Cloud Computing

Introduction to cloud computing

What is Cloud Computing ?

1. Cloud

Cloud refers to the physical servers anywhere in the world that are accessed over the internet and the software and databases that run on those servers.

2. Computing

Computing is the act of calculating something like add, sub, more complex functions.

So that cloud computing is the delivery of computing services like servers, storage, database, networking , software over the internet to increase computing speed, flexible resources and cost effective.

Cloud infrastructure

What is cloud infrastructure ?

Cloud infrastructure is the collection of hardware and software elements like computing power, networking, storage and virtualization resources are essential to enable cloud computing.

cloud infrastructure provides a UI interface for the organizations to manage the virtual resources and access data storage as our need.

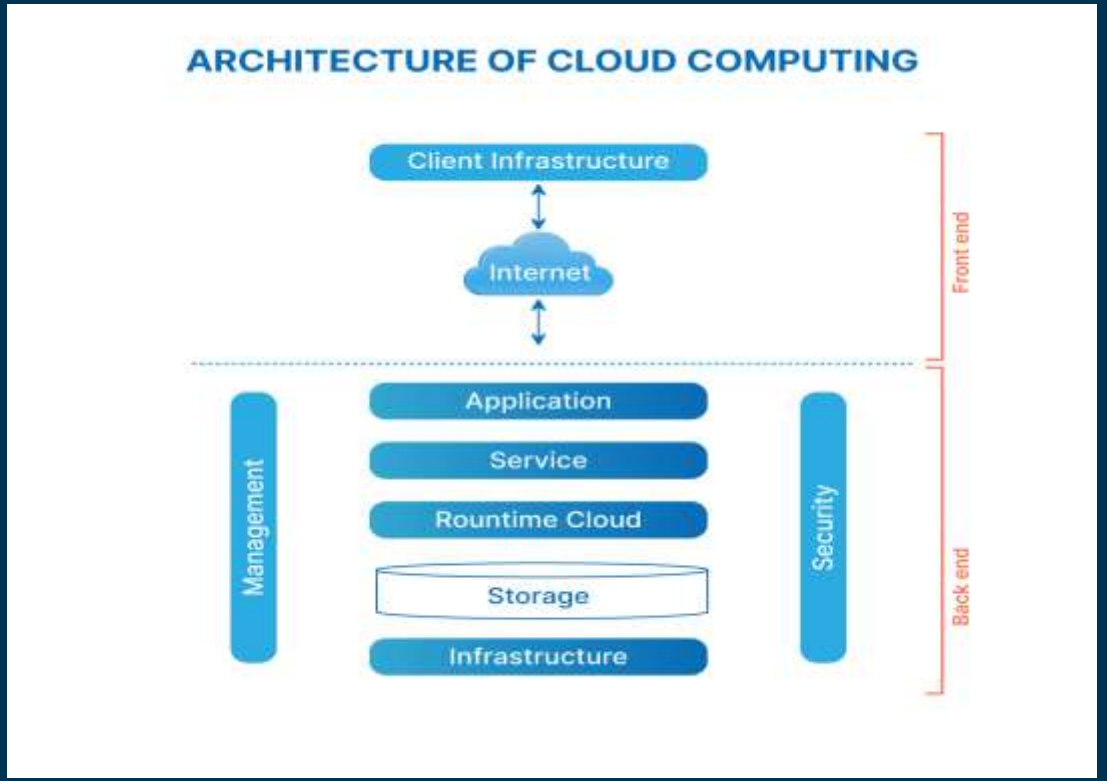
Cloud Architecture

What is cloud architecture ?

Cloud computing architecture refers to the combination of components to build a cloud platform and share through the internet.

The components of a cloud architecture includes

- Front-end platform (a computer uses to access the cloud)
- Back-end platform (servers and storage)
- A cloud based delivery model
- Networking (communication purpose)



Pros of cloud computing

- Reduce infrastructure cost
- Defend against disaster
- Stay scalable
- Access your data anywhere
- Security

Cons of cloud computing

- Lack of total control
- Difficult to migrate data from one cloud to another cloud
- Requires better internet connection
- Chance for occuring cyber attacks

Real life examples for cloud computing

- Email – for communication purposes like send and receive mails
- Whatsapp – transfer of files and chatting
- Skype – used for face to face communication over the internet
- Netflix – used for streaming movies and series over the internet

Cloud customers

A person or organization are subscribed a cloud services from the cloud providers.

Cloud Providers

Cloud Providers

A cloud service provider is a third party company offering a cloud based platform infrastructure, application or storage services.

It helps to store , manage and process our data by provide some remote server access to the customers.

Cloud Services

Cloud Services

- Iaas (infrastructure as a service)
- Paas (platform as a service)
- Saas (software as a service)

IAAS

Infrastructure as a Service

Infrastructure as a service

- Iaas means providing of resources like storage, CPU, ram and servers by virtualization method.
- Real world example for Iaas
- Renting a car where you are responsible for all like driving, patrol and its maintenance.

PAAS

Platform as a Service

Platform as a service

- Paas provides infrastructure and also gives middleware like os, GUI, IDE, database etc.
- Real world example for Paas
- Using cab like uber as a mode of transport,in this case you just a customer to book a cab for travel only. so you don’t care about the patrol and maintenance of the car.

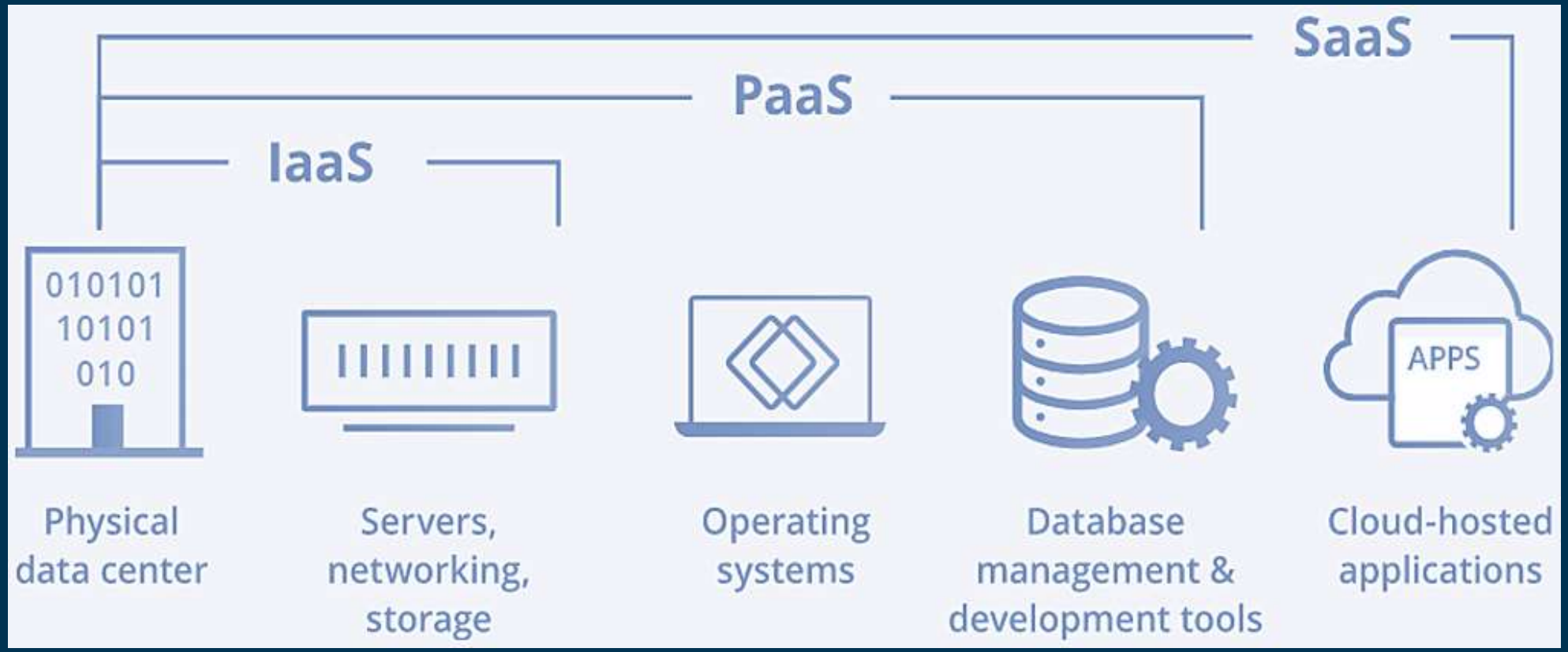
SAAS

Software as a Service

Software as a service

- Saas provides fully built in software for the user to perform their task. Like calendar, gmail, clock etc.
- Real world example for Saas
- Use government bus or train as a mode of transport, where you just catch and go on your journey. You are directly using the service provided by the government.

Overview of cloud services



Cloud Deployment Models

Cloud deployment models

Cloud deployment means deploy or upload our application on the cloud platform and the models are response for who has to access the infrastructure.

There are three major cloud deployment model

- Public cloud
- Private cloud
- Community cloud
- Hybrid cloud

Public cloud

Public cloud means a form of cloud computing that the platform is owned by third party but everyone can use and make it as public usage.

(eg) browser, youtube etc.

Private cloud

A private cloud is a cloud computing environment dedicated to a single organization.

All resources are isolated and in the control of one organization.

(eg) oracle , dell , VMware and IBM cloud

Community cloud

A Community cloud is a cloud computing environment in which multiple organizations share their resources and services with each other.

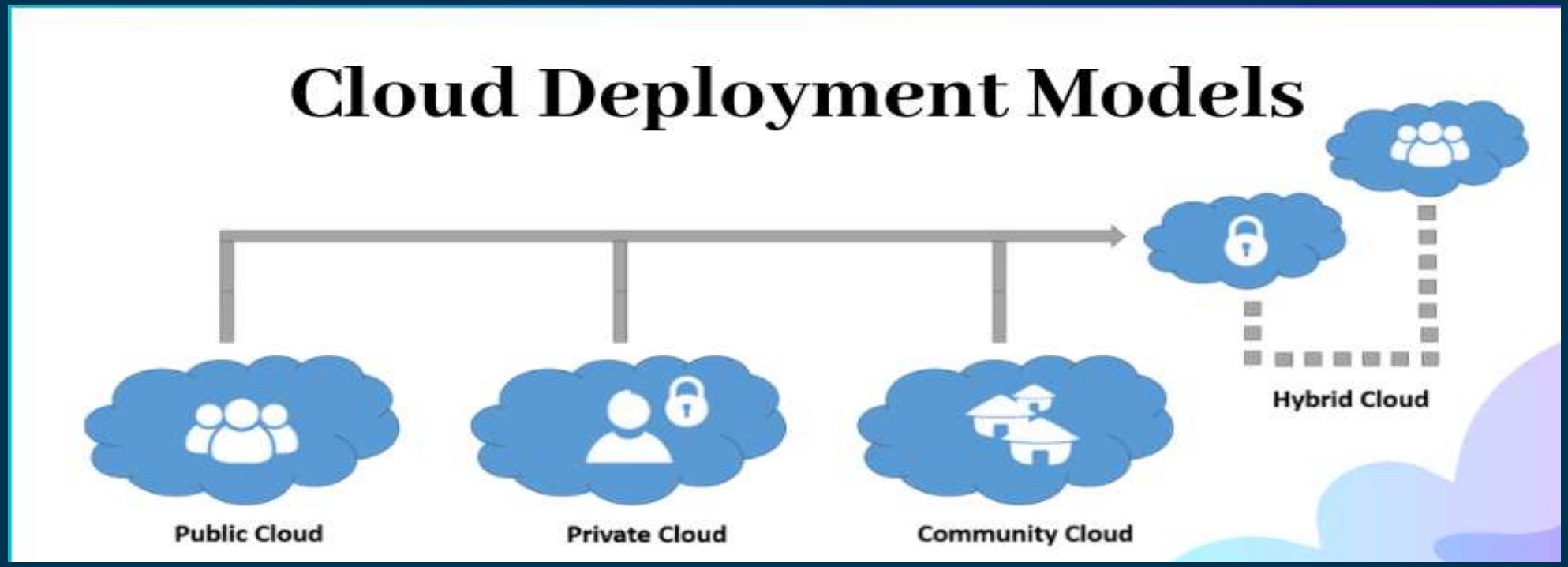
(eg) healthcare sector , government sector etc.

Hybrid cloud

A hybrid cloud is a cloud computing environment that uses a mix of private and public cloud services.

(eg) college website, bank website etc.

