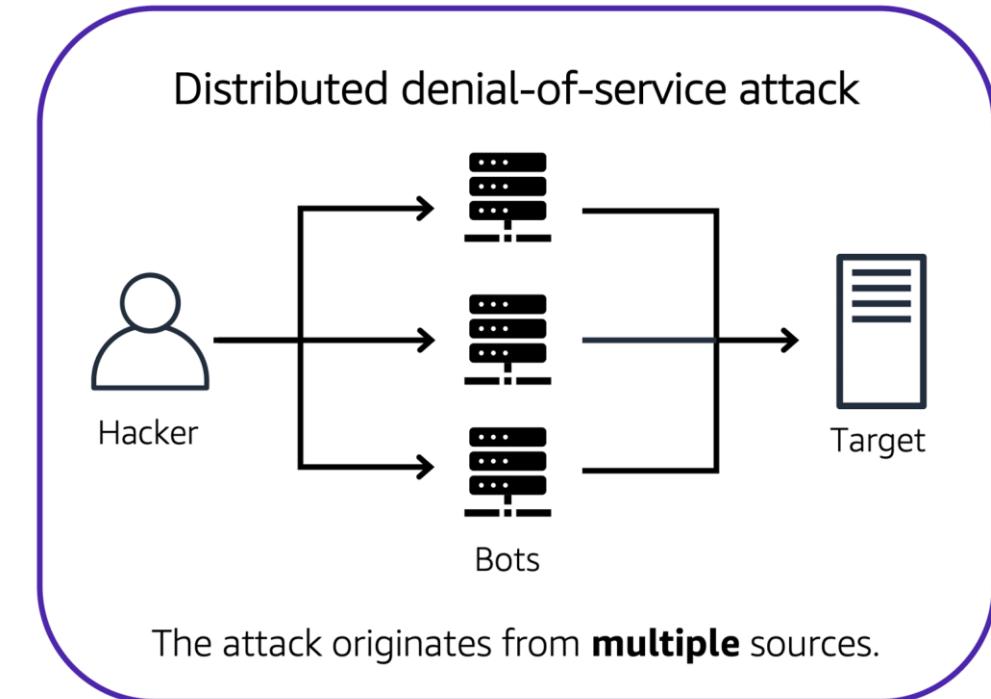
Denial-of-service attacks

- A **denial-of-service (DoS)** attack is a deliberate attempt to make a website or application unavailable to users.



Distributed denial-of-service attacks

- A distributed denial-of-service (DDoS) attack, multiple sources are used to start an attack that aims to make a website or application unavailable.



AWS Shield

- AWS Shield is a service that protects applications **against DDoS attacks**. AWS Shield provides two levels of protection: Standard and Advanced.
 - **AWS Shield Standard** - **AWS Shield Standard** automatically protects all AWS customers at no cost. It protects your AWS resources from the most common, frequently occurring types of DDoS attacks.
 - **AWS Shield Advanced** - **AWS Shield Advanced** is a paid service that provides detailed attack diagnostics and the ability to detect and mitigate sophisticated DDoS attacks.

Additional security services

- AWS Key Management Service (AWS KMS)
- AWS WAF
- Amazon Inspector
- Amazon GuardDuty

Additional resources

- [Cloud Storage on AWS](#)
- [AWS Storage Blog](#)
- [Hands-On Tutorials: Storage](#)
- [AWS Customer Stories: Storage](#)
- [AWS Database Migration Service](#)
- [Databases on AWS](#)
- [Category Deep Dive: Databases](#)
- [AWS Database Blog](#)
- [AWS Customer Stories: Databases](#)

Module 7

Monitoring and Analytics

Learning objectives

In this module, you will learn how to:

- Summarize approaches to monitoring your AWS environment.
- Describe the benefits of Amazon CloudWatch.
- Describe the benefits of AWS CloudTrail.
- Describe the benefits of AWS Trusted Advisor.

