What is Cloud Computing?

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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.

The Evolution of Cloud Hosting

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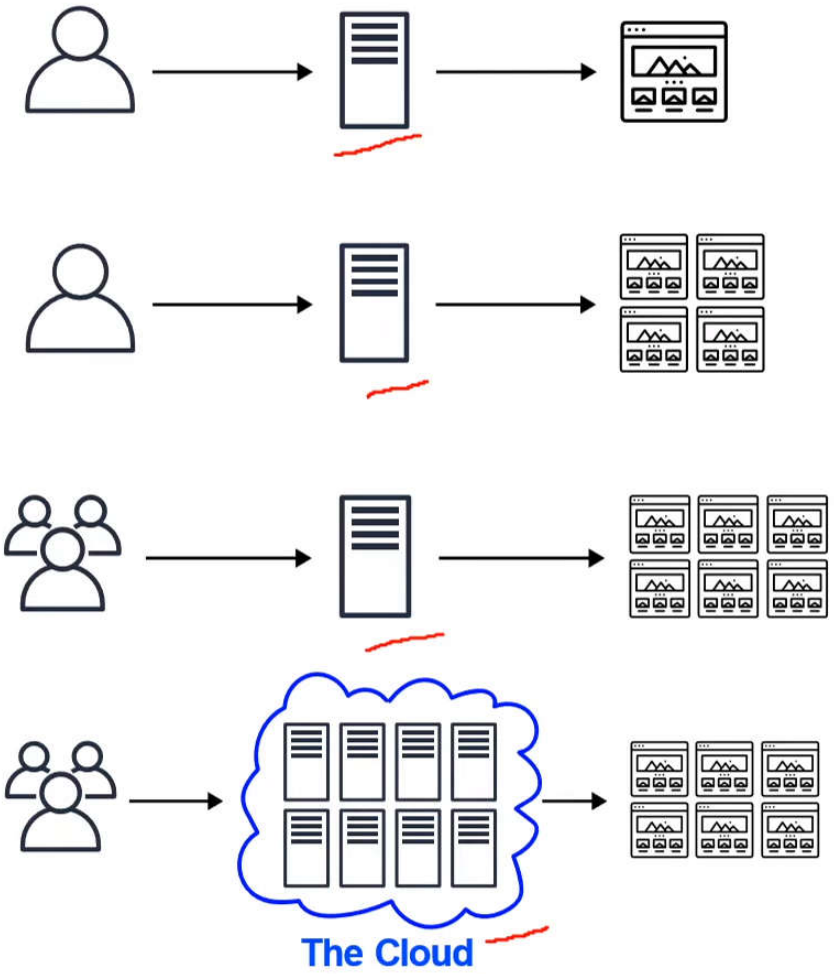

Dedicated Server

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

What is Amazon?

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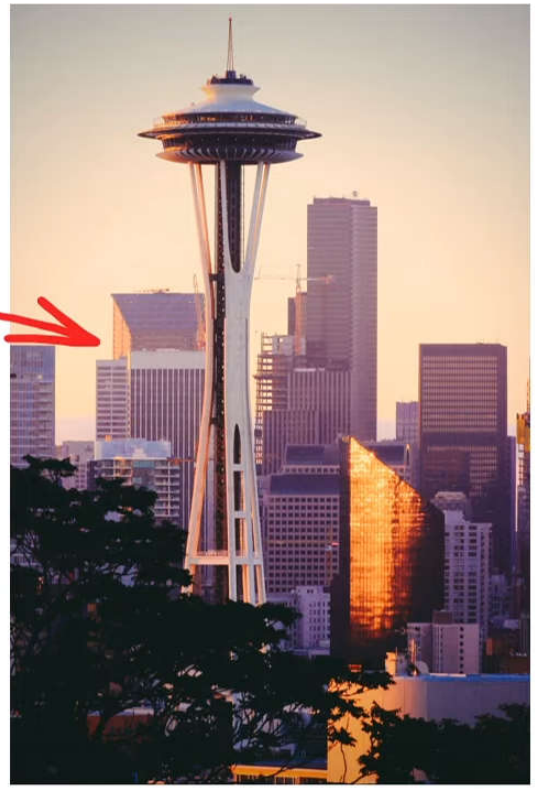
amazon

An American multinational computer technology corporation headquartered in **Seattle, Washington**



@timothyeberly on Unsplash

amazon.com

Amazon was founded in 1994 by **Jeff Bezos** and the company started as an online store for books and expanded to other products.

