AWS Free Tier

Gain free, hands-on experience with the AWS platform, products, and services

AWS Regions & Zones

AWS Global Infrastructure

AWS Global Infrastructure

- The AWS Global Cloud Infrastructure is the most secure, extensive, and reliable cloud platform, offering over **175** fully featured services from data centers globally.

- AWS now spans 77 Availability Zones within 24 geographic regions around the world, and has announced plans for 15 more Availability Zones and 5 more AWS Regions in India, Indonesia, Japan, Spain, and Switzerland.

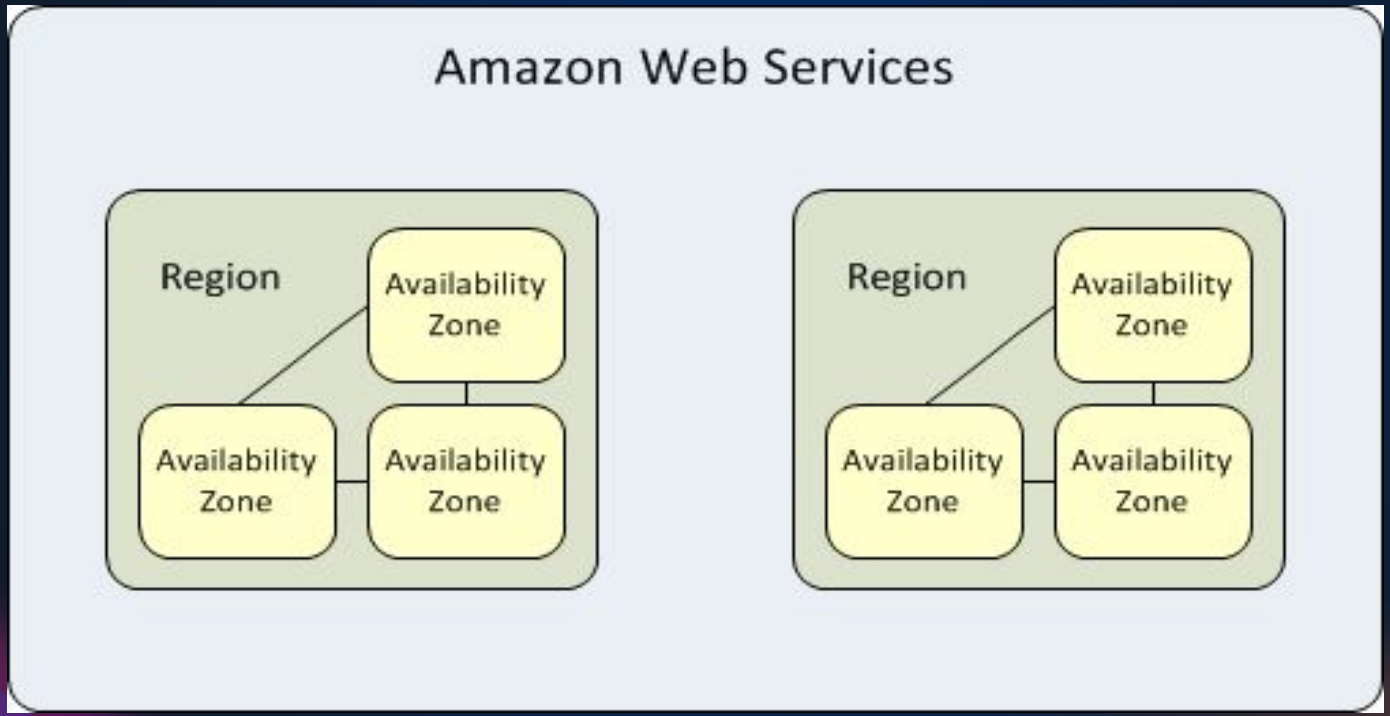
AWS Global Infrastructure

https://infrastructure.aws/

AWS Global Infrastructure

- ★ High Availability Through Multiple Availability Zones
- ★ Improving Continuity With Replication Between Regions
- ★ Meeting Compliance and Data Residency Requirements
- ★ Geographic Expansion

Availability Zones



Availability Zones

- When you launch an instance, you can select an Availability Zone or let us choose one for you.

