

Cloud Computing with AWS



\$whoami?



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Agendas

- **Cloud Computing**
- **Evolution of Cloud Computing**
- **Types of Cloud Computing**
- **Cloud Computing Deployment Models**
- **Cloud Service Provider**
- **AWS Basics Services**
- **AWS Cloud Native Networking Services**

Cloud Computing

cloud com·put·ing

noun

the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.



On-Premise

- You own the servers
- You hire the IT people
- You pay or rent the real-estate
- You take all the risk

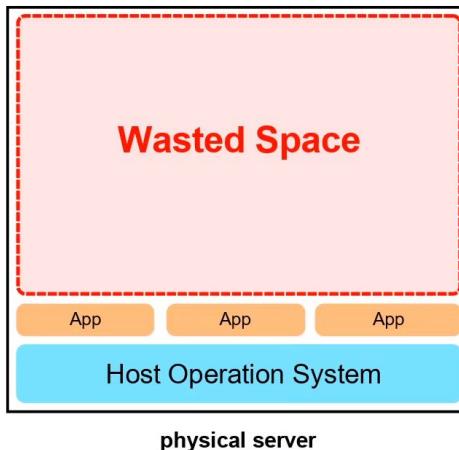
Cloud Providers

- Someone else owns the servers
- Someone else hires the IT people
- Someone else pays or rents the real-estate
- You are responsible for your configuring cloud services and code, someone else takes care of the rest.



Evolution of Cloud Computing

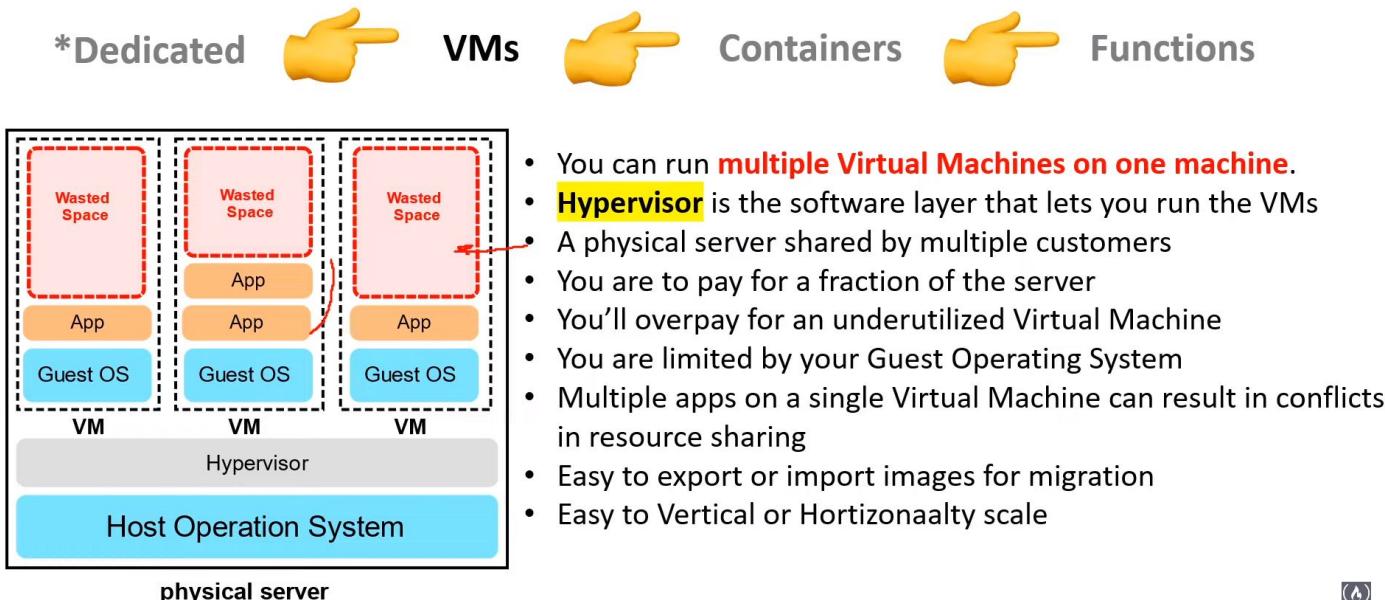
*Dedicated ➡ VMs ➡ Containers ➡ Functions