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What is Amazon?

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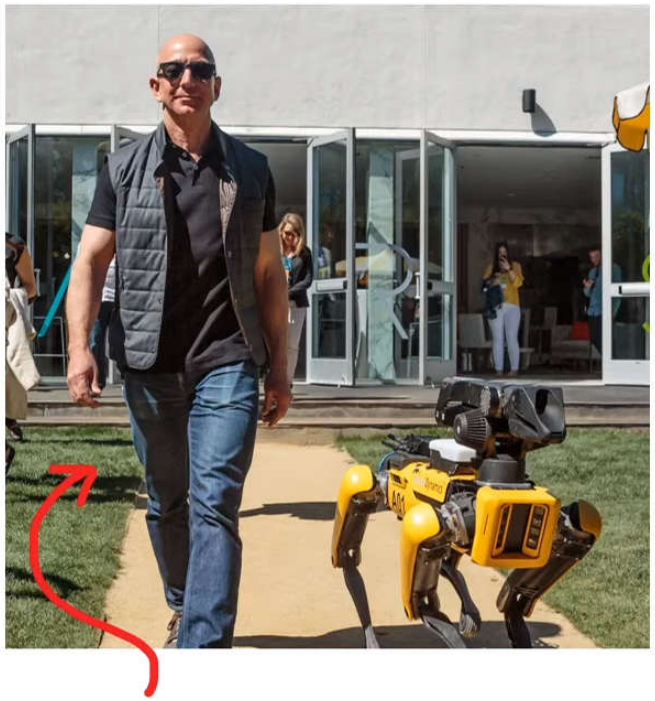

Jeff Bezos **today**

Amazon has expanded beyond just an online e-commerce store into:

- **cloud computing** (Amazon Web Services)
- digital streaming
  - Amazon Prime Video
  - Amazon Prime Music
  - Twitch.tv
- Grocery Stores (Whole Foods Market)
- artificial intelligence
- Low orbit satellites (Kuniper Systems)
- And more!

Andy Jassy is the current CEO of Amazon.
Previously the CEO of AWS.
So Jeff Bezos can focus on space travel.

What is Amazon Web Services (AWS)?

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Amazon calls their cloud provider service

Amazon Web Services

Commonly referred to just **AWS**

Old Logo

New Logo

AWS was launched in ***2006** is the **leading cloud service provider** in the world.

Cloud Service Providers can be initialized as **CSPs**

What is Amazon Web Services (AWS)?

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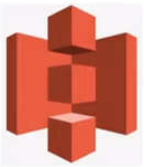
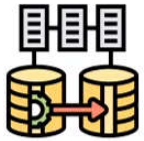
Simple Queue Service (SQS) was the first AWS service launched for public use in 2004



Simple Storage Service (S3) was launched in March of 2006

Elastic Compute Cloud (EC2) was launched in August of 2006



In November 2010, it was reported that all of Amazon.com's retail sites had migrated to AWS

To support industry-wide training and skills standardization, AWS began offering a certification program for computer engineers, on April, 2013

What is Amazon Web Services (AWS)?

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Adam Selipsky
CEO of AWS
Former CTO of Tableau, spend a decade with AWS as VP of Marketing, Sales and Support

Werner Vogels
CTO of AWS
"Everything fails, all the time."

Jeff Barr
Chief Evangelist

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What is a Cloud Service Provider (CSP)?