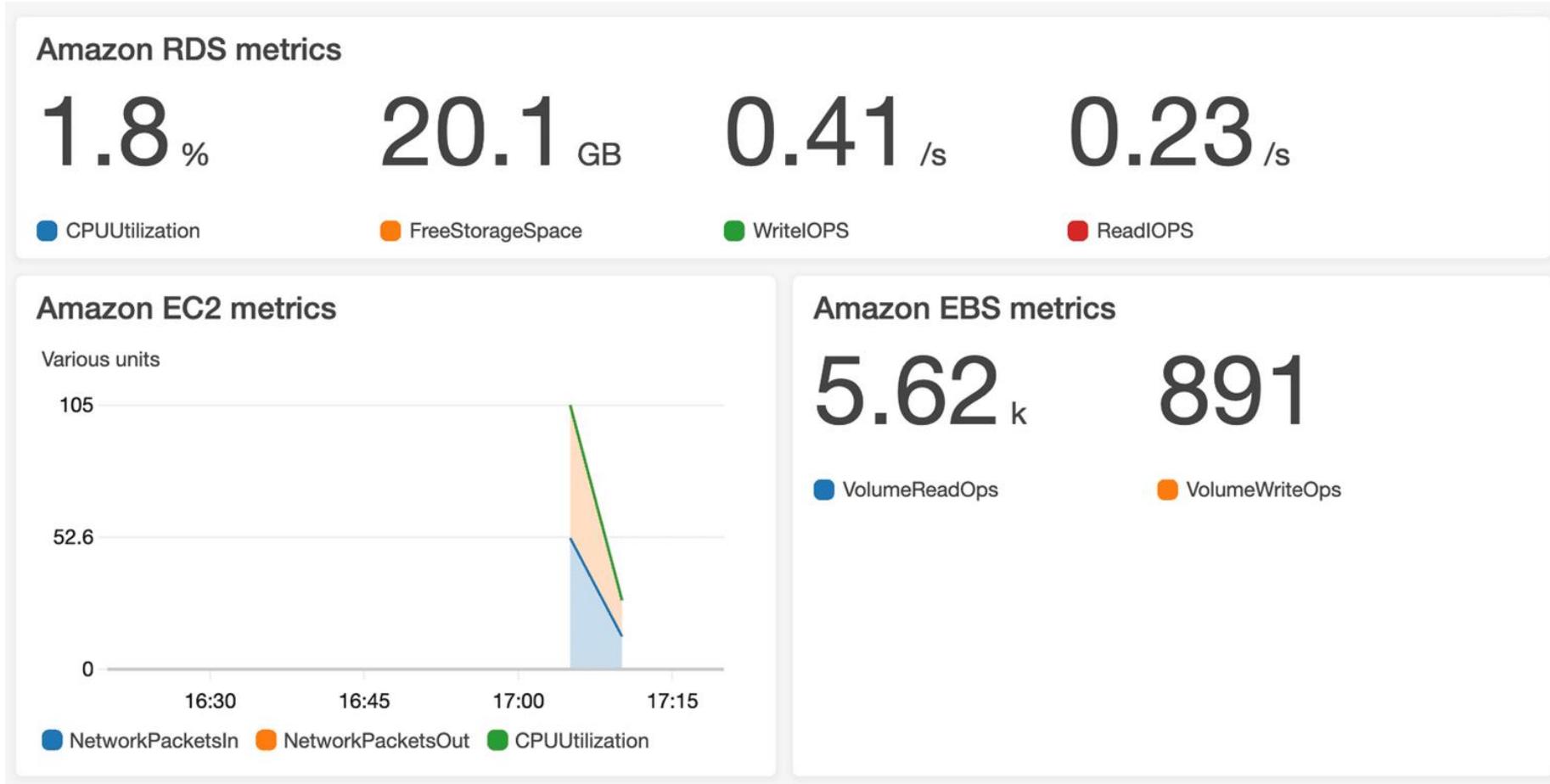
Amazon CloudWatch

- **Amazon CloudWatch** is a web service that enables you to **monitor and manage various metrics and configure alarm actions** based on data from those metrics.
- CloudWatch uses **metrics** to represent the data points for your resources. AWS services send metrics to CloudWatch.
- CloudWatch then uses these metrics to create graphs automatically that show how performance has changed over time.

CloudWatch alarms

- With CloudWatch, you can create **alarms** that automatically perform actions if the value of your metric has gone above or below a predefined threshold.