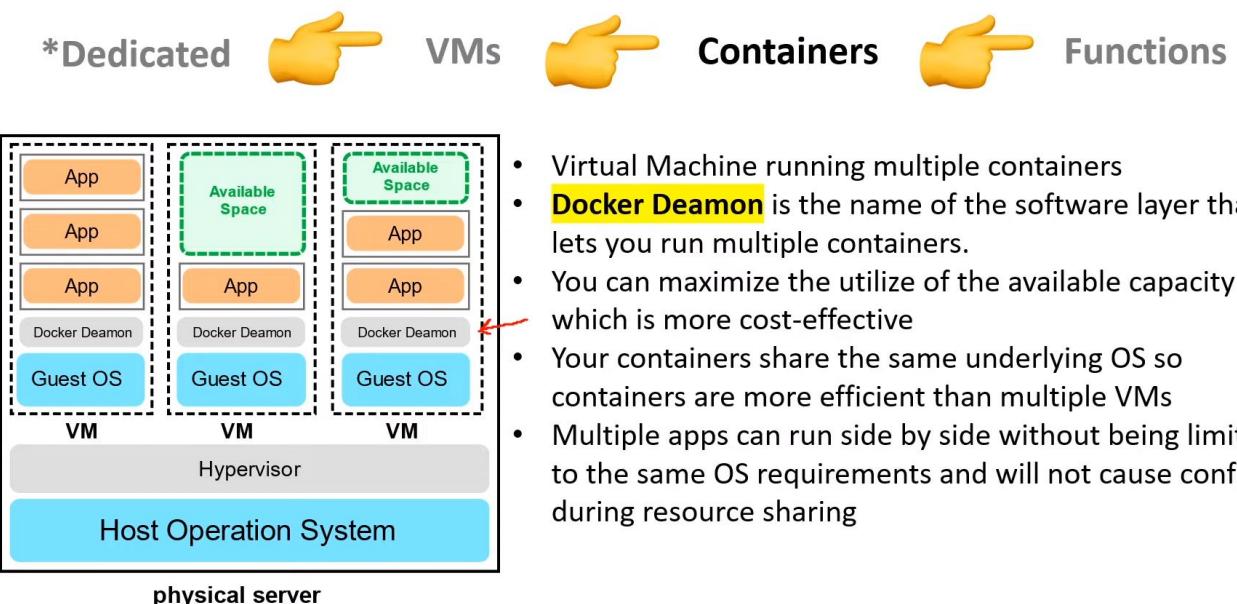
- A physical server **wholly utilized by a single customer**.
- You have to guess your capacity
- you'll overpay for an underutilized server
- You can't vertical scale, you need a manual migration
- Replacing a server is very difficult
- You are limited by your Host Operating System
- Multiple apps can result in conflicts in resource sharing
- You have a ***guarantee of security, privacy, and full utility of underlying resources**