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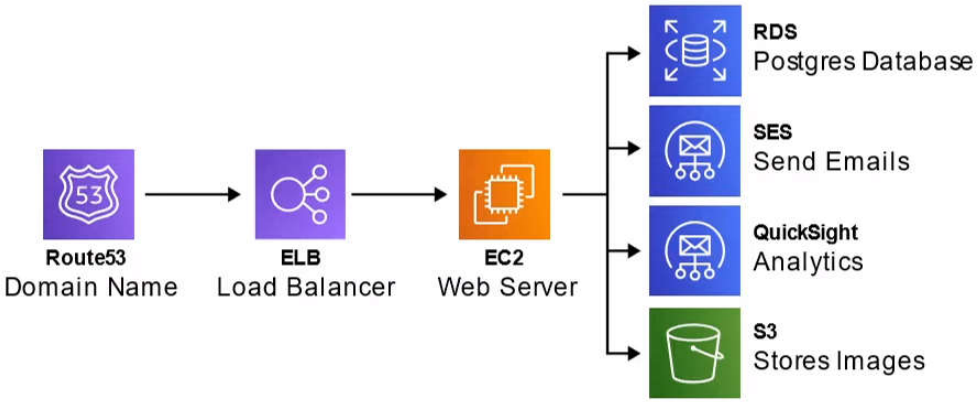
A **Cloud Service Provider (CSP)** is a company which

- 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

Landscape of CSPs

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Tier-1 (Top Tier) – Early to market, wide offering, strong synergies between services, well recognized in the industry

Amazon Web Services (AWS)

Microsoft Azure

Google Cloud Platform (GCP)

Alibaba Cloud

Tier-2 (Mid Tier) – Backed by well-known tech companies, slow to innovate and turned to specialization.

IBM Cloud

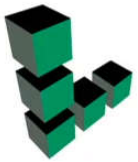
Oracle Cloud

Rackspace (OpenStack)

Tier-3 (Light Tier) – Virtual Private Servers (VPS) turned to offer core IaaS offering. Simple, cost-effective

Vultr

Digital Ocean



Linode

Gartner Magic Quadrant for Cloud

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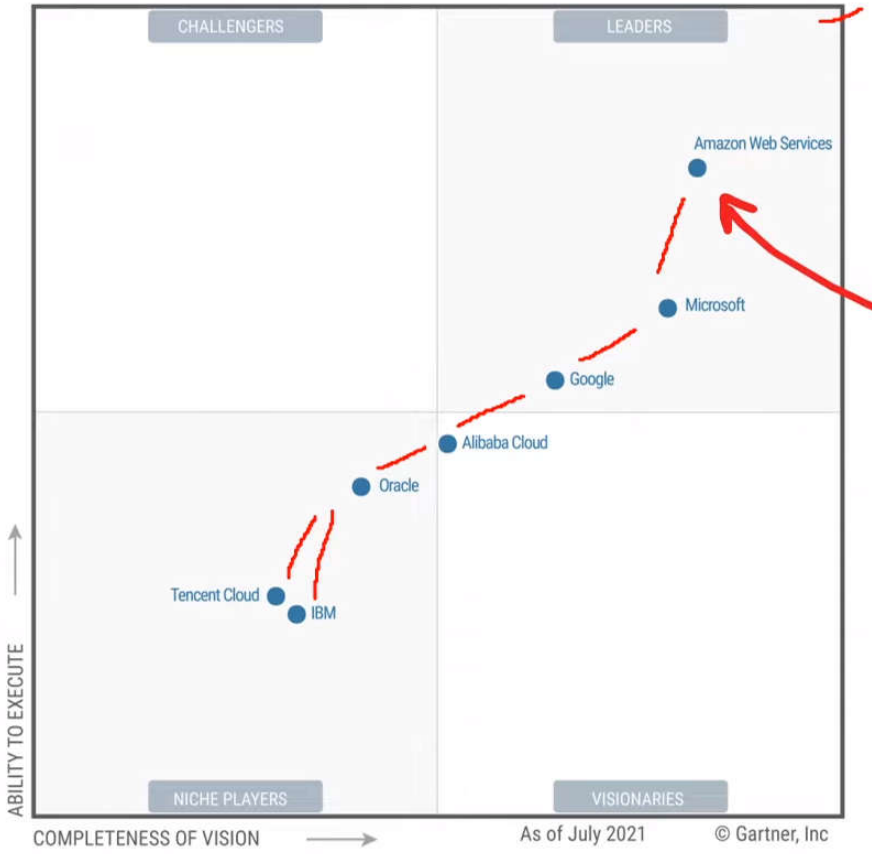
Figure 1: Magic Quadrant for Cloud Infrastructure and Platform Services



Source: Gartner (July 2021)

Magic Quadrant (MQ) is a series of market research reports published by IT consulting firm Gartner that rely on proprietary qualitative data analysis methods to demonstrate market trends, such as direction, maturity and participants.

aws

Common Cloud Services

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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.