Overview of cloud deployment models



virtualization

virtualization

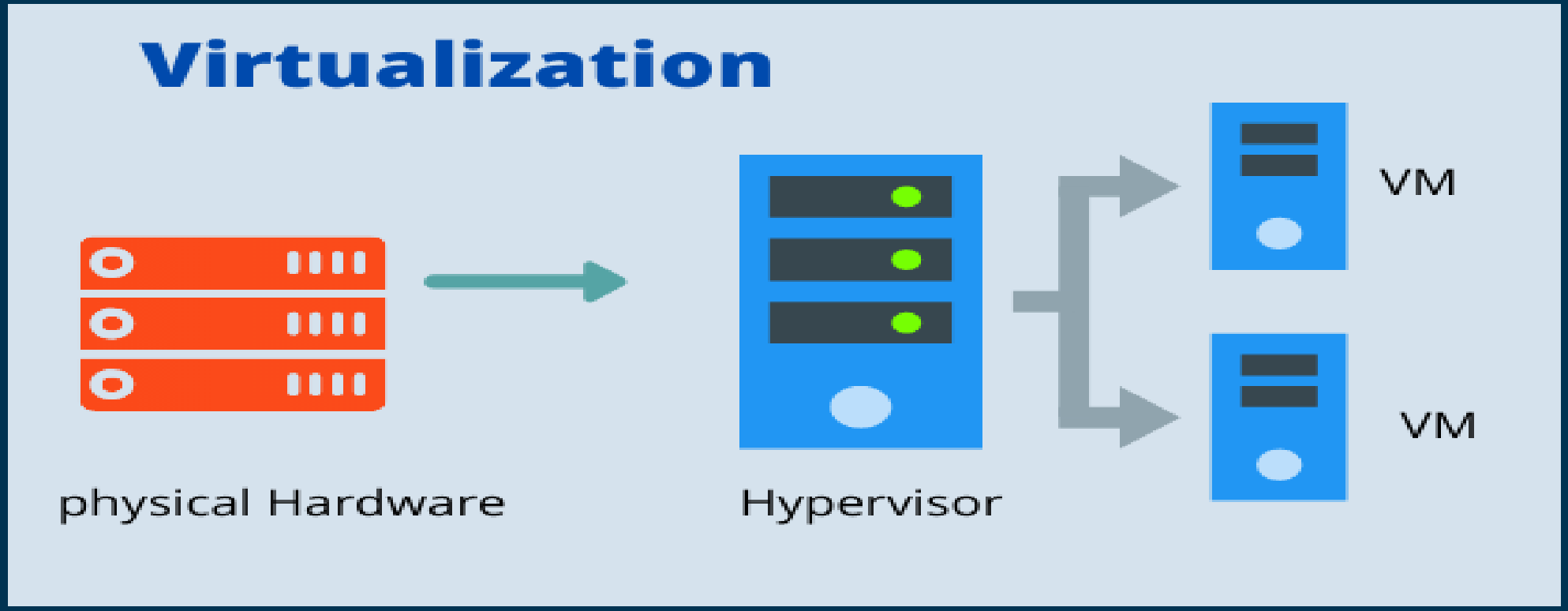
- The concept of cloud computing is achieved by virtualization.
- Virtualization is a process that allows to share a single physical server into different pieces of virtual machine and provide it as per customer's need over the internet and use some applications like Vmware.
- We can run different types of os in a single system by using virtualization method.

Types of virtualization

There are main Five types of virtualization

- Server virtualization
- Storage virtualization
- Network virtualization
- Desktop virtualization
- Application virtualization

Overview of Virtualization



Most Common services provides by cloud providers

VM

Virtual Machine

Virtual machine

- Virtual machine is a imaginary computer or server runs in our system.
- we don’t need to buy a physical server.
- We can runs multiple os and applications in one system and its never affect our system storage and hardware.
- It is useful to increase our computing speed by providing specs like extra ram, processor etc.

IAM

Identity and Access Management

IAM

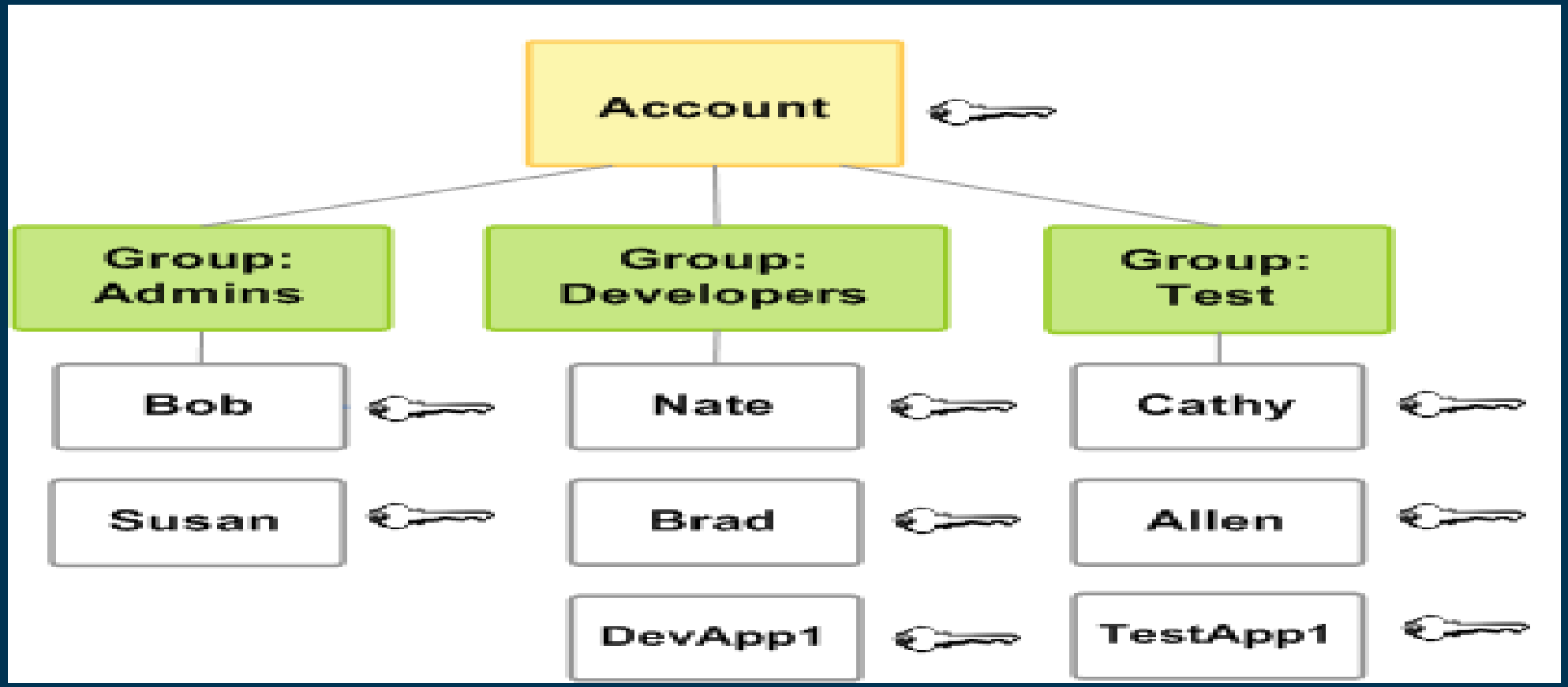
- IAM user means that root user orders the sub users for what to do and what they don’t do and are defined by some set of policies.

- IAM groups are the combination of members like dev groups, tester groups etc.

- IAM Role means that what the position or role that having a iam users.

Eg. A iam user assigned for manage billing only

Overview of IAM



Cloud Shell

Cloud shell

- It is a Inbuilt terminal used to access cloud resources directly in the management console.
- It has command line interface to manage the resources as fast.
- It is easy to manage, explore and interaction.
- All cloud platform have their own cloud shell.

Networking in Cloud

Networking in Cloud

There are three main components in networking

- Virtual Network
- Subnet
- Security group

Virtual Network

A virtual network is a network where all devices, servers, virtual machines and data centers in a region are connected through some services.

There are some categories in virtual network

- Virutal private network (VPN)
- Virtual local area network (VLAN)
- Virtual extensible local area networks (VXLAN)

Subnets

- **Subnet** is a network inside network helps to handle network traffic and make a shorter path to reach our destination without any disturbance.

- Range of IP addresses makes subnets.

Security Groups

- Security groups acts as a firewall for our server and controls the incoming and outgoing traffic in our resources.

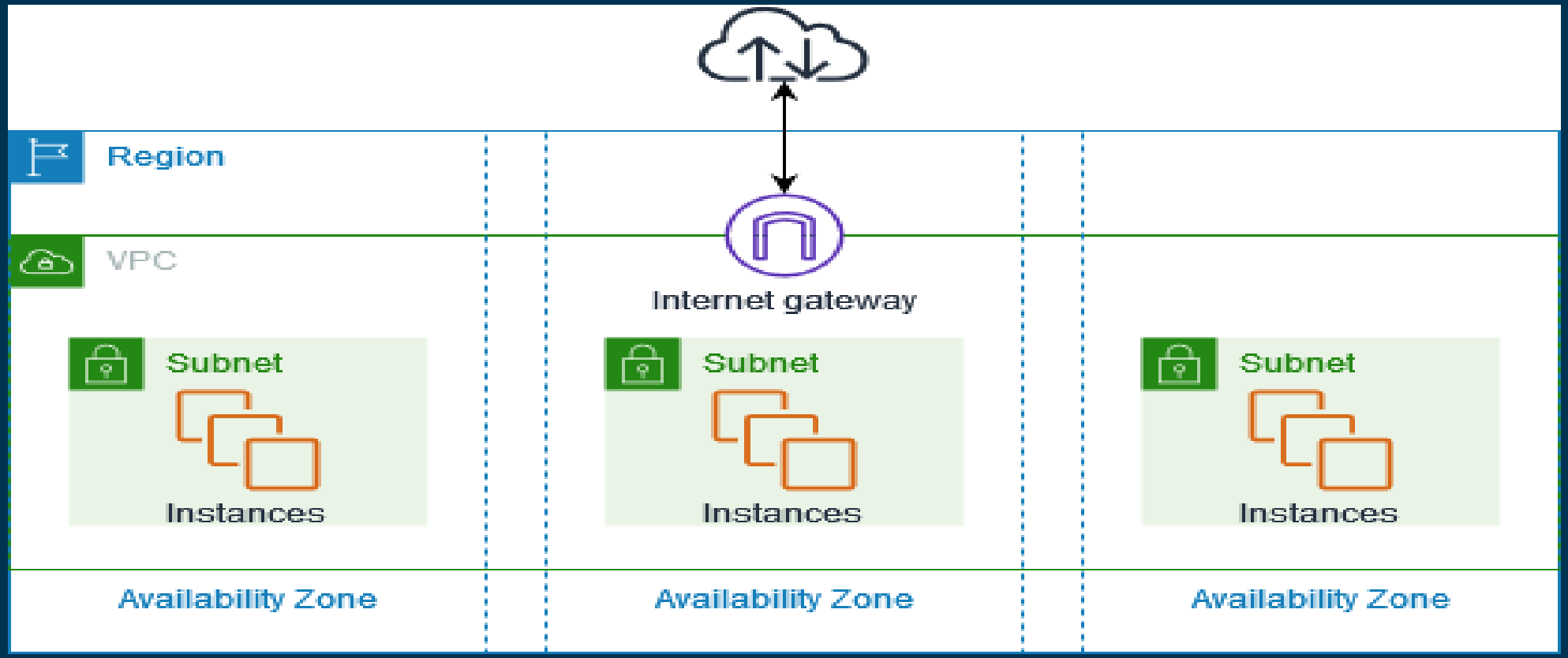
- It has some protocols to secure our resources from cyber attacks.

Virtual Private Cloud (VPC)

Virtual private cloud

- A Virtual Private Cloud (VPC) allows you to virtually create a private and isolated network in a public cloud infrastructure.
- It helps to make a privacy and security for an organization.
- Useful for data encryption.