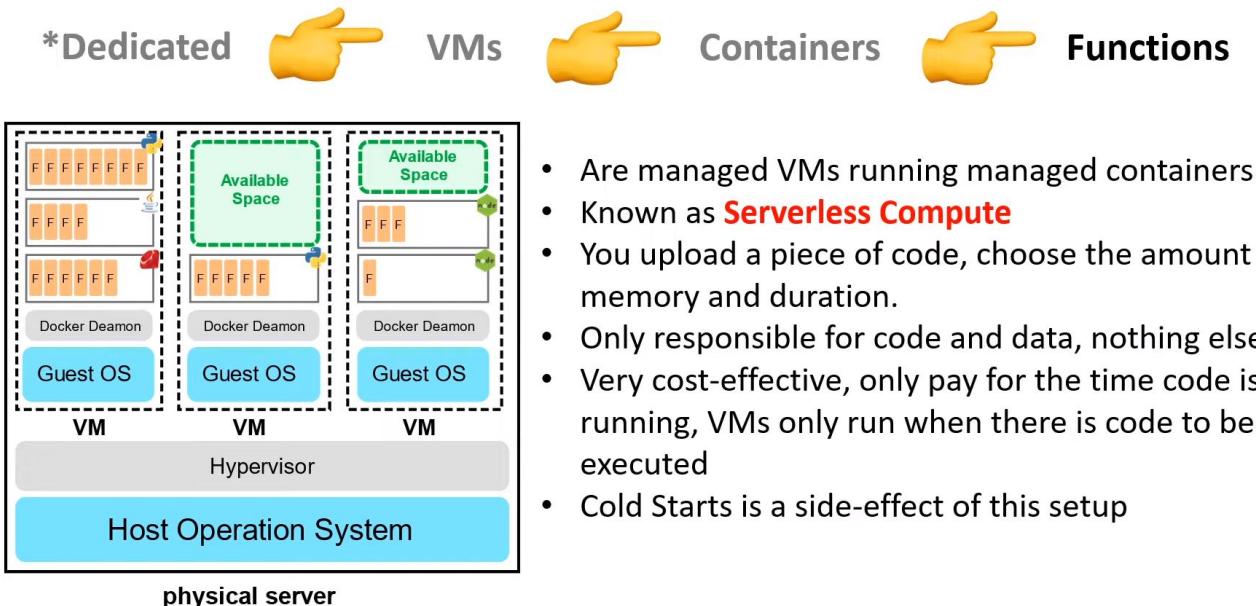
Evolution of Cloud Computing



Evolution of Cloud Computing



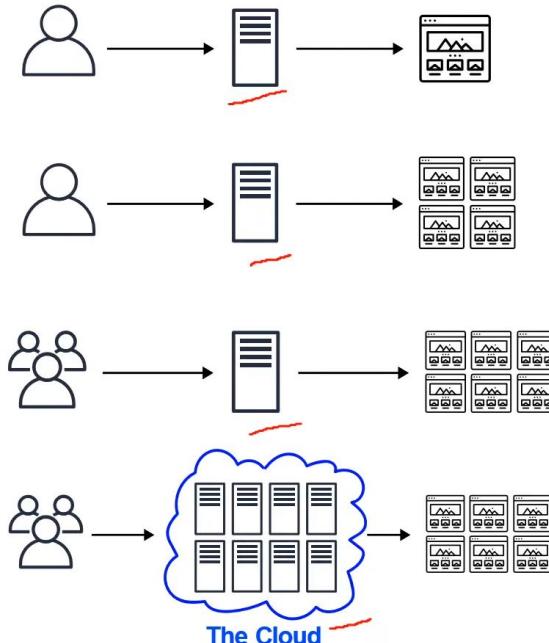
Evolution of Cloud Computing



- Are managed VMs running managed containers.
- Known as **Serverless Compute**
- You upload a piece of code, choose the amount of memory and duration.
- Only responsible for code and data, nothing else
- Very cost-effective, only pay for the time code is running, VMs only run when there is code to be executed
- Cold Starts is a side-effect of this setup



Evolution of Cloud Computing



Dedicated Server

One physical machine dedicated to single a business.

Runs a single web-app/site.

Very Expensive, High Maintenance, *High Security

Virtual Private Server (VPS)

One physical machine dedicated to a single business.

The physical machine is virtualized **into sub-machines**

Runs multiple web-apps/sites

Better Utilization and Isolation of Resources

Shared Hosting

One physical machine, shared by hundred of businesses

Relies on most tenants under-utilizing their resources.