CloudWatch dashboard



AWS CloudTrail

- **AWS CloudTrail** records API calls for your account. The recorded information includes the identity of the API caller, the time of the API call, the source IP address of the API caller, and more. You can think of CloudTrail as a “trail” of breadcrumbs (or a log of actions) that someone has left behind them.

Example: AWS CloudTrail event

What happened?

A new IAM user (Mary) was created.



Who made the request?

IAM user John



When did this occur?

January 1, 2020 at 9:00 AM



How was the request made?

Through the AWS Management Console



AWS Trusted Advisor

- **AWS Trusted Advisor** is a web service that **inspects your AWS environment and provides real-time recommendations in accordance with AWS best practices.**
- Trusted Advisor compares its findings to AWS best practices in **five categories: cost optimization, performance, security, fault tolerance, and service limits.**
- When you access the Trusted Advisor dashboard on the AWS Management Console, you can review completed checks for cost optimization, performance, security, fault tolerance, and service limits.
- For each category:
 - **The green check indicates the number of items for which it detected no problems.**
 - **The orange triangle represents the number of recommended investigations.**
 - **The red circle represents the number of recommended actions.**

AWS Trusted Advisor dashboard

Cost Optimization



0 9 0
\$7,516.85

Potential monthly savings

Performance



3 7 0

Security



2 4 11

Fault Tolerance



0 15 5

Service Limits



37 0 1

Additional resources

- [Management and Governance on AWS](#)
- [Monitoring and Observability](#)
- [Configuration, Compliance, and Auditing](#)
- [AWS Management & Governance Blog](#)
- [Whitepaper: AWS Governance at Scale](#)

Module 8

Pricing and Support

Learning objectives

In this module, you will learn how to:

- Describe AWS pricing and support models.
- Describe the AWS Free Tier.
- Describe key benefits of AWS Organizations and consolidated billing.
- Explain the benefits of AWS Budgets.
- Explain the benefits of AWS Cost Explorer.
- Explain the primary benefits of the AWS Pricing Calculator.
- Distinguish between the various AWS Support Plans.
- Describe the benefits of AWS Marketplace.

AWS Free Tier

- The AWS Free Tier enables you to begin using certain services without having to worry about incurring costs for the specified period.
- Three types of offers are available:
 - **Always Free**
 - **12 Months Free**
 - **Trials**

AWS Free Tier

Always Free

- These offers do not expire and are available to all AWS customers.
- For example, AWS Lambda allows 1 million free requests and up to 3.2 million seconds of compute time per month.
- Amazon DynamoDB allows 25 GB of free storage per month.

AWS Free Tier

12 Months Free

- These offers are free for 12 months following your initial sign-up date to AWS.
- Examples include specific amounts of Amazon S3 Standard Storage, thresholds for monthly hours of Amazon EC2 compute time, and amounts of Amazon CloudFront data transfer out.