Overview of VPC



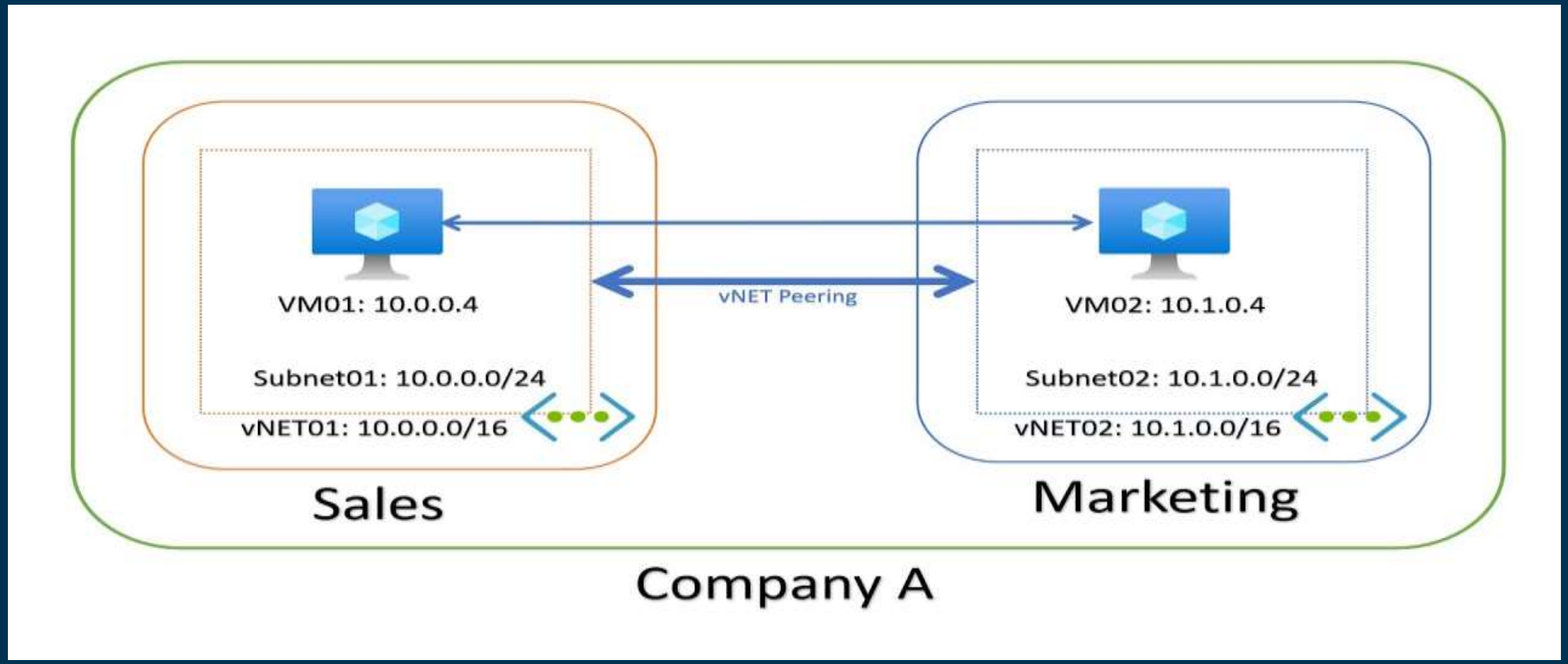
Virtual network peering

Virtual network peering

- **Vmpeering** is a method used in virtual network to connect two virtual networks.

- This enables resources in one virtual network to communicate with resources of another virtual network without going through the public.

Overview of Vnet peering



Ports and protocols

Ports and protocols

- SSH (secure shell) / port no . 22
- FTP (File transfer protocol) / port no . 21
- SFTP (Secure File transfer protocol) / port no . 22
- HTTP (Hypertext transfer protocol) / port no . 80
- HTTPS (Hypertext transfer protocol secure) / port no 443
- RDP (Remote Desktop protocol) / port no . 3389

Scalability

Scalability

It is a ability to increase or decrease the resources as needed to met the change in our demand.

Two types of scalability

- Vertical scalability
- Horizontal scalability

Vertical Scalability

- Vertical scalability refers to adding more hardware disks and features to our existing machine so that we can run more complex process on better specs.

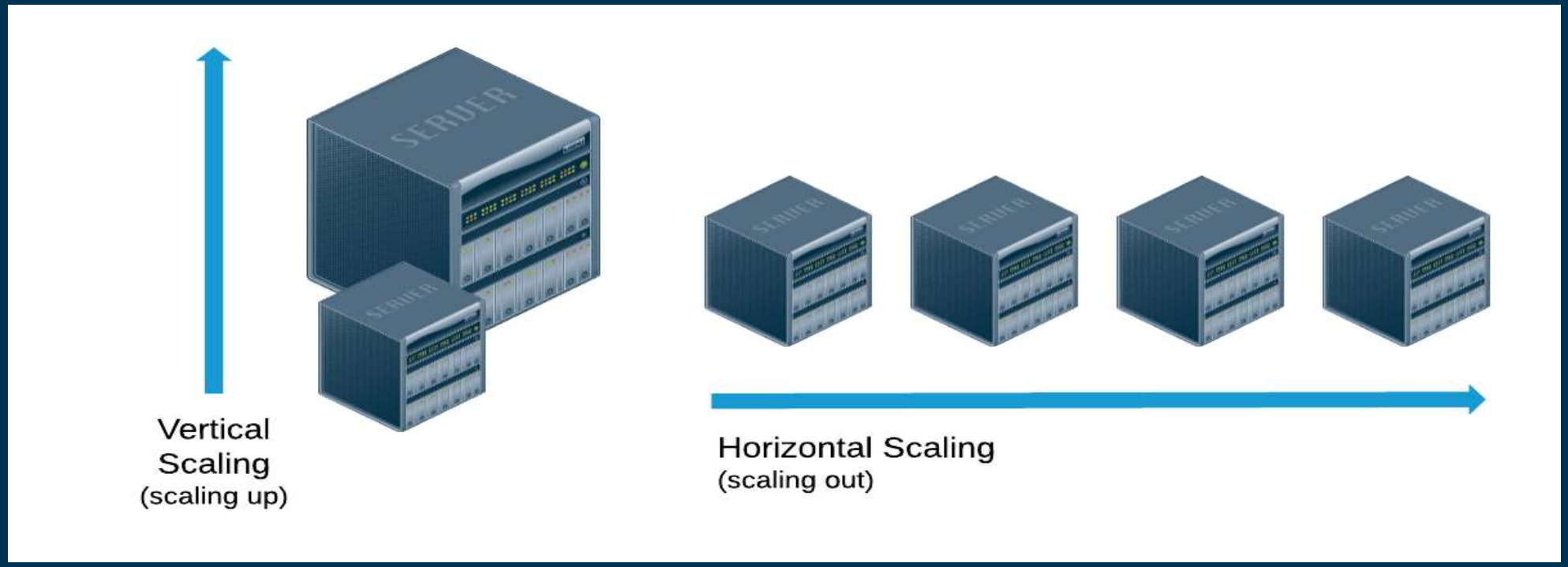
- Increase the resources quality is called vertical scalability.

Horizontal Scalability

- Horizontal scalability refers to adding of more than one servers to our infrastructure to perform the complex task.

- Increase the resources quantity is called Horizontal scalability.

Overview of Scalability



High availability

High availability

- It means that running application in at more than one availability zones.

- The main goal of high availability its to secure our data when the data center losses.

Load Balancer

Load Balancer

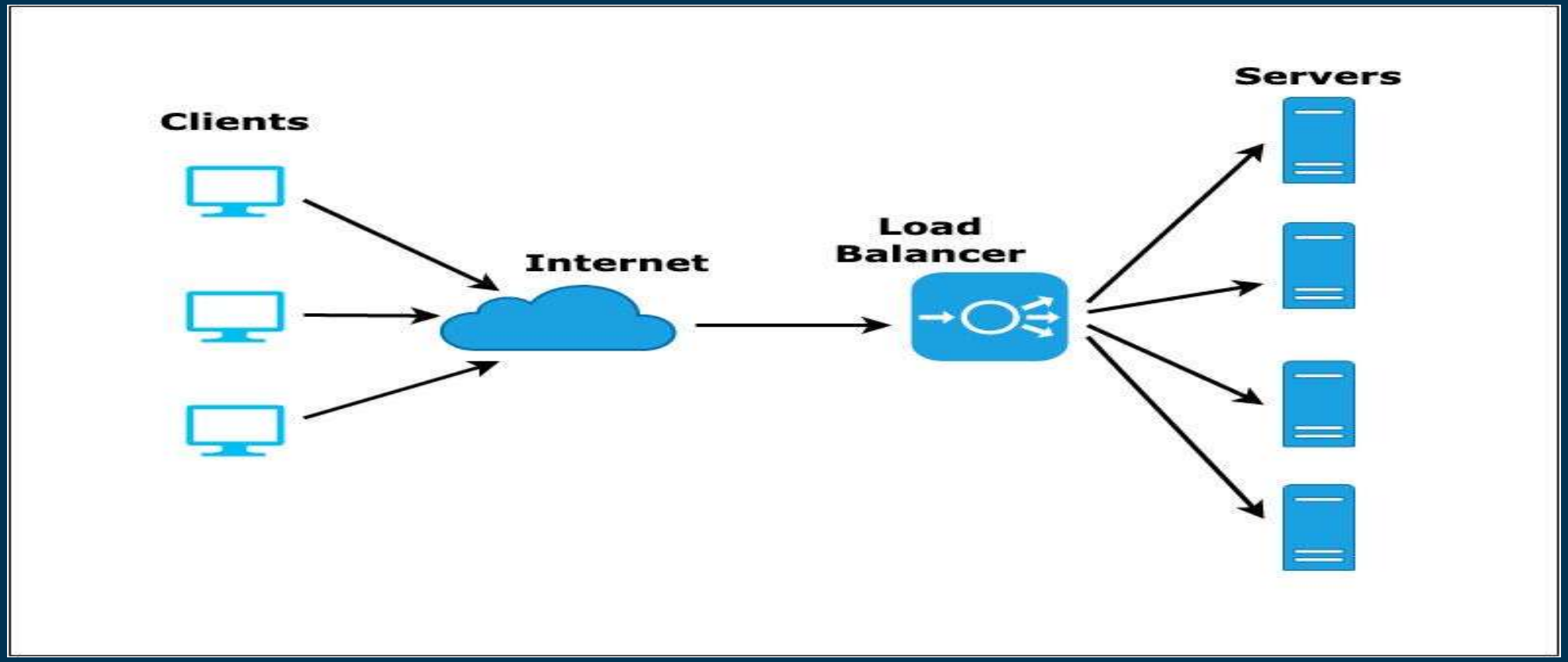
- It is a solution that acts as a traffic distributers to send user heavy requests into many servers and it makes quick response.

- It distribute the requests into many servers by using set of algorithms.

Algorithm of Load Balancer

- Round Robin
- Least request
- Least response time
- Source IP
- Least bandwidth

Overview of Load Balancer



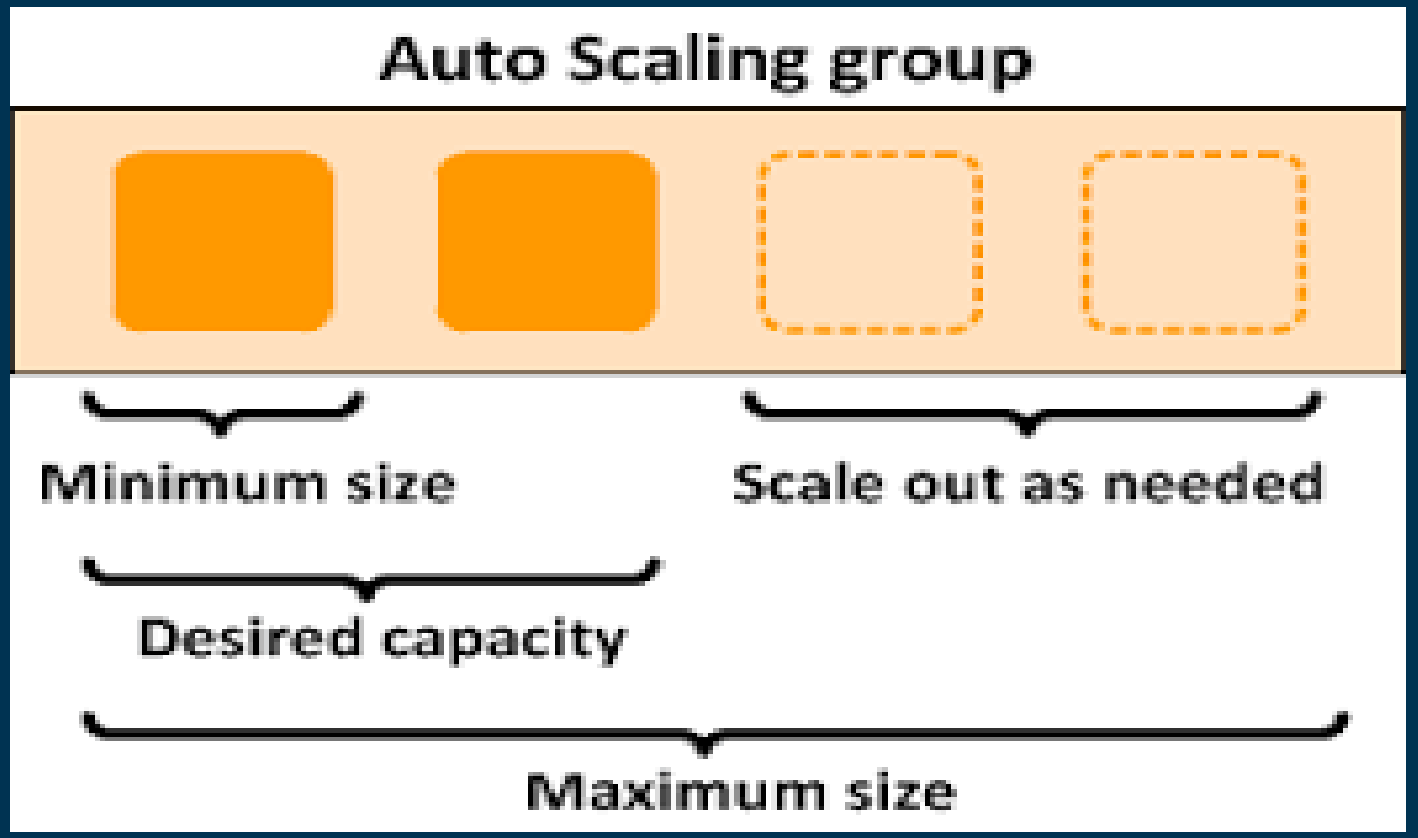
Auto Scaling Groups

Auto Scaling Groups

- It is a service used to create new server while traffic increase and decrease as our needed.