Very Cheap, Limited functionality, Poor Isolation

Cloud Hosting

Multiple physical machines that act as one system.

The system is abstracted into multiple **cloud services**

Flexible, Scalable, Secure, Cost-Effective, High Configurability



Types of Cloud Computing



SaaS Software as a Service For Customers

A product that is run and managed by the service provider
*Don't worry about how the service is maintained.
It just works and remains available.*

PaaS Platform as a Service For Developers

Focus on the deployment and management of your apps.
*Don't worry about, provisioning, configuring or
understanding the hardware or OS.*

IaaS Infrastructure as a Service For Admins

The basic building blocks for cloud IT. Provides access to networking features, computers and data storage space.
Don't worry about IT staff, data centers and hardware.

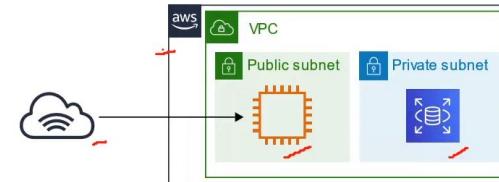


Cloud Computing Deployment Models

Public Cloud

Everything (the workload or project) is built on the CSP

Also known as: *Cloud-Native or Cloud First

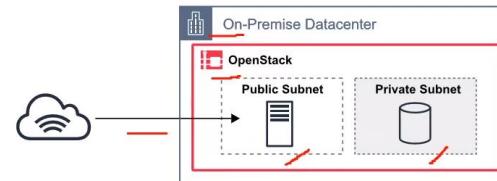


Private Cloud

Everything built on company's datacenters

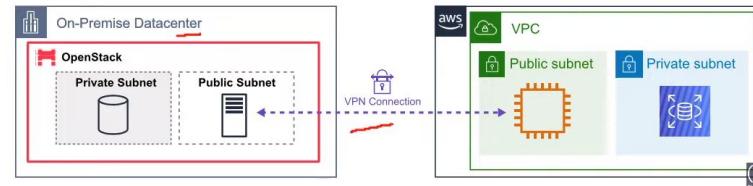
Also known as **On-Premise**

The cloud could be **OpenStack**



Hybrid

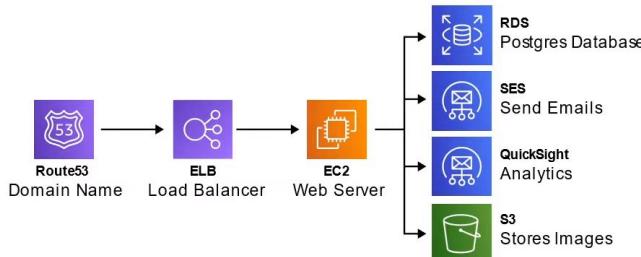
Using both **On-Premise** and
A **Cloud Service Provider**



Cloud Service Provider

A **Cloud Service Provider (CSP)** is a company which

- provides multiple Cloud Services e.g. tens to hundreds of services
- those Cloud Services **can be chained together** to create cloud architectures
- those Cloud Services are accessible **via Single Unified API** eg. AWS API
- those Cloud Services utilized **metered billing** based on usage e.g. per second, per hour
- those Cloud Services have rich monitoring built in eg. AWS CloudTrail
- those Cloud Services have an Infrastructure as a Service (IaaS) offering
- Those Cloud Services offers **automation** via Infrastructure as Code (IaC)



If a company offers multiple cloud services under a single UI but do not meet most of or all of these requirements, it would be referred to as a Cloud Platform e.g. Twilio, HashiCorp, Databricks



Common Cloud Computing Services

A cloud service provider **can have hundreds of cloud services** that are grouped into various types of services.
The four most common types of cloud services (*the 4 core*) for Infrastructure as a Service (IaaS) would be:



Compute

Imagine having a virtual computer that can run application, programs and code.