Technology Overview

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Cloud Service Provider (CSPs) that are **Infrastructure as a Service (IaaS)** will always have **4 core cloud service** offerings:

Compute

EC2 Virtual Machines

Storage

EBS Virtual Hard drives

Database

RDS SQL databases

Networking and Content Delivery

VPC Private Cloud Network

- **Analytics**
- **Application Integration**
- **AR & VR**
- **AWS Cost Management**
- **Blockchain**
- **Business Applications**
- **Containers**
- **Customer Engagement**
- **Developer Tools**
- **End User Computing**
- **Game Tech**
- **Internet of Things**
- **Machine Learning**
- **Management & Governance**
- **Media Services**
- **Migration & Transfer**
- **Mobile**
- **Quantum Technologies**
- **Robotics**
- **Satellites**
- **Security, Identity & Compliance**

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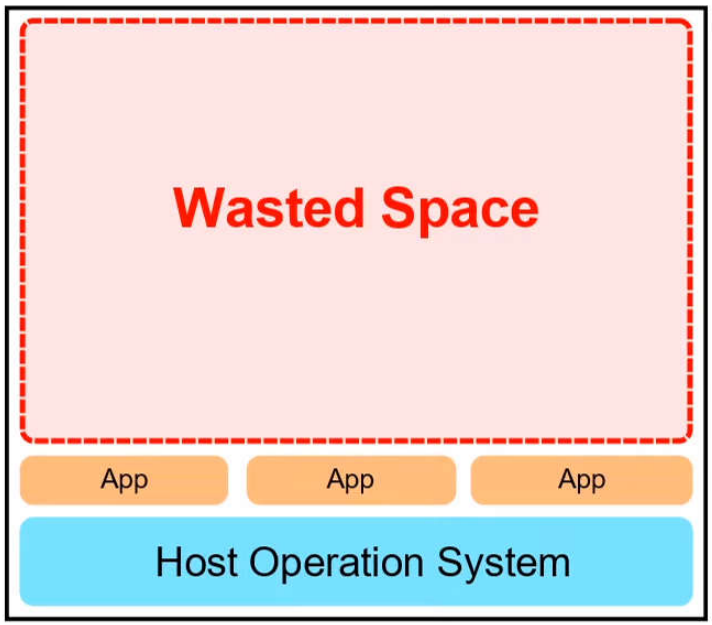
***Dedicated** 👉 VMs 👉 Containers 👉 Functions



physical server

- 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**

The Evolution of Computing

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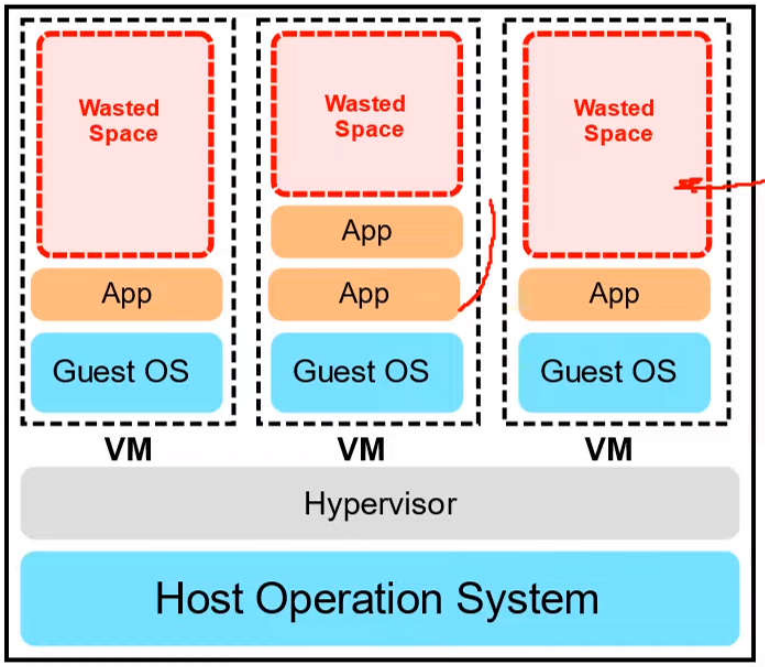
*Dedicated 👉 VMs 👉 Containers 👉 Functions