- If you distribute your instances across multiple Availability Zones and one instance fails, you can design your application so that an instance in another Availability Zone can handle requests.

What is IAM?

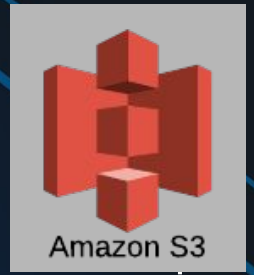
Securely control access to AWS resources

IAM Features

- Shared access to your AWS account
- Granular Permission
- Multi-factor authentication (MFA)
- IAM Roles
- Identity federation
- Free to use

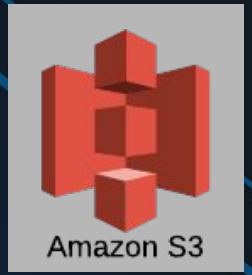
https://docs.aws.amazon.com/IAM/latest/UserGuide/introduction.html

What is S3?



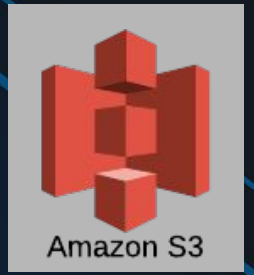
Simple storage service

What is S3?



- Amazon Simple Storage Service (Amazon S3) is storage for the internet. You can use Amazon S3 to store and retrieve any amount of data at any time, from anywhere on the web.