Networking

Imagine having virtual network defining internet connections or network isolations between services or outbound to the internet



Storage

Imagine having a virtual hard-drive that can store files



Databases

Imagine a virtual database for storing reporting data or a database for general purpose web-application

AWS has over **200+** cloud services

The term “Cloud Computing” can be used to refer to all categories, even though it has “compute” in the name.



Computing Services



Elastic Compute Cloud (EC2) allows you to launch **Virtual Machines (VM)**

What is a Virtual Machine?

A Virtual Machine (VM) is an emulation of a physical computer using software.

Server Virtualization allows you to easily **create, copy, resize or migrate** your server.

Multiple VMs can run **on the same physical server** so you can share the cost with other customers.

Imagine if your server or computer was an executable file on your computer

When we launch a Virtual Machine we call it an "**instance**"

EC2 is **highly configurable server** where you can choose **AMI** that affects options such as:

- The amount of CPUs
- The amount of Memory (RAM)
- The amount of Network Bandwidth
- The Operation System (OS) eg. Windows 10, Ubuntu, Amazon Linux 2
- Attach multiple virtual hard-drives for storage eg. Elastic Block Store (EBS)



An **Amazon Machine Image (AMI)** is a predefined configuration for a Virtual Machine.



EC2 is also considered **the backbone of AWS** because the majority of AWS services are using EC2 as their underlying servers. eg. S3, RDS, DynamoDB, Lambdas



Computing Services

Virtual Machines — an emulation of a physical computer using software



Amazon LightSail is the **managed virtual server service**. It is the “friendly” version of EC2 Virtual Machines

When you need to launch a Linux or Windows server but don't have much AWS knowledge. eg. Launch a Wordpress

Containers — virtualizing an Operation System (OS) to run multiple workloads on a single OS instance. Containers are generally used in micro-service architecture (when you divide your application into smaller applications that talk to each other)



Elastic Container Service (ECS) is a **container orchestration service** that support **Docker** containers. Launches a cluster of server(s) on EC2 instances with Docker installed. *When you need Docker as a Service, or you need to run containers.*



Elastic Container Registry (ECR) is **repository for container images**. In order to launch a containers you need an image. An image just means a saved copy. A repository just means a storage that has version control.



ECS Fargate is **serverless orchestration container service**. It is the same as ECS expect you pay-on-demand per running container (With ECS you have to keep a EC2 server running even if you have no containers running) AWS manages the underlying server, so you don't have to scale or upgrade the EC2 server.



Elastic Kubernetes Service (EKS) is a **fully managed Kubernetes service**. Kubernetes (K8) is an open-source orchestration software that was created by Google and is generally the standard for managing microservices. *When you need to run Kubernetes as a Service.*



Serverless — when the underlying servers are managed by AWS. You don't worry or configure servers.



AWS Lambda is a **serverless functions service**. You can run code without provisioning or managing servers.

You upload small pieces of code, choose much memory and how long function is allowed to run before timing out. You are charged based on the runtime of the serverless function rounded to the nearest 100ms.



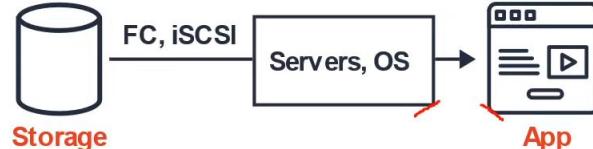
Storage Services



Elastic Block Store (EBS) - Block

Data is split into evenly split blocks
Directly accessed by the Operation System
Supports only a single write volume

When you need a virtual hard drive attached to a VM



AWS Elastic File Storage (EFS) - File

File is stored with data and metadata
Multiple connections via a network share
Supports multiple reads, writing locks the file.