physical server

- You can run **multiple Virtual Machines on one machine**.
- **Hypervisor** is the software layer that lets you run the VMs
- A physical server shared by multiple customers
- You are to pay for a fraction of the server
- You'll overpay for an underutilized Virtual Machine
- You are limited by your Guest Operating System
- Multiple apps on a single Virtual Machine can result in conflicts in resource sharing
- Easy to export or import images for migration
- Easy to Vertical or Hortizonaalty scale

The Evolution of Computing

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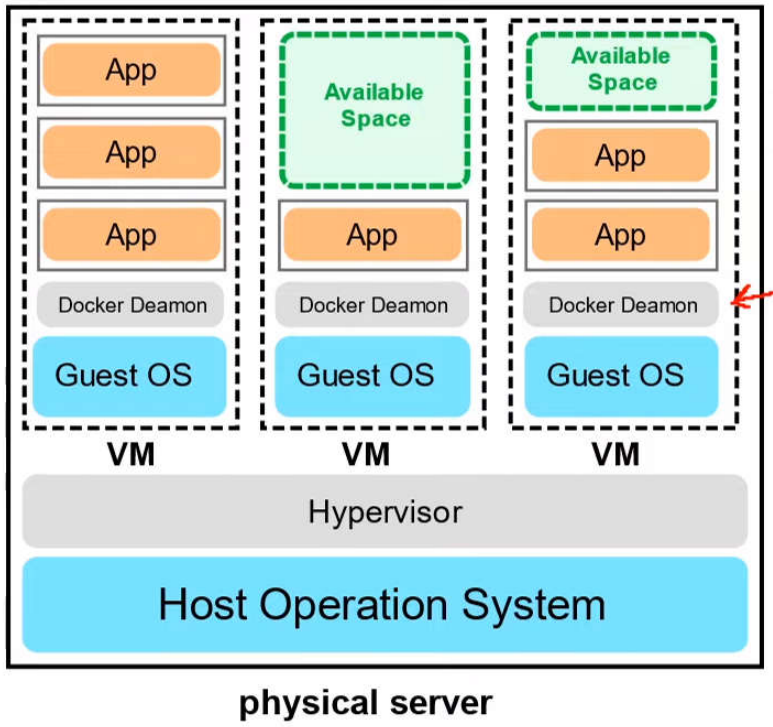
*Dedicated 👉 VMs 👉 **Containers** 👉 Functions



- Virtual Machine running multiple containers
- **Docker Deamon** is the name of the software layer that lets you run multiple containers.
- You can maximize the utilize of the available capacity which is more cost-effective
- Your containers share the same underlying OS so containers are more efficient than multiple VMs
- Multiple apps can run side by side without being limited to the same OS requirements and will not cause conflicts during resource sharing

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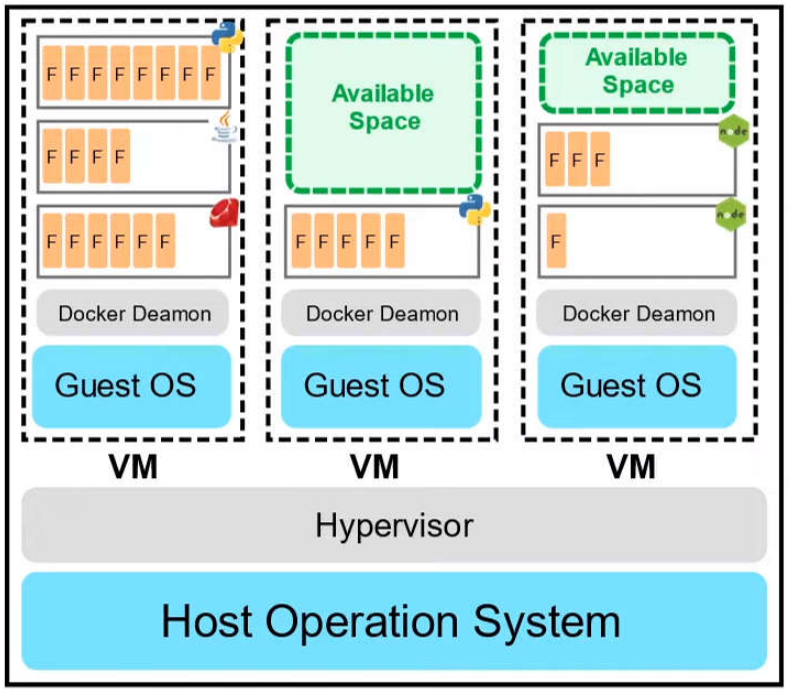
*Dedicated 👉 VMs 👉 Containers 👉 **Functions**