S3 Basics

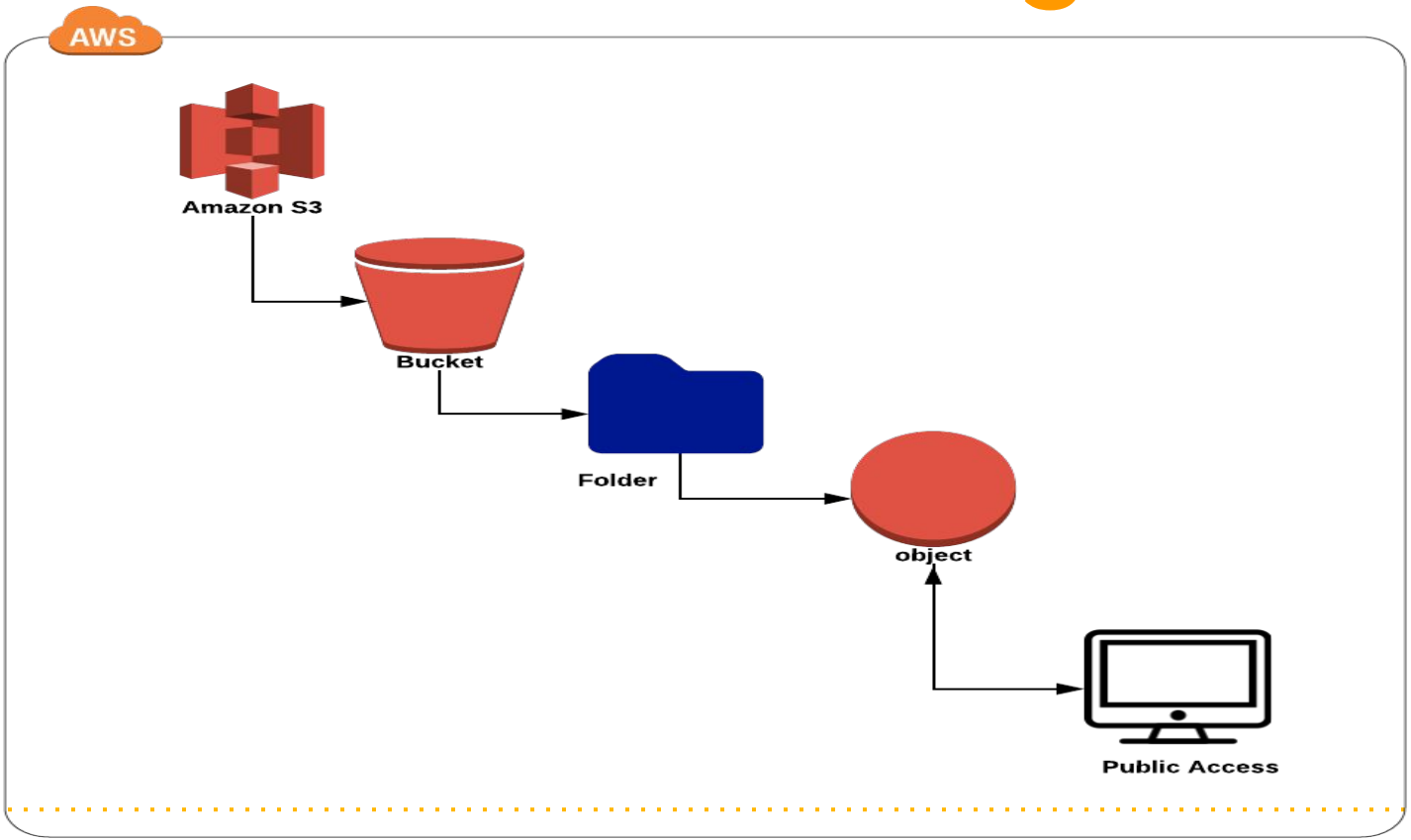


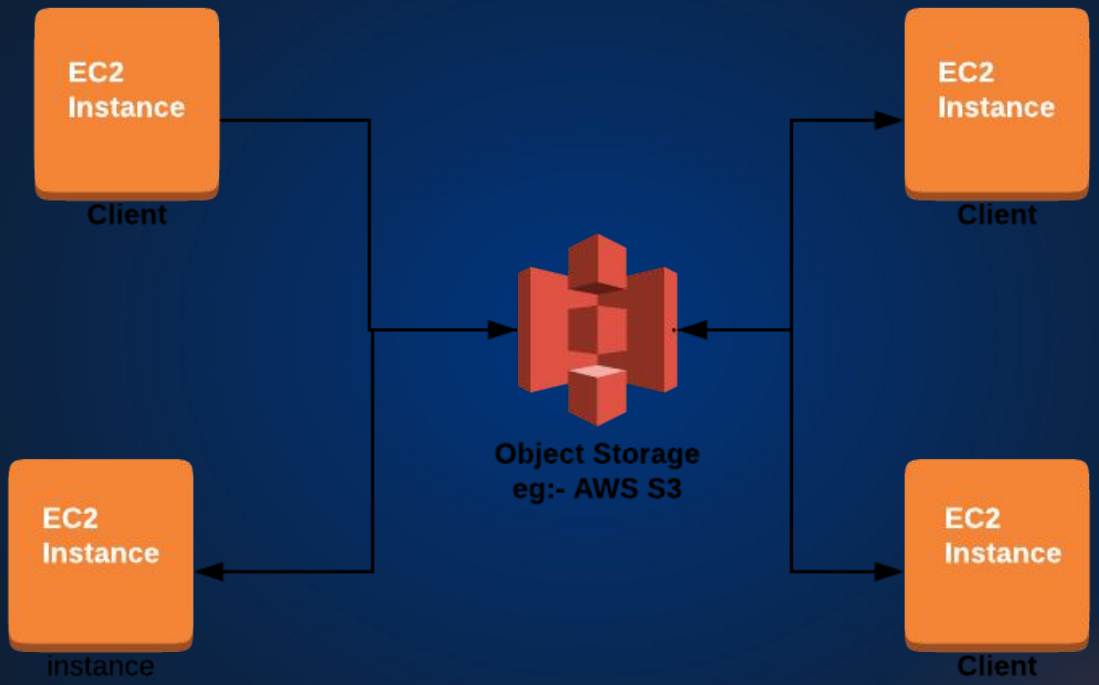
- It is Object-Based Storage
- Data is replicated across multiple facilities
- Unlimited Storage
- Amazon S3 stores data as **objects** within **buckets**
- **Bucket name has to be unique**

A bucket is a logical unit of storage in Amazon Web Services (AWS).