AWS Free Tier

Trials

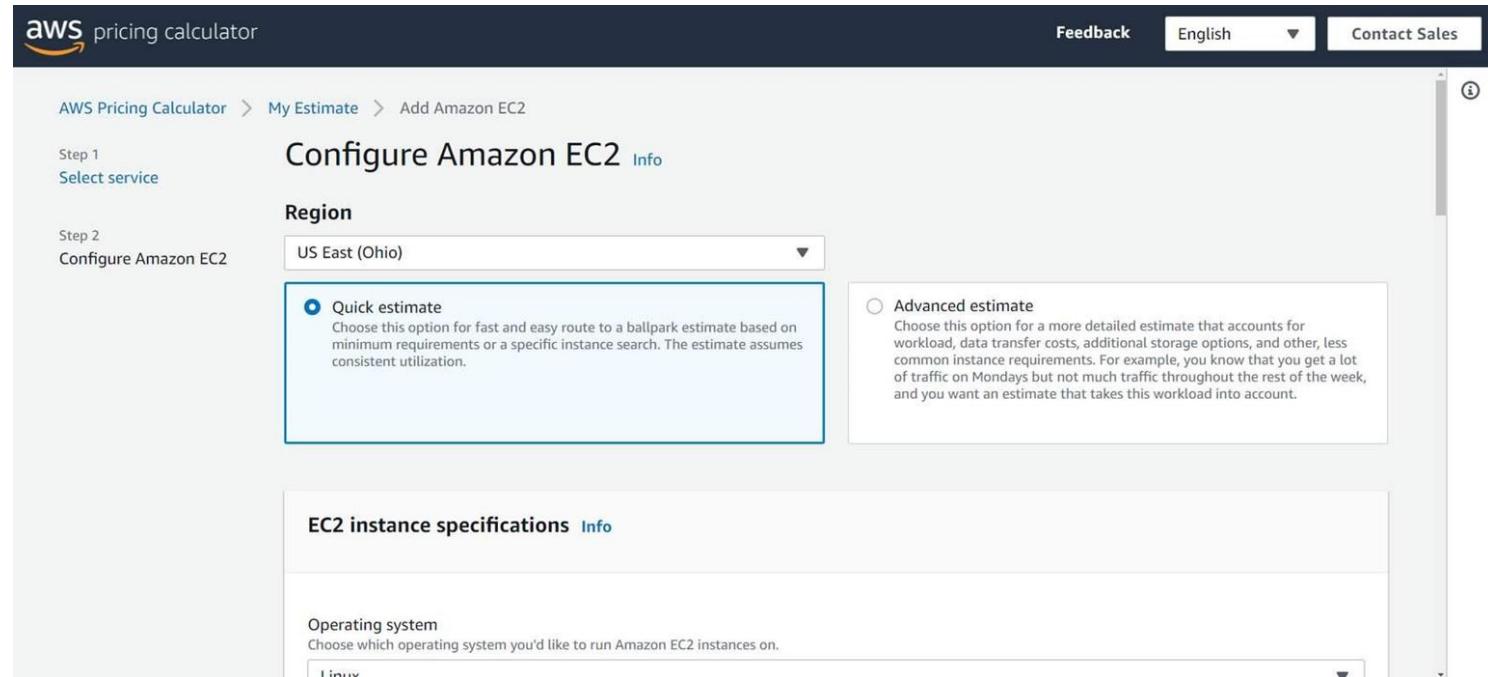
- Short-term free trial offers start from the date you activate a particular service. The length of each trial might vary by number of days or the amount of usage in the service.
- For example, Amazon Inspector offers a 90-day free trial.
- Amazon Lightsail (a service that enables you to run virtual private servers) offers 750 free hours of usage over a 30-day period.

AWS pricing concepts

- Pay for what you use
- Pay less when you reserve.
- Pay less with volume-based discounts when you use more.

AWS Pricing Calculator

- The [AWS Pricing Calculator](#) lets you explore AWS services and create an estimate for the cost of your use cases on AWS.
- You can organize your AWS estimates by groups that you define.
- A group can reflect how your company is organized, such as providing estimates by cost center.



Amazon EC2

- With [Amazon EC2 pricing](#), you pay for only the compute time that you use while your instances are running.
- You can find additional cost savings for Amazon EC2 by considering Savings Plans and Reserved Instances.

Amazon S3

- For Amazon S3 pricing, the following cost components are considered
 - **Storage** - You pay for only the storage that you use.
 - **Requests and data retrievals** - You pay for requests made to your Amazon S3 objects and buckets.
 - **Data transfer** - you pay for data that you transfer into and out of Amazon S3
 - **Management and replication** - ou pay for the storage management features that you have enabled on your account's Amazon S3 buckets.