physical server

- 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

Types of Cloud Computing

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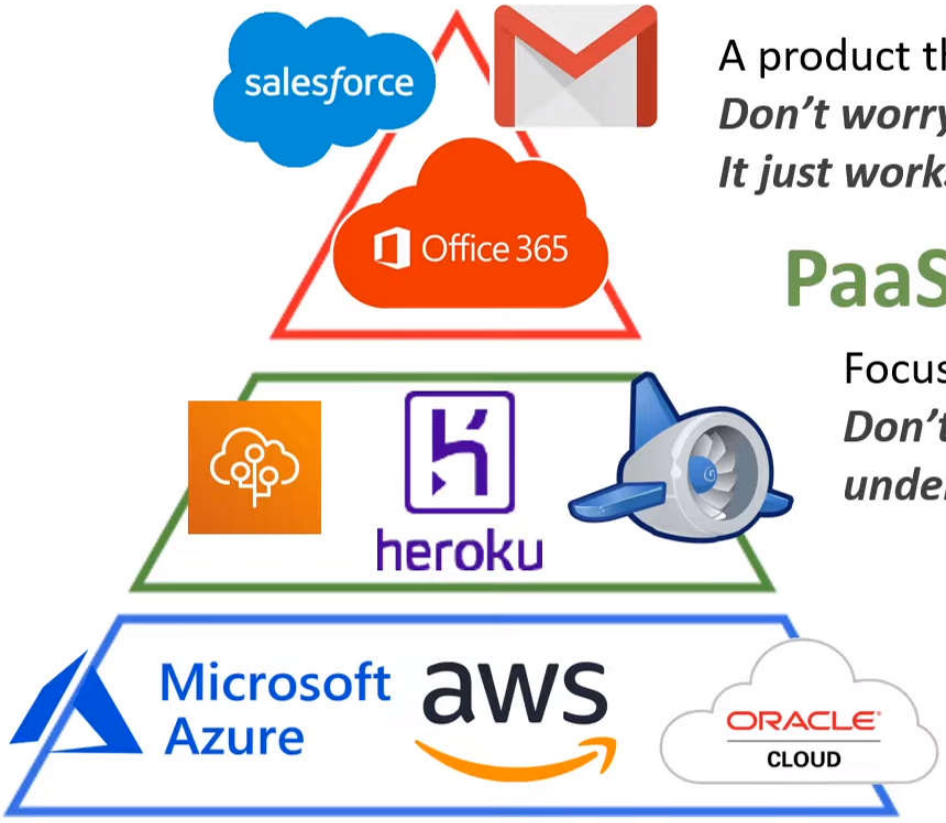

SaaS Software as a Service **For Customers**

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

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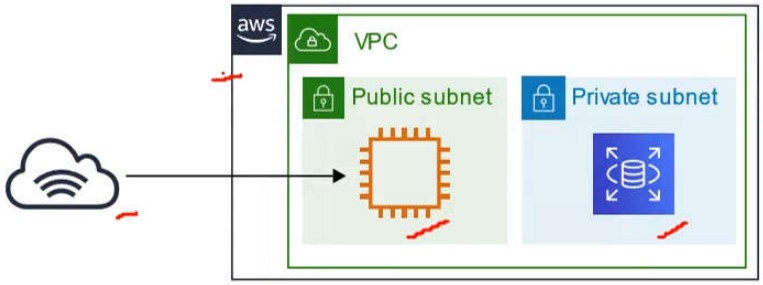
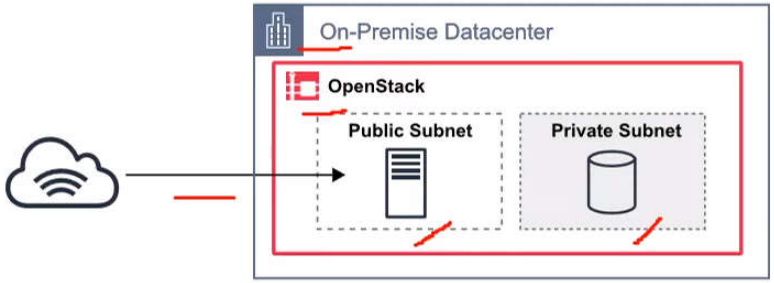
Public Cloud