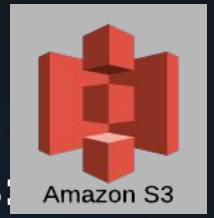
Object Storage is a computer data storage architecture that manages data as Objects.

Creation of S3




EC2
Instance
Client
EC2
Instance
Client
Object Storage
eg:- AWS S3
EC2
Instance
instance
EC2
Instance
Client

S3 Storage Classes



1 S3 Standard:

general-purpose storage of frequently accessed data. Fast access & object replication in multi AZ.

2 S3 IA– Infrequent Access:

Long-lived, but less frequently accessed data. Slow access, object replication in multi AZ

3 S3 One Zone-IA

is for data that is accessed less frequently, but requires rapid access when needed. Slow access, no object replication.

4 S3 Intelligent Tiering

Automatically moves data to most cost effective tier.

S3 Storage Classes

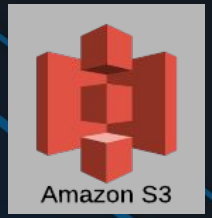
5 S3 Glacier:

Low Cost Storage class for data Archiving.

6 S3 Glacier Deep Archive

Lowest cost storage, retrieval time of 12 Hrs.

Lifecycle Policies



	S3 Standard	S3 Intelligent-Tiering*	S3 Standard-IA	S3 One Zone-IA†	S3 Glacier	S3 Glacier Deep Archive
Designed for durability	99.999999999% (11 9's)	99.999999999% (11 9's)	99.999999999% (11 9's)	99.999999999% (11 9's)	99.999999999% (11 9's)	99.999999999% (11 9's)
Designed for availability	99.99%	99.9%	99.9%	99.5%	99.99%	99.99%
Availability SLA	99.9%	99%	99%	99%	99.9%	99.9%
Availability Zones	≥3	≥3	≥3	1	≥3	≥3
Minimum capacity charge per object	N/A	N/A	128KB	128KB	40KB	40KB
Minimum storage duration charge	N/A	30 days	30 days	30 days	90 days	180 days
Retrieval fee	N/A	N/A	per GB retrieved	per GB retrieved	per GB retrieved	per GB retrieved
First byte latency	milliseconds	milliseconds	milliseconds	milliseconds	select minutes or hours	select hours
Storage type	Object	Object	Object	Object	Object	Object
Lifecycle transitions	Yes	Yes	Yes	Yes	Yes	Yes

S3 Charges

- Storage
- Requests
- Tiers
- Data Transfer
- Region Replication

What is EC2 ?

EC2 Features

- EC2 provides web services API for provisioning, managing, and deprovisioning virtual servers inside amazon cloud.
- Ease In Scaling Up/Down
- Pay only for what you use
- Can be integrated into several other services

Ec2 Pricing

1 On Demand

Pay per hour or seconds.

2 Reserved

Reserve Capacity(1 or 3 yrs) for discounts.

3 Spot

Bid your price for unused ec2 capacity.

4 Dedicated Hosts

Physical Server dedicated for you.

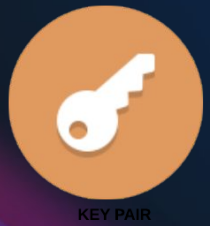
Amazon Machine Image (AMI) provides the information required to launch an instance, which is a virtual server in the cloud.

When you launch an instance, the instance type that you specify determines the hardware of the host computer used for your instance

Amazon EC2 provides you with flexible, cost effective, and easy-to-use data storage options for your instances.