- Ensure the right amount of capacity to handle the current traffic demand.

Overview of Auto scaling groups



Billing alerts in cloud

Billing alerts

- This feature helps to prevent from unexpected billing.
- We can setup a billing alarm while the limit of free tier may overload without our knowledge, suddenly it sends a notification to our email.
- This features is mainly used in all cloud platform.

Cloud Storage

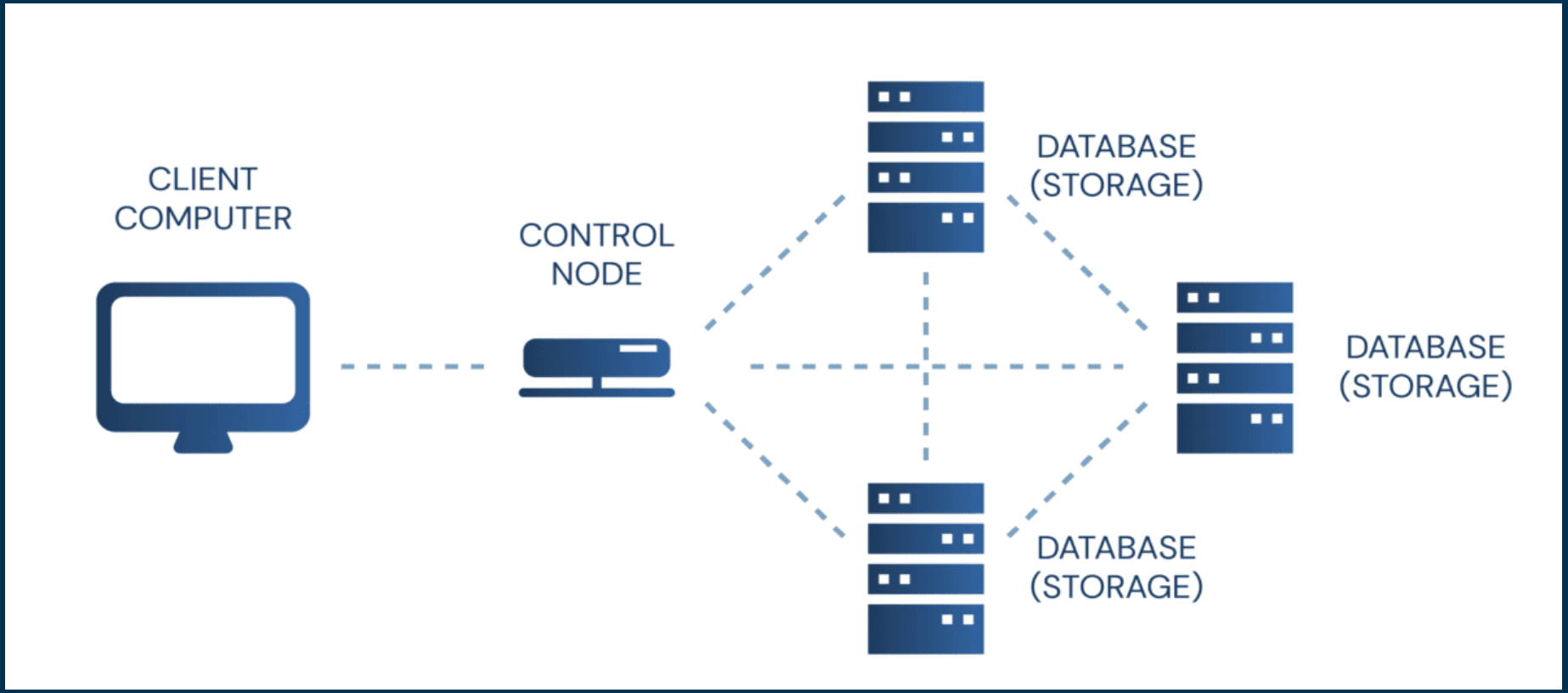
Cloud storage

- Cloud storage is a service model in which data is transmitted and stored on a remote storage systems, where it is maintained, secured and backup all are available to the user over the internet.

- Users generally pay for their usage of cloud data storage on a pay as use and monthly rate also.

- User data is maintain and secure by the cloud providers.

Overview of Cloud Storage



AWS

Amazon Web Service

Amazon web service (AWS)

- Aws is a evolving cloud computing platform provided by amazon. It includes a mixture of (IAAS , PAAS, SAAS).
- Aws offers tools such as compute power, database storage and content delivery services.
- Aws offers Pay-As-You-Go model to the customers for pay only for what the resource they use.

Aws Global Infrastructure

Aws Global infrastructure

- Global infrastructure is a region around the world in which aws is based.
- AWS provides 200+ services in globally.
- Global cloud infrastructure consists of Availability zones, Regions and edge networks.
- Aws global infrastructure is the most secure , extensive and reliable cloud platform in the current industry and offers many services.

Overview of AWS Global Infrastructure

Regions and Availability Zones

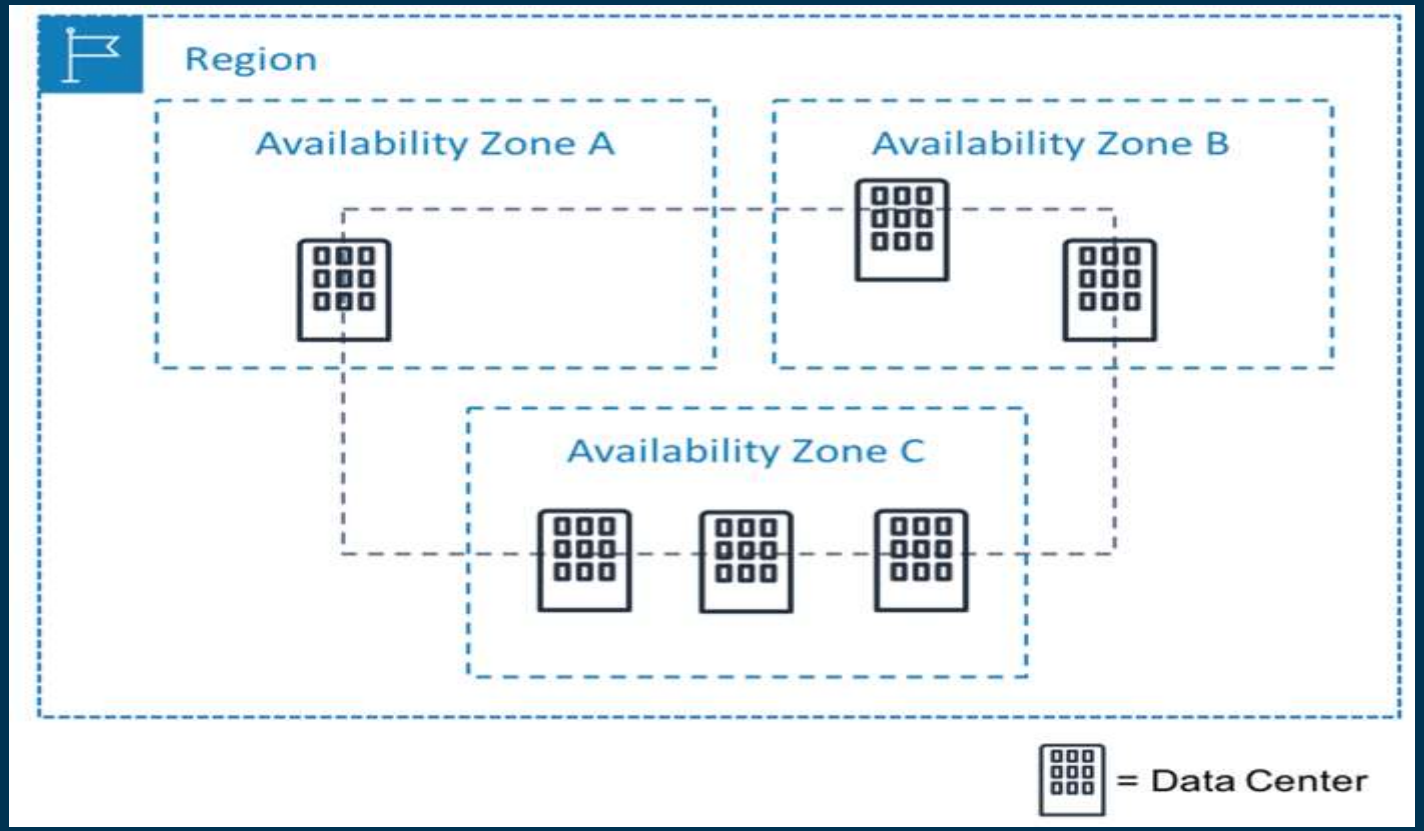
Regions

- Aws region is a cluster of data centers in a specific geographic area , such as the northeastern united states or western europe.
- Aws have 33 active geographic regions.
- We can choose our nearby region to access our data quickly.
- Each regions have multiple availability zones to store and access the data like (Asia pacific) ap-south-1a zone, ap-south-1b zone.

Availability Zones (AZ)

- An AZ is a standalone data center or set of data centers within a Region.
- Each AZ operates independently, so a failure in one won’t affect others.
- Aws have 105 active Availability Zones.

Overview of regions and AZs



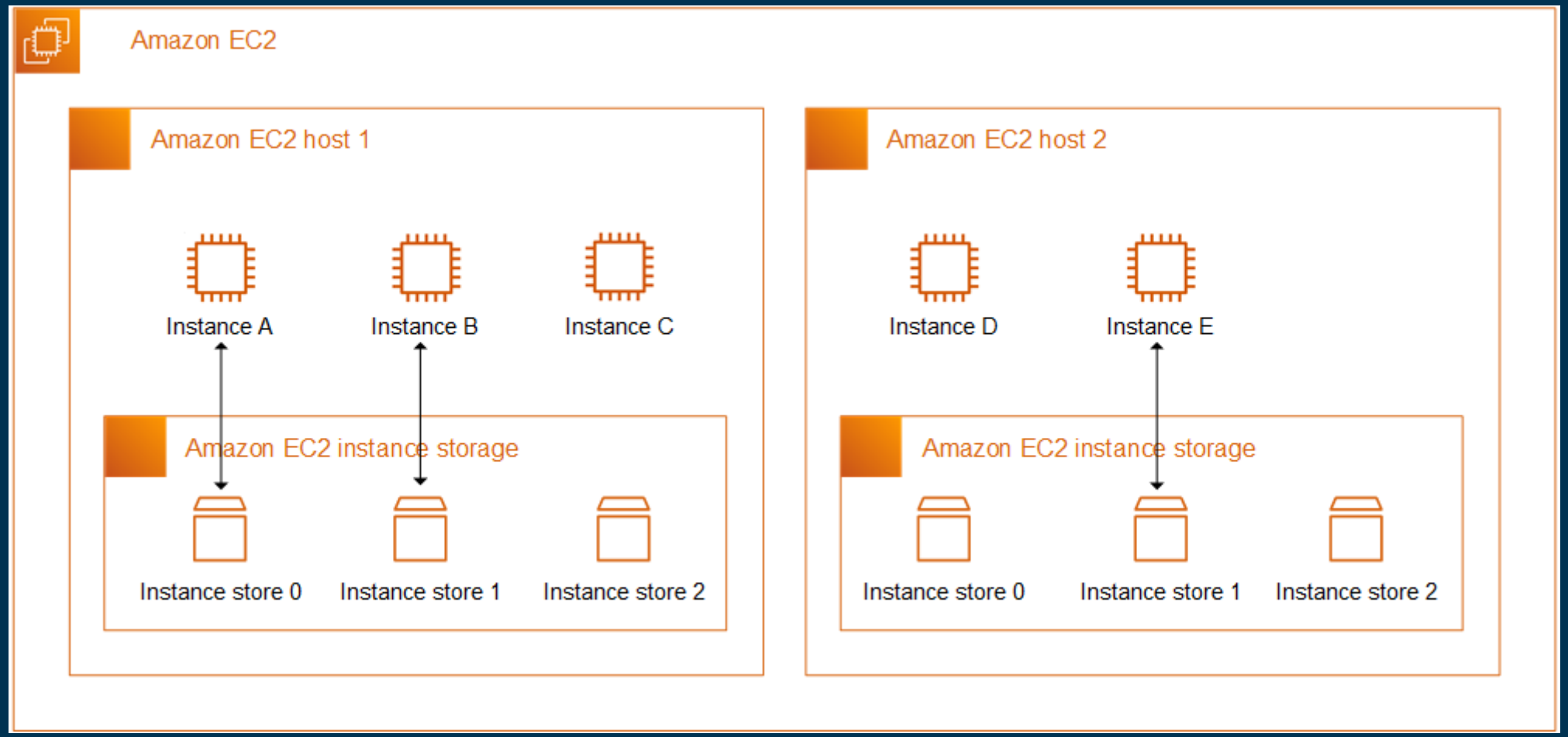
Amazon EC2

Amazon Elastic Compute cloud service

Amazon EC2 instance

- It is a famous service provided by Aws.
- Instance is nothing but a virtual machine.
- EC2 instance is a web service that provides virtual machine with custom specs like OS, CPU RAM, storage, security groups and also handle user data.