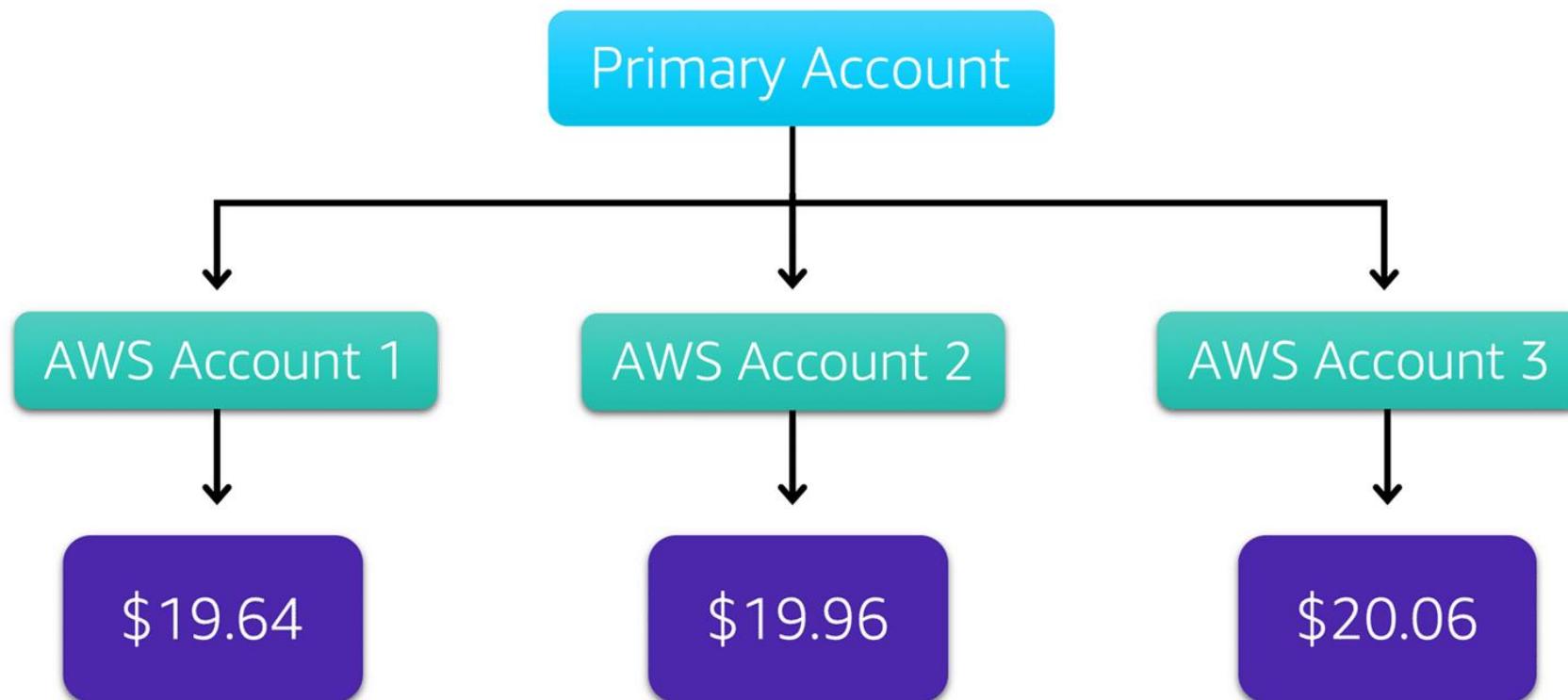
Billing dashboard

- Use the [**AWS Billing & Cost Management dashboard**](#) to pay your AWS bill, monitor your usage, and analyze and control your costs.
 - View month-to-date spend by service.
 - View Free Tier usage by service.
 - Access Cost Explorer and create budgets.
 - Purchase and manage Savings Plans.
 - Publish [AWS Cost and Usage Reports](#).