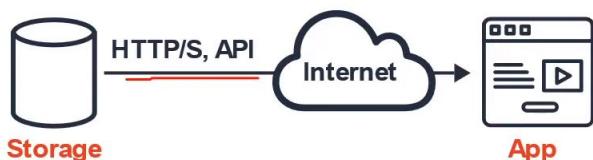
When you need a file-share where multiple users or VMs need to access the same drive



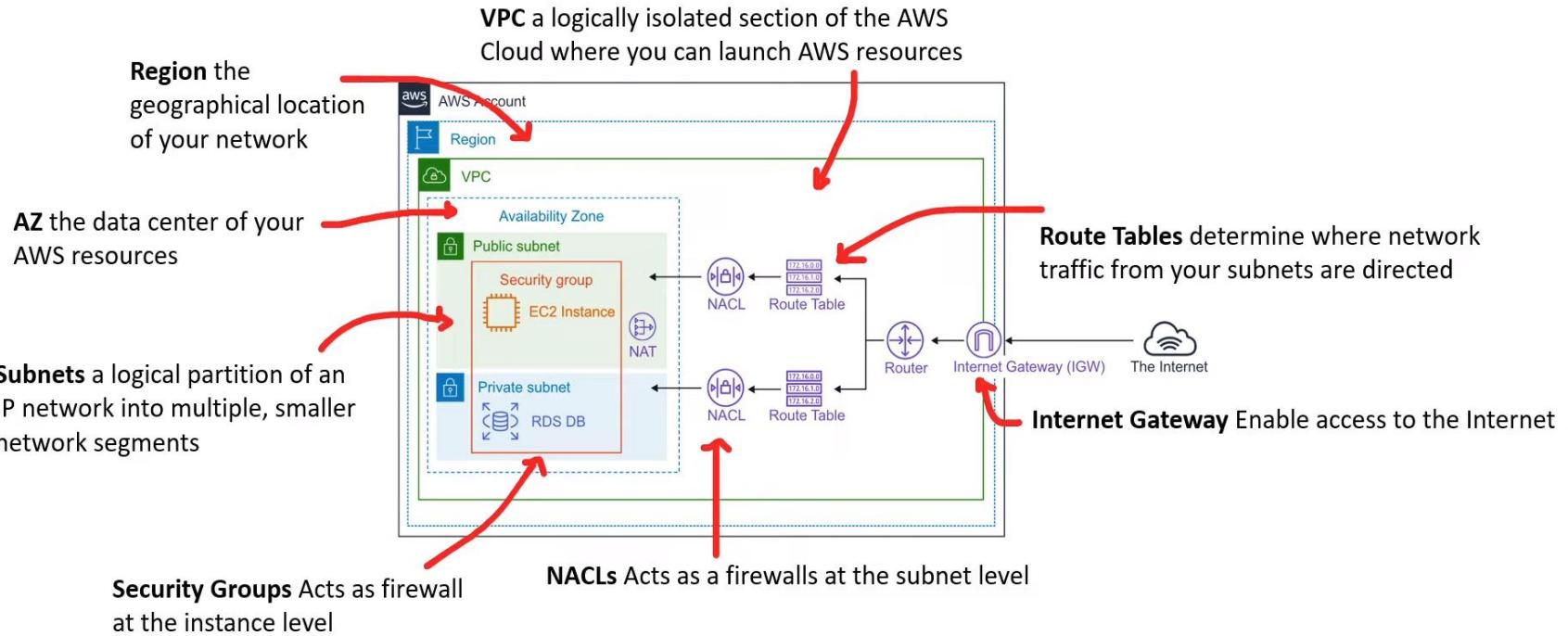
Amazon Simple Storage Service (S3) - Object

Object is stored with data, metadata and Unique ID
Scales with limited no file limit or storage limit
Supports multiple reads and writes (no locks)

When you just want to upload files, and not have to worry about underlying infrastructure. Not intended for high IOPs