Overview of EC2 instance



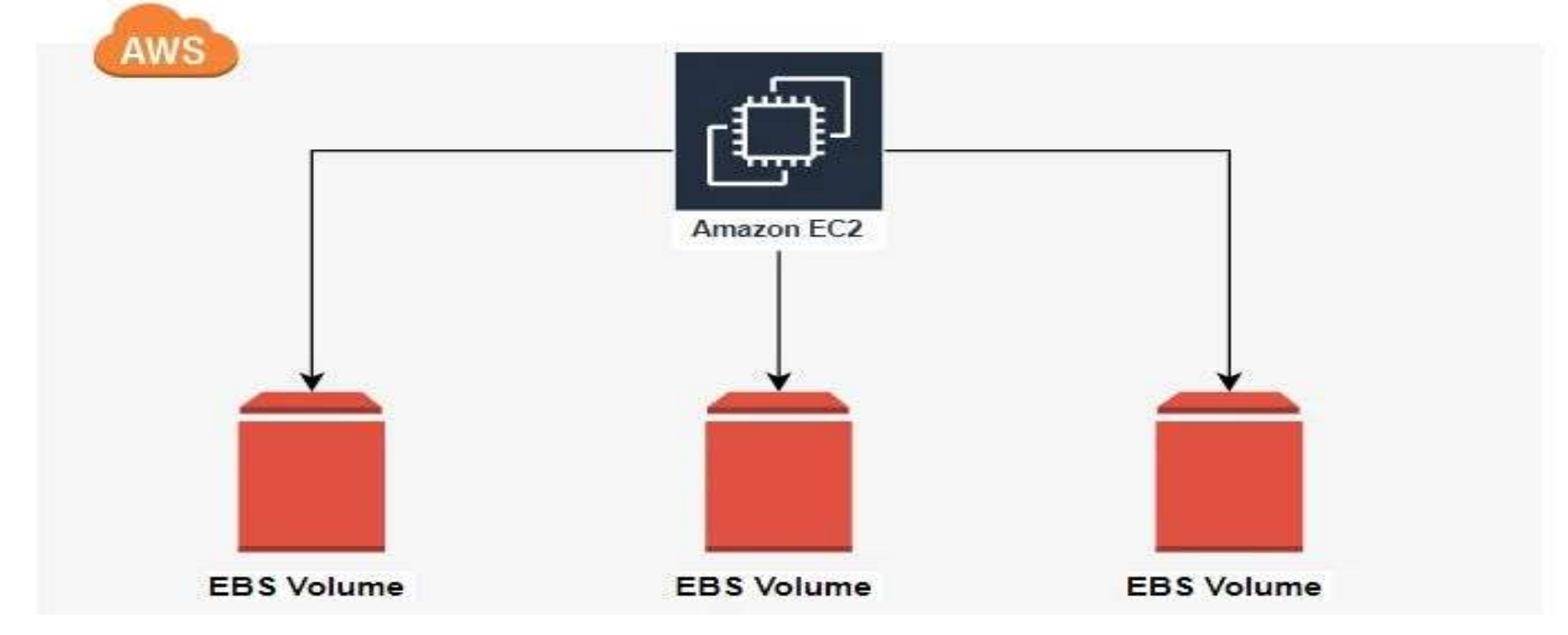
EBS

Elastic Block Store

Elastic block store

- Ebs is a block level storage that allows you to create a storage space and attach them into the Amazon EC2 instance.
- We can add persistent disk like extra hard disk for storage at the run time of a instance, this process does not affects the instance speed.
- Ebs can only be used in one instances.
- More ebs volumes can be attached to a single instances. But one ebs volume cannot be attached to multiple instances.

Overview of EBS

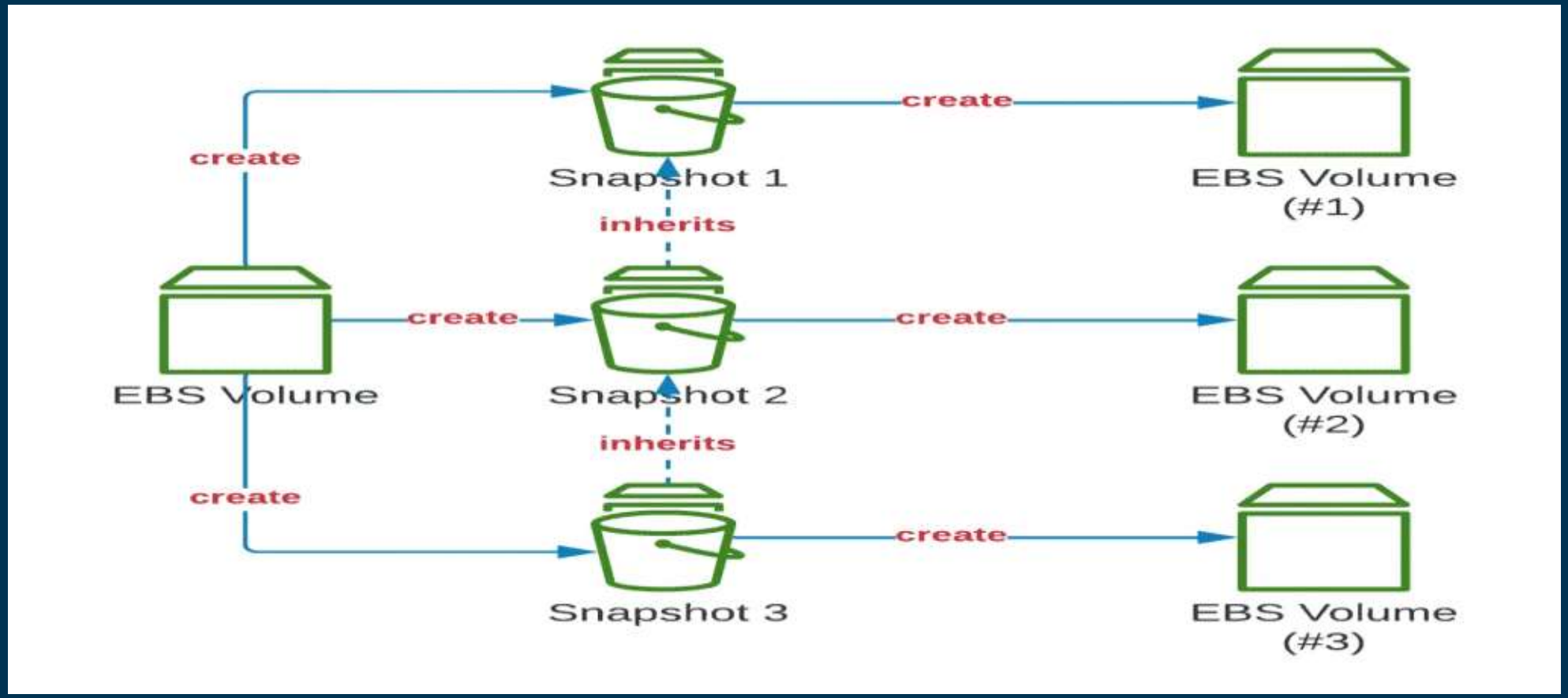


AWS Snapshots

AWS Snapshots

- AWS snapshots for amazon EBS volume provides aws users with a way to create backup copies of the data.
- It is used when disaster recovery, Data migration etc.
- When we create a snapshot copy from the original ebs, the duplicate one contains the extact data of the original ebs.

Overview of AWS snapshots



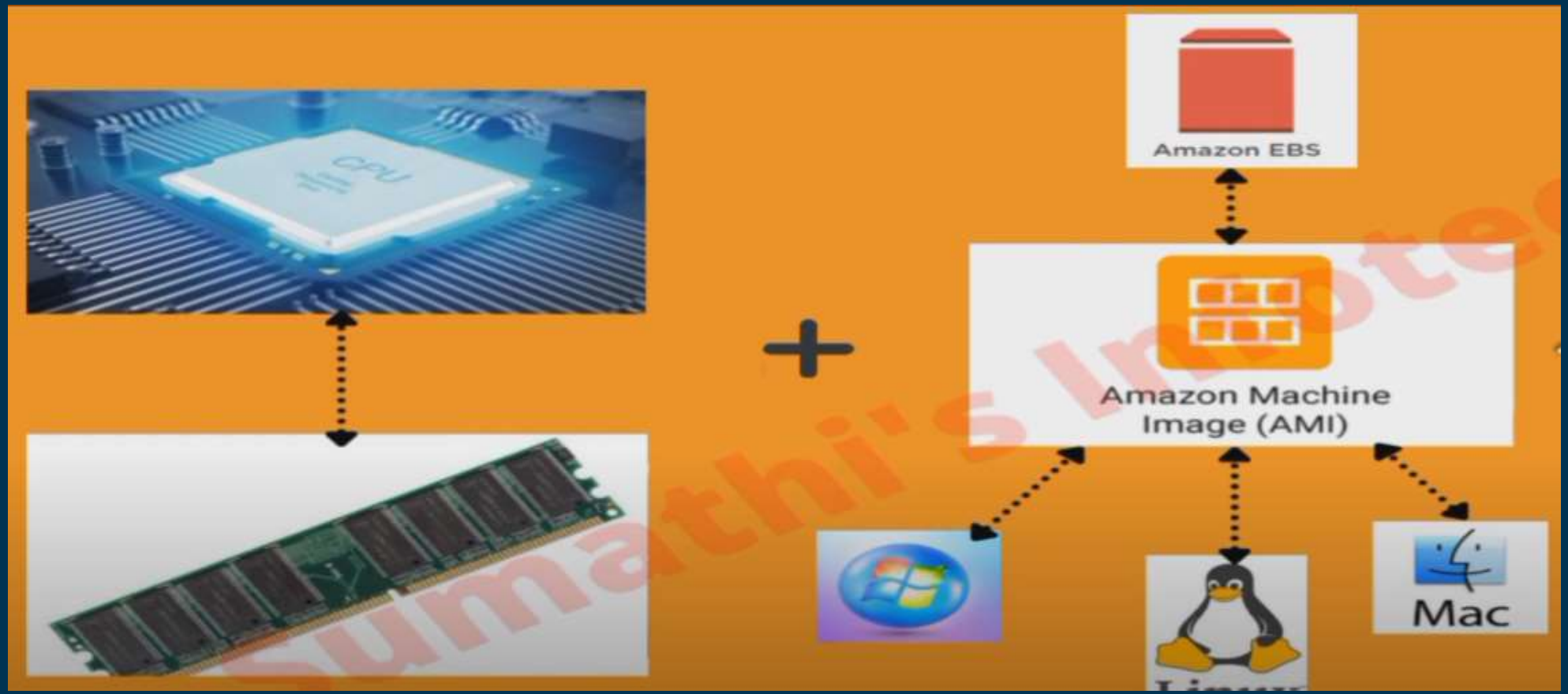
AMI

Amazon Machine image

Amazon machine image

- To launch a virtual machine in aws environment must to choose the AMI configurations.
- Combination of os, ebs, networking and other specs called AMI.
- Ami is a master image easy to share with other instances and easy to create multiple instance with same config.