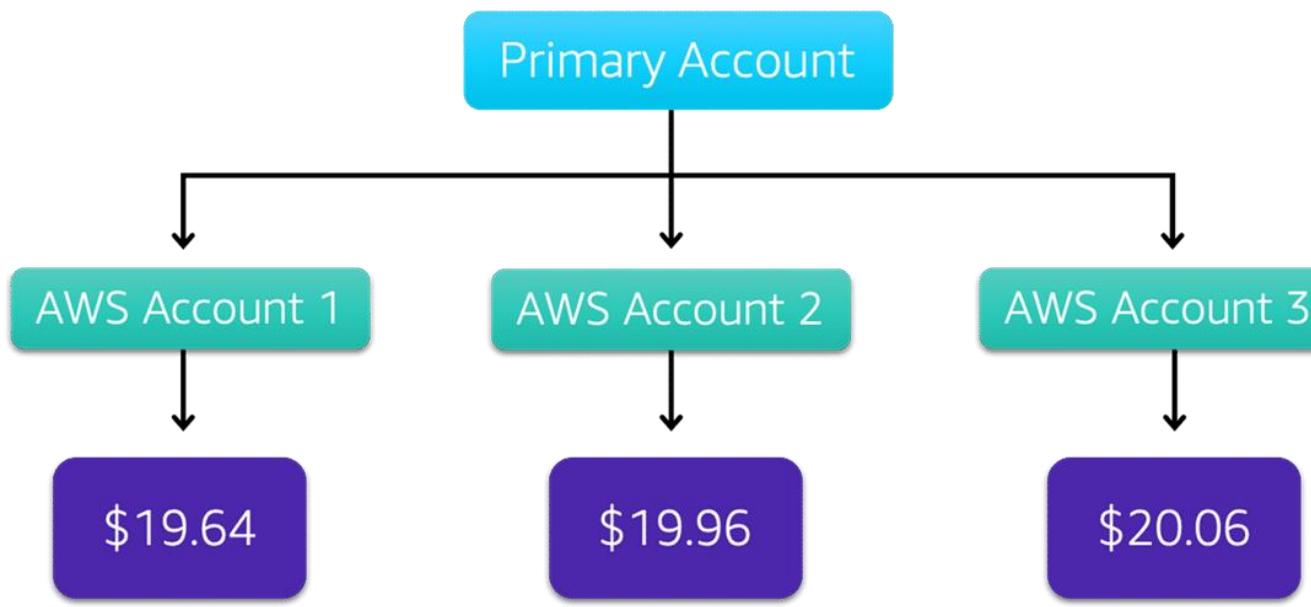
Consolidated billing

- AWS Organizations also provides the option for consolidated billing.
- The consolidated billing feature of AWS Organizations enables you to receive a single bill for all AWS accounts in your organization.
- On your monthly bill, you can review itemized charges incurred by each account.