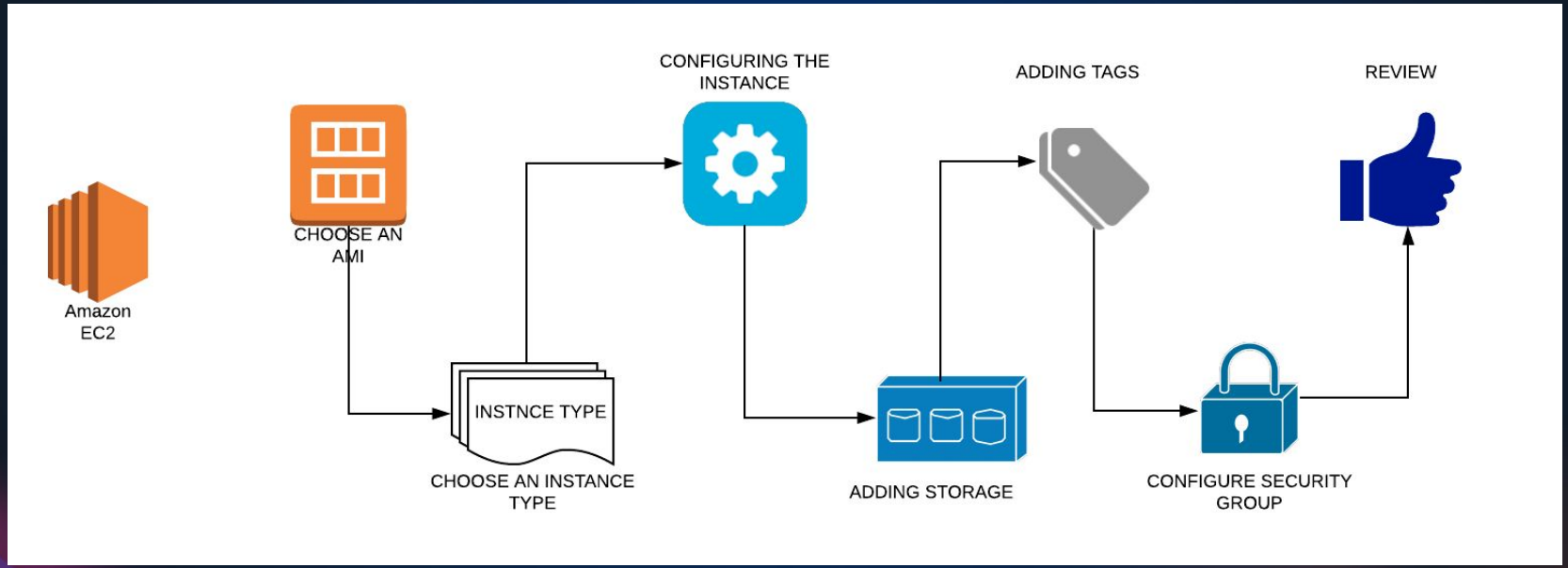
Tag is a simple label consisting of a customer-defined key and an optional value that can make it easier to manage, search for, and filter resources.

A security group acts as a virtual firewall that controls the traffic for one or more instances



Amazon EC2 uses public–key cryptography to encrypt and decrypt login information.

Creation of EC2 Instance



EC2 instance creation

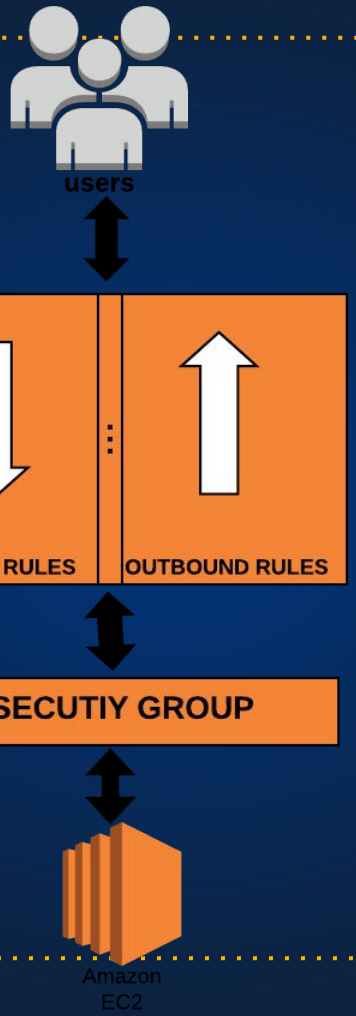
1. Key pairs
2. Security Group
3. Instance Launch

Security Group

Security Groups

- A security group acts as a virtual firewall that controls the traffic for one or more instances.
- You can add rules to each security group that allow traffic to or from its associated instances
- Security groups are "stateful".