Everything (the workload or project) is built on the CSP
Also known as: *Cloud-Native or Cloud First



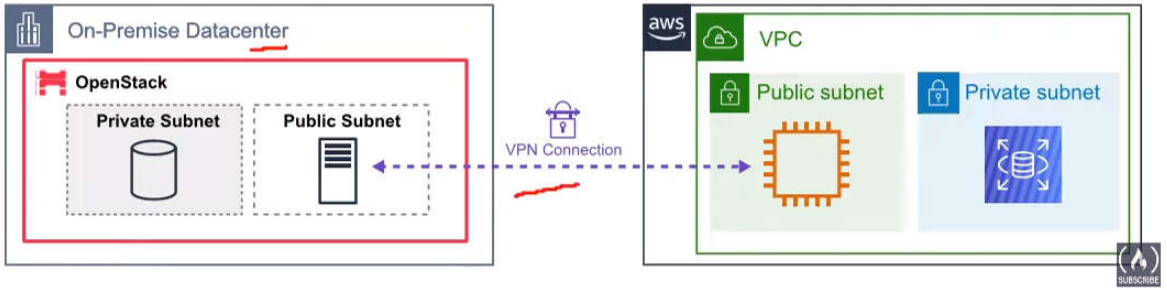
Private Cloud

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 Computing Deployment Models

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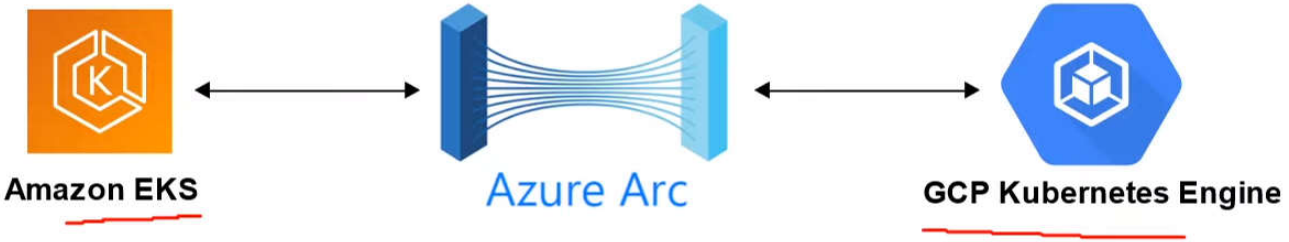
Cross-Cloud

Using **Multiple Cloud Providers**

Aka multi-cloud, ~~"hybrid-cloud"~~



Anthos is GCP's offering for a control plane for compute across multiple CSPs and On-premise environments

Cloud Computing Deployment Models

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Cloud

Fully utilizing cloud computing

Dropbox

Companies that are starting out today, or are small enough to make the leap from a VPS to a CSP.

- Startups
- SaaS offerings
- New projects and companies

Hybrid

Using both Cloud and On-Premise

Deloitte.

CIBC

CPP INVESTMENT BOARD

Organizations that started with their own datacenter, can't fully move to cloud due to effort of migration or security compliance

- Banks
- FinTech, Investment Management
- Large Professional Service providers
- Legacy on-premise

On-Premise

Deploying resources on-premises, using virtualization and resource management tools, is sometimes called "private cloud".

AIG

Canada

Organizations that cannot run on cloud due to strict regulatory compliance or the sheer size of their organization

- Public Sector eg. Government
- Super Sensitive Data eg. Hospitals
- Large Enterprise with heavy regulation eg. Insurance Companies

There really isn't reason to **be fully on-premise**