Example: Consolidated billing



Example: Consolidated billing

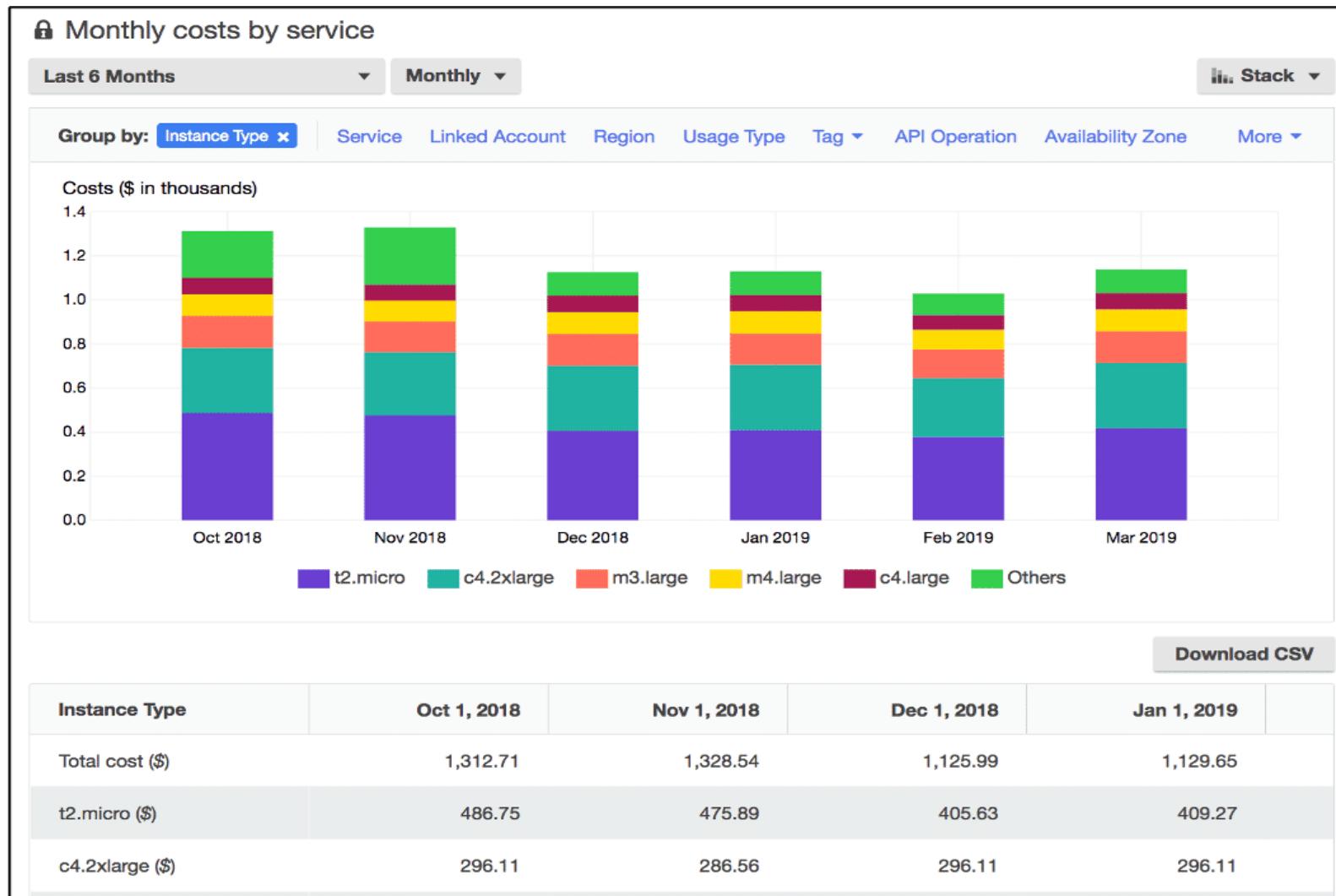


Monthly Consolidated Bill	
Primary Account	\$14.14
AWS Account 1	\$19.64
AWS Account 2	\$19.96
AWS Account 3	\$20.06
Total charged to paying account:	\$73.80

AWS Cost Explorer

- **AWS Cost Explorer** is a tool that **enables you to visualize, understand, and manage your AWS costs and usage over time.**
- AWS Cost Explorer includes a default report of the costs and usage for your top five cost-accruing AWS services.
- You can apply custom filters and groups to analyze your data. For example, you can view resource usage at the hourly level.

AWS Cost Explorer



AWS Support plans

- AWS offers four different **Support plans** to help you troubleshoot issues, lower costs, and efficiently use AWS services.
- You can choose from the following Support plans to meet your company's needs:
 - Basic
 - Developer
 - Business
 - Enterprise
- **AWS Support** site

Technical Account Manager (TAM)

- The Enterprise Support plan includes access to a **Technical Account Manager (TAM)**.
- If your company has an Enterprise Support plan, the TAM is your primary point of contact at AWS.
- They provide guidance, architectural reviews, and ongoing communication with your company as you plan, deploy, and optimize your applications.

AWS Marketplace

- **AWS Marketplace** is a digital catalog that includes thousands of software listings from independent software vendors.

- You can use AWS Marketplace to find, test, and buy software that runs on AWS.
- For each listing in AWS Marketplace, you can access detailed information on pricing options, available support, and reviews from other AWS customers.



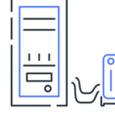
Business Applications



Data & Analytics



DevOps



Infrastructure Software



Internet of Things
(IoT)



Machine Learning



Migration



Security

Additional resources

- [AWS Pricing](#)
- [AWS Free Tier](#)
- [AWS Cost Management](#)
- [Whitepaper: How AWS Pricing Works](#)
- [Whitepaper: Introduction to AWS Economics](#)
- [AWS Support](#)
- [AWS Knowledge Center](#)

Module 9

Migration

Learning objectives

In this module, you will learn how to:

- Understand migration and innovation in the AWS Cloud.
- Summarize the AWS Cloud Adoption Framework (AWS CAF).
- Summarize the six key factors of a cloud migration strategy.
- Describe the benefits of AWS data migration solutions, such as AWS Snowcone, AWS Snowball, and AWS Snowmobile.
- Summarize the broad scope of innovative solutions that AWS offers.