Overview of AMI



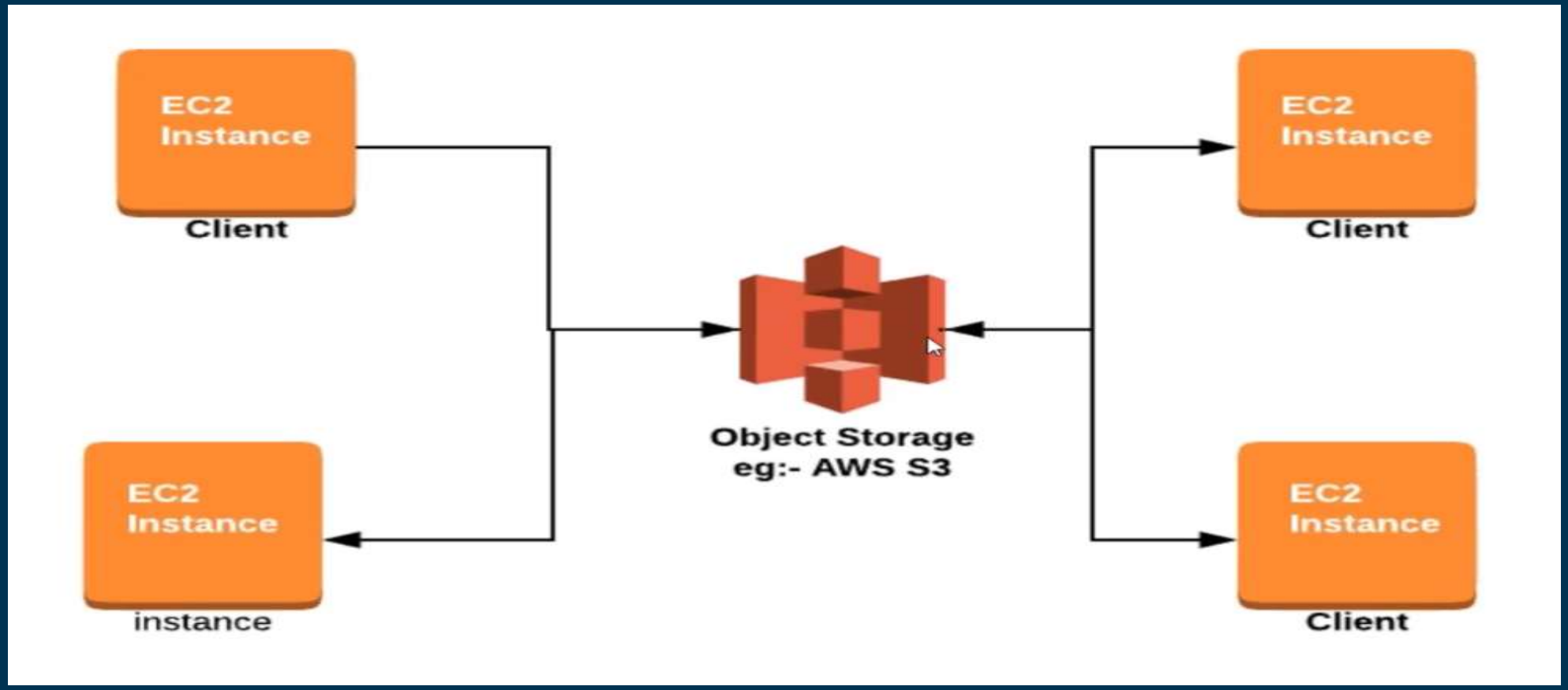
S3

Simple Storage Service

Simple storage service

- It is one of the main storage building blocks of aws.
- Object level storage services
- Infinitely scaling storage
- S3 is safe place to store our files
- Many websites use this as a backbone
- Recommended for storing static content such as files, doc, audio, video , log files and compressed files.
- S3 have a feature called s3 bucket allows user to store objects like files and directories.
- Buckets must have a globally unique name.

Overview of S3



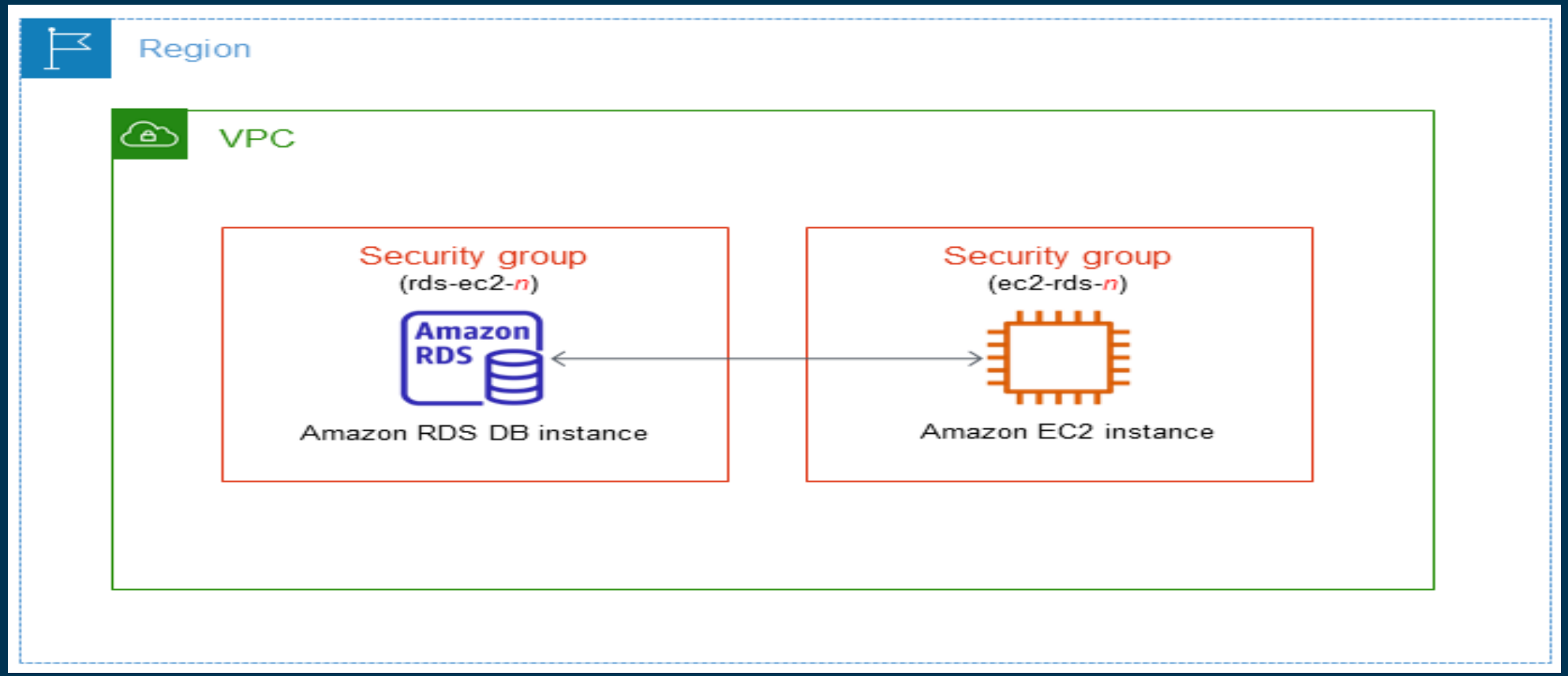
RDS

Relational Database Services

Relational database services

- It is a Platform as a Service model (PaaS).
- User mainly use sql query to handle the database.
- It is simple to set up, operate, and scale up and down when on-demand.
- Automically database backups
- Supporting DB like
- Postgresql
- Mysql
- MariaDB
- Microsoft sql server
- Auroura

Overview of RDS



Microsoft Azure

Microsoft Azure

- Azure is a Microsoft’s public cloud platform. Azure offers a large collection of services, which includes services like iaas, paas, saas and offers serverless relational databases such as Azure sql and NoSql.

- Azure is a best cost effective option to handle smaller workloads.

- It is mainly used as a platform for hosting databases in the cloud.

Azure Global Infrastructure

Azure Global infrastructure

- Azure global infrastructure is built on two key components, a physical infrastructure and connective networking components.
- Physical infrastructure consists of physical data centers helps to store the data.
- Networking components connects all the azure data centers with each other with high speed and high availability.

Overview of AZ Global Infrastructure

Regions and Availability Zones

Regions

- Azure region is made up of data centers in a specific geographic area.
- Azure have more than 60 active geographic regions.
- Each regions have multiple availability zones to store and access the data like west US, east US.

Availability Zones (AZ)

- An AZ is a standalone data center or set of data centers within a Region.

- Azure have more than 160 datacenters in worldwide.

Overview of regions and AZs

Azure Management Hierarchy

Azure Management Hierarchy

The Azure hierarchy is a structured model that helps to organize and manage the Azure resources.

There are five levels in this model

- Tenant
- Management groups
- Subscriptions
- Resource groups
- Resources

Tenant

- Tenant means a single user account that may be a person, company or organization.
- It is the main thing used to enter into the azure environment namely azure active directory.
- It is place at the head of the azure management hierarchy.

Management Groups

- Management groups is a important thing in the hierarchy.
- It is like a container that contains all your subscriptions.
- Organizations have multiple management groups to handle the subscriptions.

Subscriptions

- Subscription is a container that holds a collection of resource group.
- We can creates multiple subscriptions like dev subscription, tester subscription etc.
- We can use many resources within a subscription and pay for all as subscription charge.

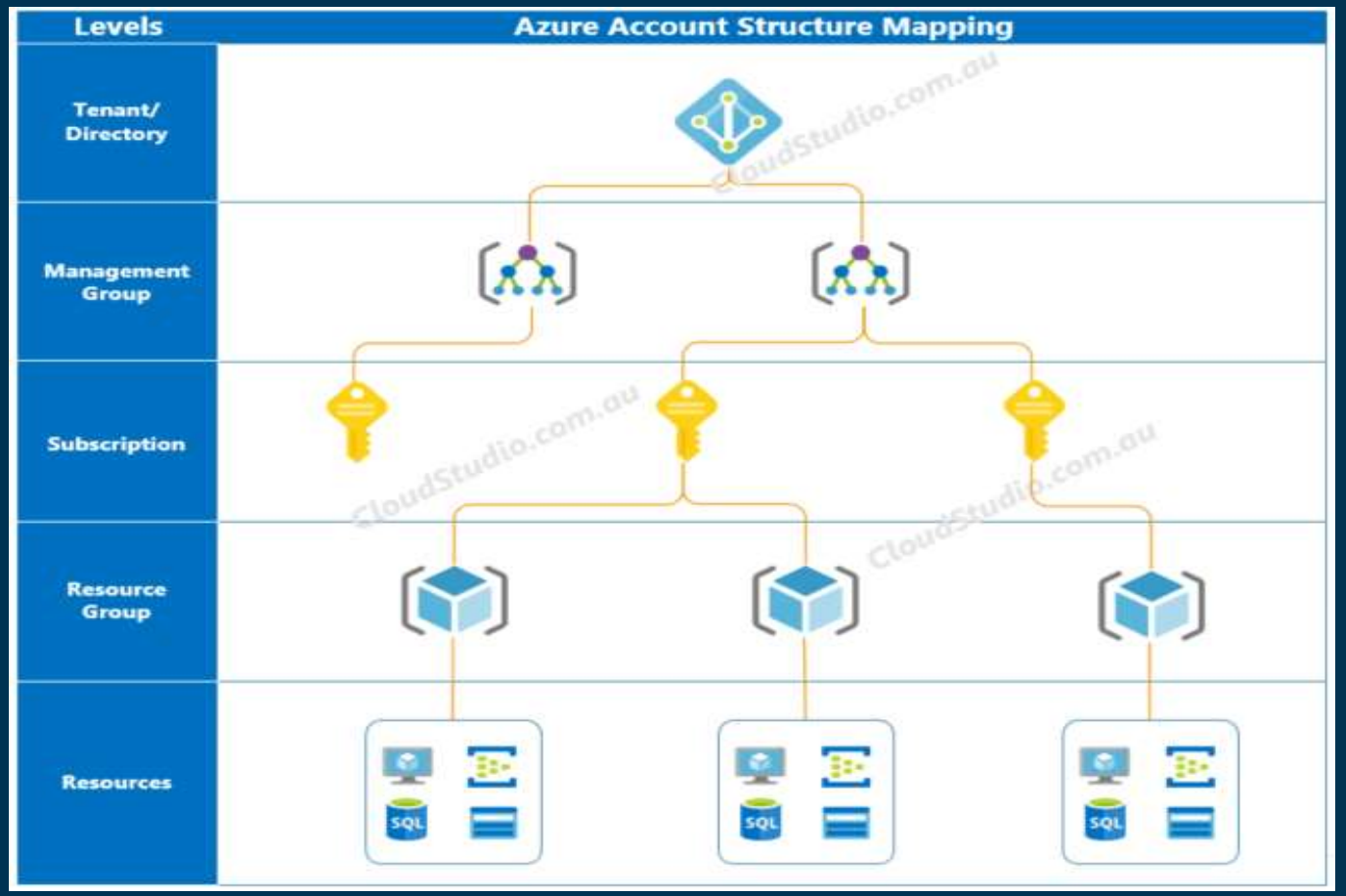
Resource group

- Azure resource group is the collection of resources.
- It helps to organize, manage, and monitor our resources.
- We can creates multiple resources within a resource group.