Firewall is a network security system that monitors and controls incoming and outgoing network traffic.



Inbound :- Traffic coming from outside on the Instance

Outbound:- Traffic going from Instance to outside

Requirement Gathering

1. Toolplate website
2. OS
   a. Centos
3. Size => Ram, CPU, Network etc
   a. Min
4. Storage size
   a. 5 gigs for web server images
5. Project
6. Services/Apps Running
   a. SSH, Http, Mysql etc
7. Environment (Dev, QA, Staging, Prod)
8. Login User/ Owner

EBS (Elastic Block Storage)

ELASTIC BLOCK STORAGE

- Block based storage
- Runs ec2 OS, store data from db, file data, etc
- Placed in specific AZ. Automatically replicated within the AZ to protect from failure.
- Snapshot is backup of a volume

EBS Types

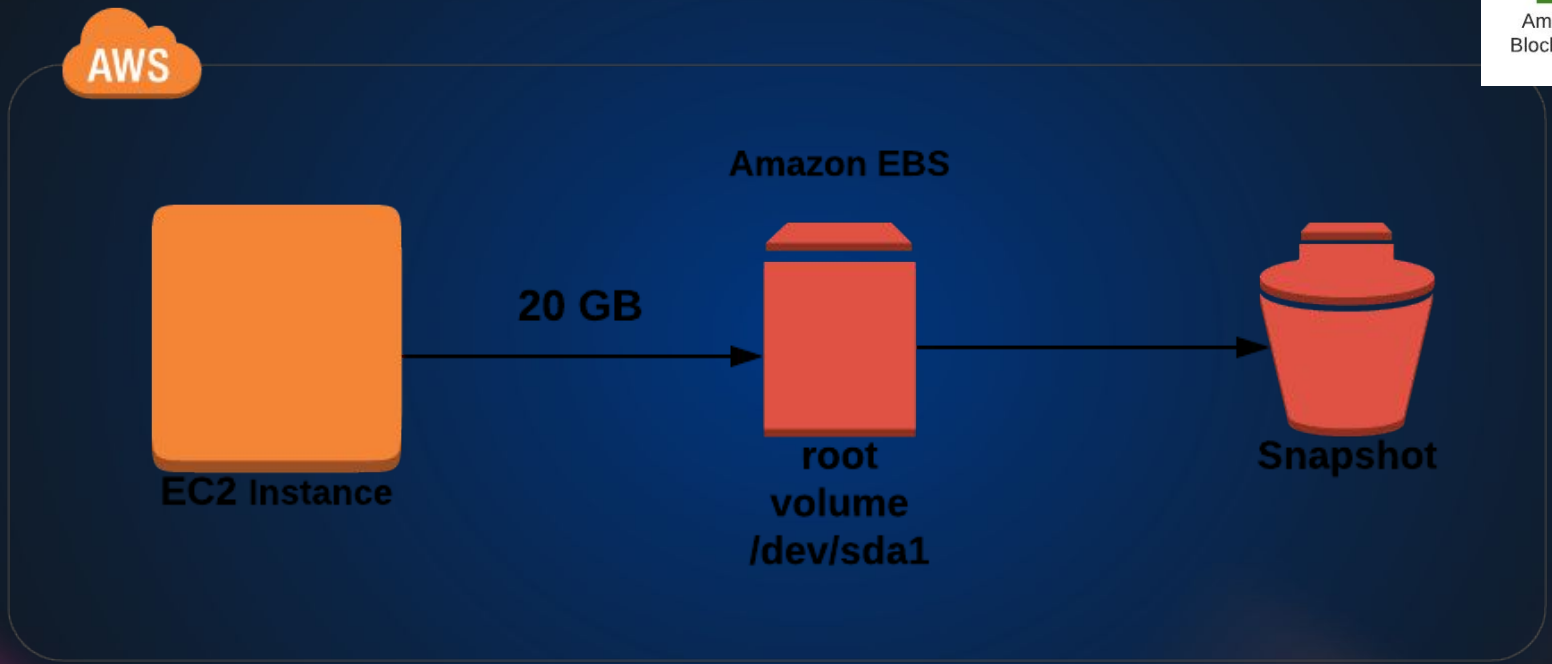
- General Purpose (SSD)
  - Most Work Loads
- Provisioned IOPS
  - Large Databases
- Throughput Optimized HD
  - Big Data & Data Warehouses
- Cold HDD
  - File Servers
- Magnetic
  - Backups & Archives