AWS Cloud Adoption Framework (AWS CAF)

- The **AWS Cloud Adoption Framework (AWS CAF)** organizes guidance into **six areas of focus**, called **Perspectives**.
- Six core perspectives of the Cloud Adoption Framework
- In general, the **Business, People, & Governance** Perspectives focus on business capabilities, whereas the **Platform, Security, and Operations** focus on technology capabilities

Business Perspective

- The **Business Perspective** ensures that IT aligns with business needs and that IT investments link to key business results.
- Common roles in the Business Perspective include:
 - Business managers
 - Finance managers
 - Budget owners
 - Strategy stakeholders

People Perspective

- The **People Perspective** supports development of an organization-wide change management strategy for successful cloud adoption.
- Common roles in the People Perspective include:
 - Human resources
 - Staffing
 - People managers

Governance Perspective

- The **Governance Perspective** focuses on the skills and processes to align IT strategy with business strategy.
- Common roles in the Governance Perspective include:
 - Chief Information Officer (CIO)
 - Program managers
 - Enterprise architects
 - Business analysts
 - Portfolio managers

Platform Perspective

- The **Platform Perspective** includes principles and patterns for implementing new solutions on the cloud, and migrating on-premises workloads to the cloud.
- Common roles in the Platform Perspective include:
 - Chief Technology Officer (CTO)
 - IT managers
 - Solutions architects

Security Perspective

- The **Security Perspective** ensures that the organization meets security objectives for visibility, auditability, control, and agility.
- Common roles in the Security Perspective include:
 - Chief Information Security Officer (CISO)
 - IT security managers
 - IT security analysts

Operations Perspective

- The **Operations Perspective** helps you to enable, run, use, operate, and recover IT workloads to the level agreed upon with your business stakeholders.
- Common roles in the Operations Perspective include:
 - IT operations managers
 - IT support managers

Migration strategies

- When migrating applications to the cloud, six of the most common migration strategies that you can implement in aws
 - Rehosting
 - Replatforming
 - Refactoring/re-architecting
 - Repurchasing
 - Retaining
 - Retiring

AWS Snow Family members

- The **AWS Snow Family** is a collection of physical devices that help to physically transport up to exabytes of data into and out of AWS.
- AWS Snow Family is composed of
 - **AWS Snowcone,**
 - **AWS Snowball,**
 - **AWS Snowmobile.**

Additional resources

- [Migration & Transfer on AWS](#)
- [A Process for Mass Migrations to the Cloud](#)
- [6 Strategies for Migrating Applications to the Cloud](#)
- [AWS Cloud Adoption Framework](#)
- [AWS Fundamentals: Core Concepts](#)
- [AWS Cloud Enterprise Strategy Blog](#)
- [Modernizing with AWS Blog](#)
- [AWS Customer Stories: Data Center Migration](#)

Module 10

The Cloud Journey

Learning objectives

In this module, you will learn how to:

- Summarize the five pillars of the Well-Architected Framework.
- Explain the six benefits of cloud computing.

The AWS Well-Architected Framework

- The **AWS Well-Architected Framework** helps you understand how to design and operate reliable, secure, efficient, and cost-effective systems in the AWS Cloud.
- The Well-Architected Framework is based on five pillars:
 - Operational excellence
 - Security
 - Reliability
 - Performance efficiency
 - Cost optimization

Additional resources

- [AWS Well-Architected](#)
- [Whitepaper: AWS Well-Architected Framework](#)
- [AWS Architecture Center](#)
- [Six Advantages of Cloud Computing](#)
- [AWS Architecture Blog](#)

Practice makes perfect

- If you're new to AWS, take a bit of AWS practice, before rushing to the exam
- The exam recommends you have 6 months or more of hands-on experience on AWS
- Practice makes perfect!
- If you feel overwhelmed by the amount of knowledge you just learned, just go through it one more time

How will the Exam work?

- You'll have to register online at <https://www.aws.training/>
- Fee for the exam is 100 USD
- Provide two identity documents (ID, Credit Card, details are in emails sent to you)
- No notes are allowed, no pen is allowed, no speaking
- 65 questions will be asked in 90 minutes
- At the end you can optionally review all the questions / answers
- You would know right away if you passed / failed the exams
- You will not know which answers were right / wrong
- You will know the overall score a few days later (email notification)
- To pass you need a score of at least 700 out of 1000
- If you fail, you can retake the exam again 14 days late

Exam strategies

- Read the full question.
- Predict the answer before reviewing the response options.
- Eliminate incorrect response options.

Register Your exam

- <https://aws.amazon.com/certification/certified-cloud-practitioner/>

Congratulations

- Congrats on finishing the course!
- We hope you will pass the exam without a hitch
- Please give your Feedback, So that we improve and bring best content for you.

THANK YOU