Resources

- Resources means items or services provided by Microsoft azure.
- Resources like virtual machine, storage, virtual networks etc.
- It is useful to deploy, manage and update our applications.

Overview of Azure Hierarchy

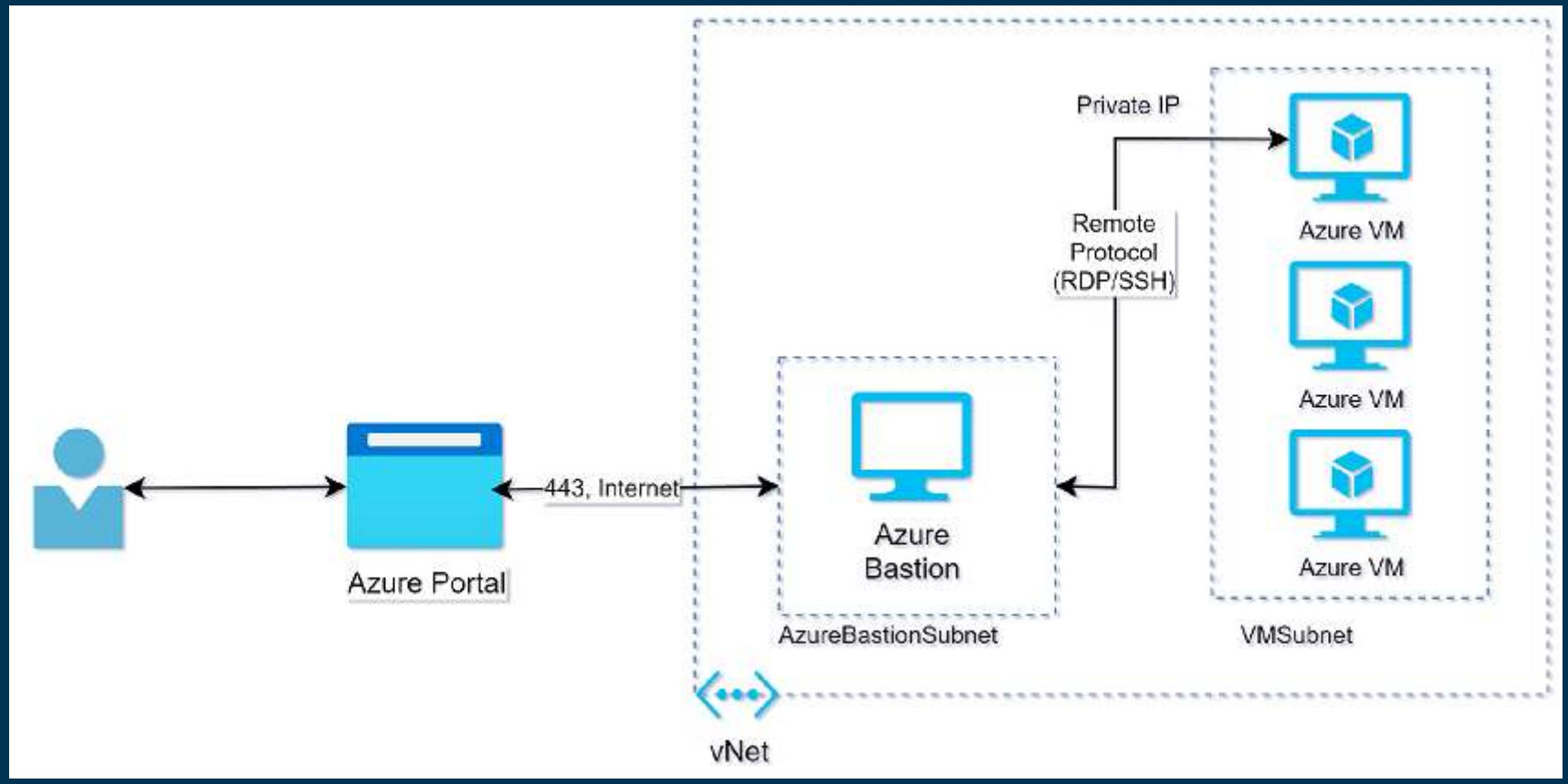


Azure Bastion

Azure Bastion

- It is a Platform as a Service model.
- Azure Bastion is a fully managed service that provides more secure with remote desktop protocol and secure shell protocol used to access the virtual machine without any exposure of public IP addresses.
- It provides a secure way to access the virtual machine within a virtual network via the private IP address.

Overview of Azure Bastion



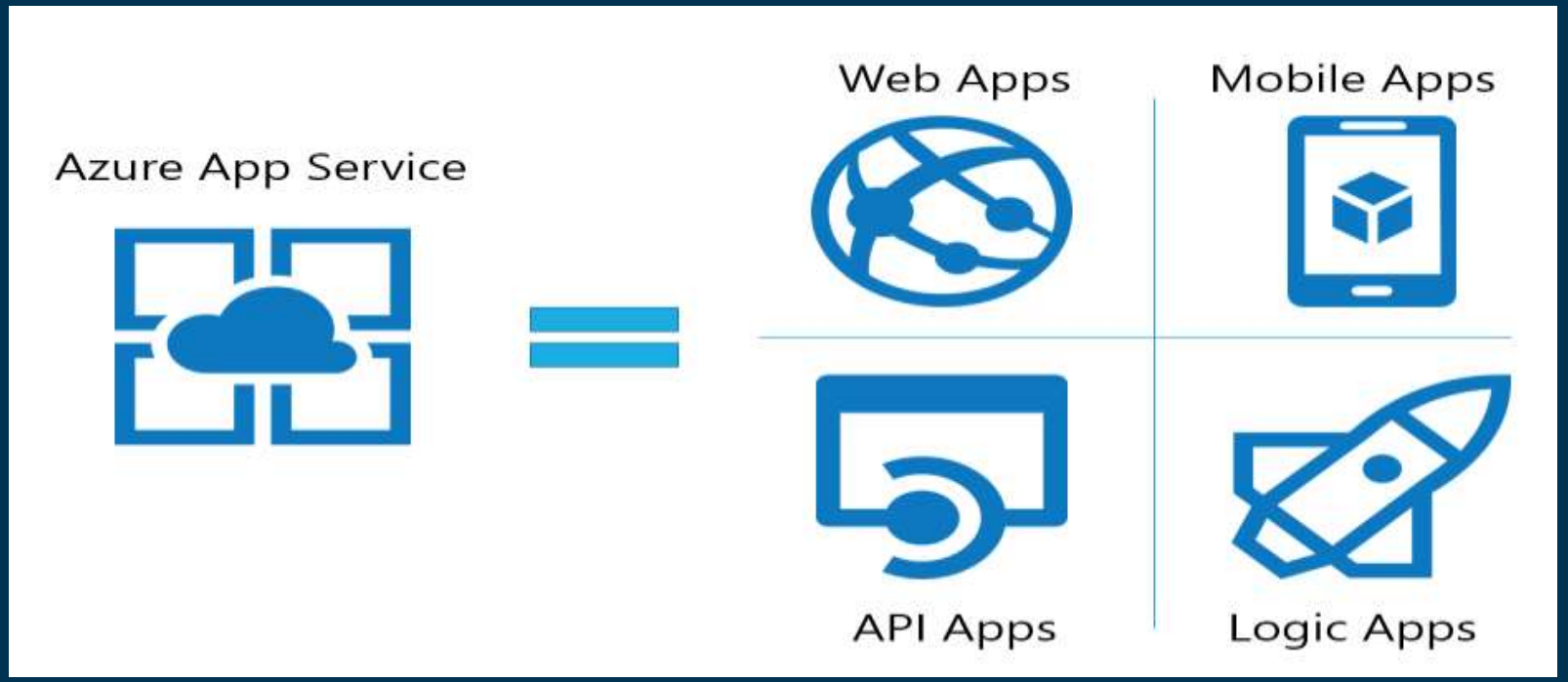
Azure App Service

Azure app service

- App services is a platform as a service model offering by Microsoft.

- we use it to build or host web applications, API apps and other backend services for mobile applications without managing infrastructure.

Overview of Azure app service



Azure storage platform

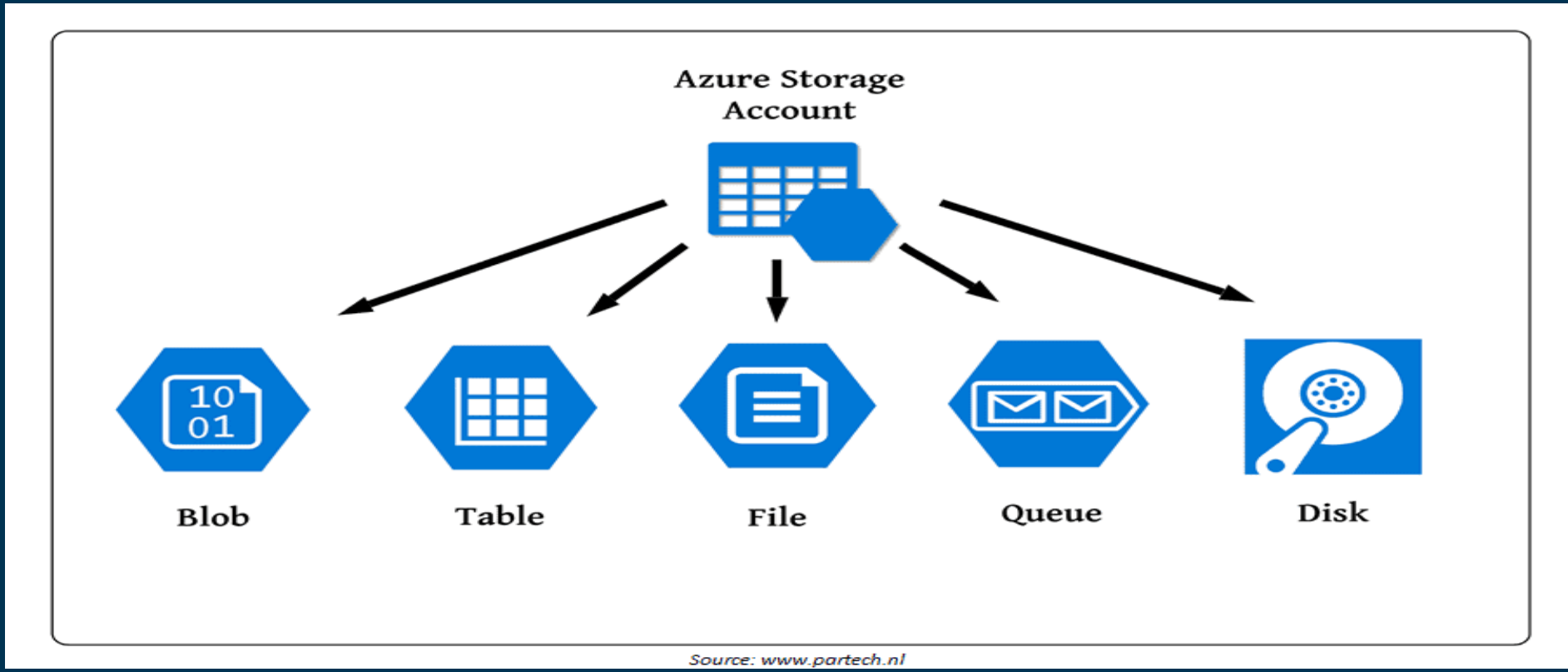
Azure storage platform

- Azure storage is a cloud storage solution delivered by Microsoft that enables you to store and access data in the cloud.

- It offers highly availability, massive scalable and storage as five different storage types like **file, blob**, **queue**, **table** and **disk**.

- Data storage objects are accessed by several programming languages like .Net, python and java.

Overview of Azure Storage



Source: www.partech.nl

GCP

Google Cloud Platform

Google Cloud Platform

- Google cloud is a cloud computing platform offers by google.
- It provides a wide of range of services, including computing power, storage, databases, machine learning, networking, and all delivered over the internet.
- GCP enables businesses to build, deploy, and scale applications and services with quick and efficiently.