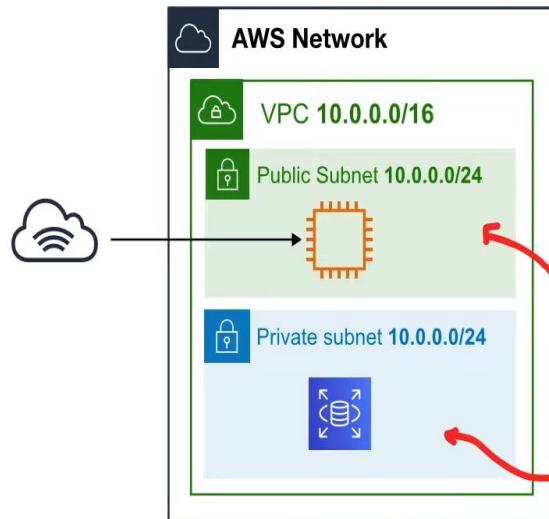
AWS Cloud Native Networking Services



VPC & Subnets

Virtual Private Cloud (VPC) is a logically isolated section of the AWS Network where you launch your AWS resources. You choose a **range of IPs using CIDR Range**

CIDR Range of **10.0.0.0/16 = 65,536 IP Addresses**



Subnets a logical partition of an IP network into multiple smaller network segments. **You are breaking up your IP range for VPC** into smaller networks.

Subnets **need to have a smaller CIDR range than to the VPC** represent their portion.

eg Subnet CIDR Range $10.0.0.0/24 = 256$ IP Addresses

A **Public Subnet** is one that can reach the internet

A **Private Subnet** is one that cannot reach the internet

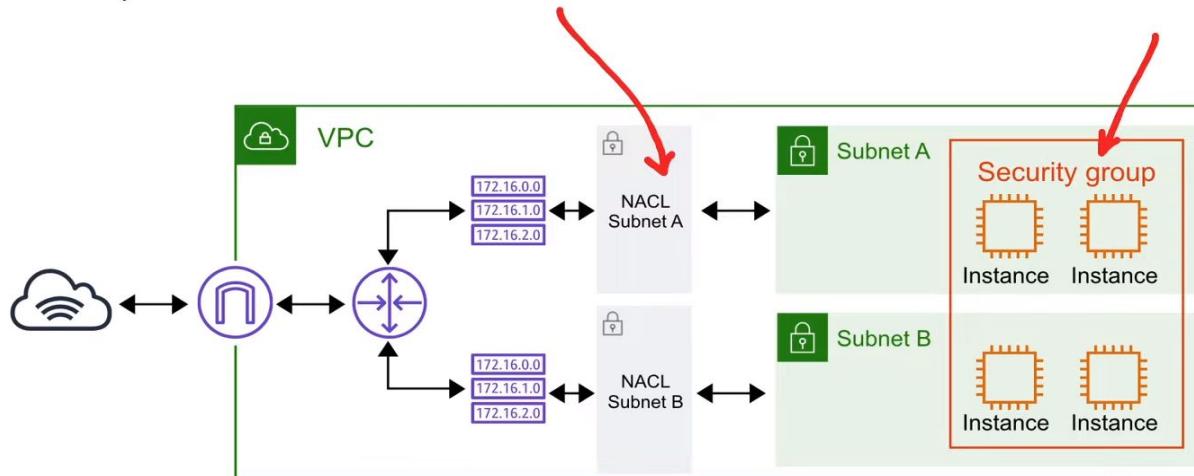
Security Groups & NACLs

Network Access Control Lists (NACLs)

Acts as a virtual **firewall at the subnet level**

You create **Allow and Deny rules**.

eg. Block a specific IP address known for abuse



Security Groups

Acts as a virtual **firewall at the instance level**

Implicitly denies all traffic. **You create only Allow rules**.

eg. Allow an EC2 instance access on port 22 for SSH

eg. You cannot block a single IP address.



Thank You!