GCP Global Infrastructure

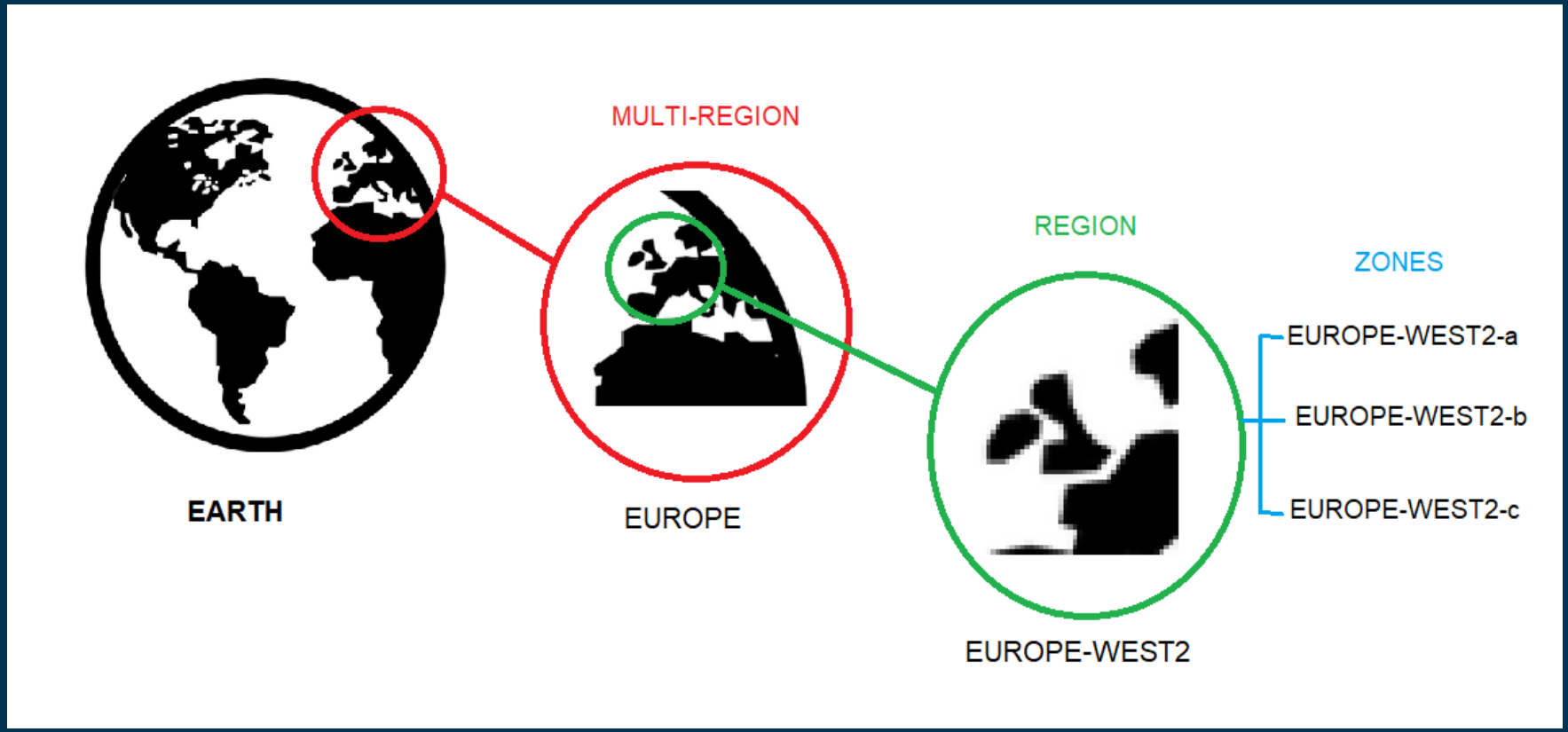
GCP Global infrastructure

- Global infrastructure refers to the global presence of data centers, networks, and cloud services available to the users.

- GCP has 25 regions, 76 zones, 144 edge networks and is available in over 200 countries.

Overview of GCP Global Infrastructure

Overview of regions and AZs

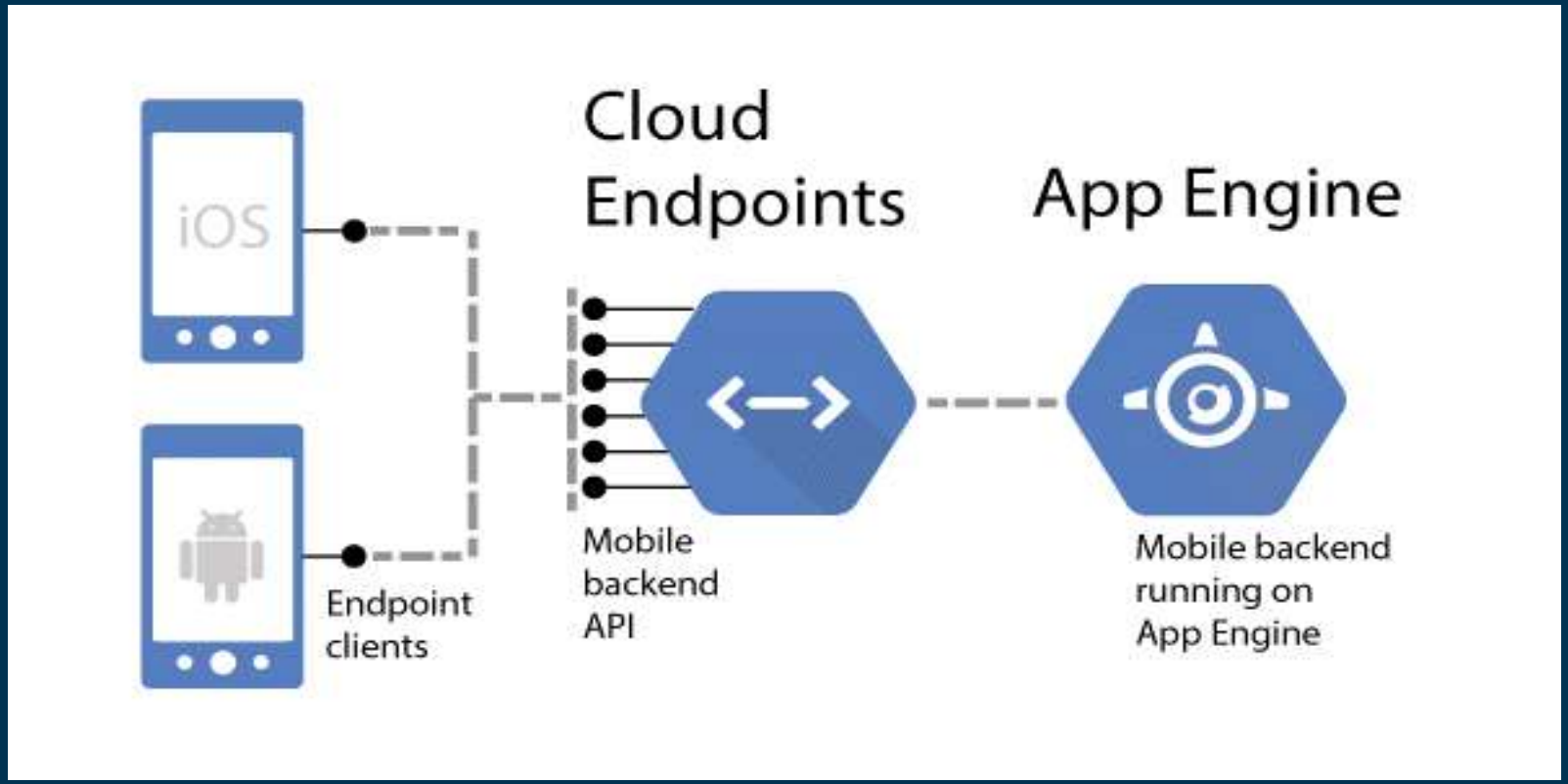


Google App Engine

Google App engine

- It is a PaaS model and fully managed serverless platform for developing and hosting web applications.
- Supporting languages such as GO, PHP, java, python, .Net, Ruby.
- App Engine take care of server configurations and scaling your app instances based on demand.
- Cloud endpoints is useful to connect application backend into app engine via APIs.

Overview of Google App Engine



Google Compute Engine

Google Compute engine

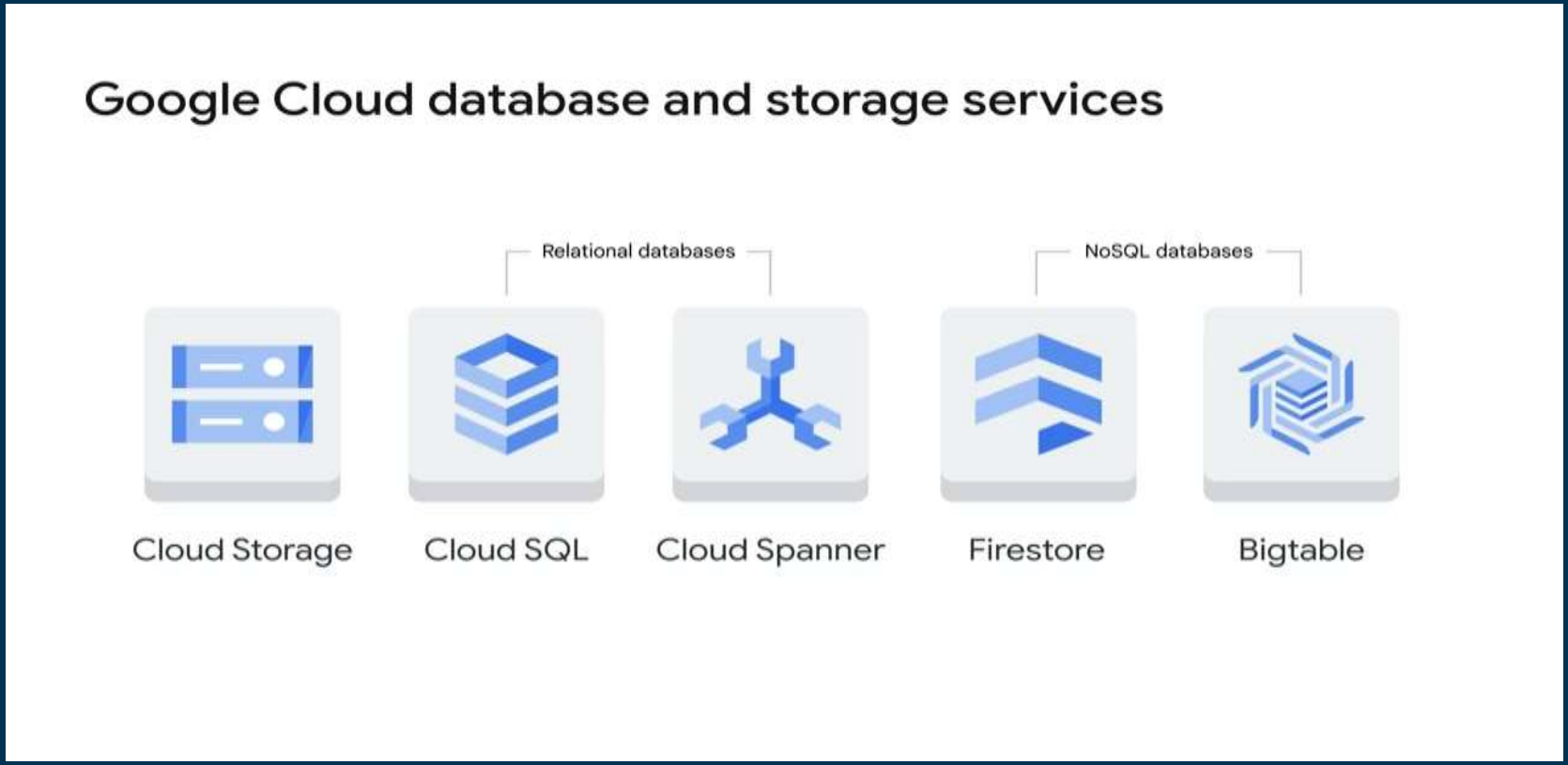
- GCE is a infrastructure as a service model.
- It helps to create and run virtual machines using the google cloud platform console.
- user have to define the server specs, also deploy and manage the application.
- It provide services like VM, cloud storage and cloud sql etc.

Google cloud storage

Google cloud storage

- It is a online file storage web service for storing and accessing data on google cloud platform infrastructure.
- You can add unstructured data objects of any kind and size, and upto 5 TB.
- It have both sql and Nosql services with high performance and scalability of google’s cloud with advance security.
- Buckets are the basic containers that hold your data. Everything that you store in cloud storage must be contained in a bucket.

Overview of Google cloud storage



Cloud SQL

Google cloud sql

- It is a fully managed relational database service
- Supports mysql, postgresQl, and SQL server
- Vertical scalability
- High availability
- Backup and restore
- Strong encryption
- Read replica

Overview of Google Cloud SQL