Snapshot Backup & Restore

- Unmount partition
- Detach volume
- Create new volume from snapshot
- Attach the volume created from snapshot
- Mount it back

Snapshot Use Cases

- Backup & Restore
- Size Change
- Volume type change
- Copy Volume to different zone
- Move Snap to different region
- Share it with other AWS accounts.



Amazon Elastic
Block Store (EBS)

ELASTIC LOAD BALANCER

Clusters

- Cluster of servers needs Endpoints
- Endpoints are usually of a Load Balancer
- Load Balancer balances incoming traffic to backend servers

LOAD BALANCER Ports

- Frontend Port: Listens from the User Requests on this port AKA Listeners.
  - e:g 80, 443, 25 etc
- Backend Ports: Services running on OS listening on this port
  - e:g 80, 443, 8080 etc

ELASTIC LOAD BALANCER

- Elastic Load Balancing distributes incoming application or network traffic across multiple targets, such as Amazon EC2 instances, containers, and IP addresses, in multiple Availability Zones.

- Elastic Load Balancing supports three types of load balancers:
  - Application Load Balancer
  - Network Load Balancer
  - Classic Load Balancer
  - Gateway Load Balancer

aws

AWS Load Balancers

1

Classic Load Balancer

2

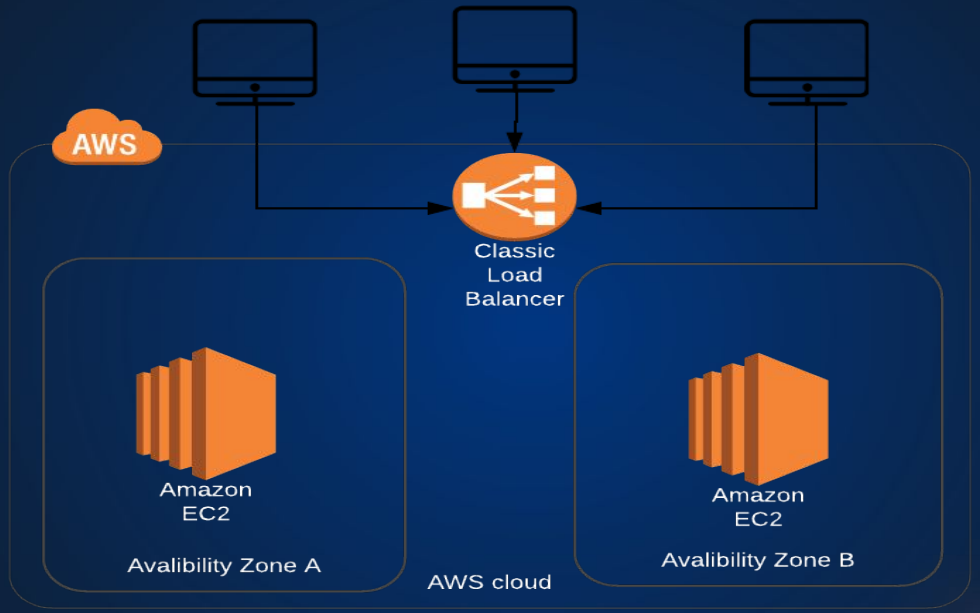
Application Load Balancer

3

Network Load Balancer

CLASSIC LOAD BALANCER

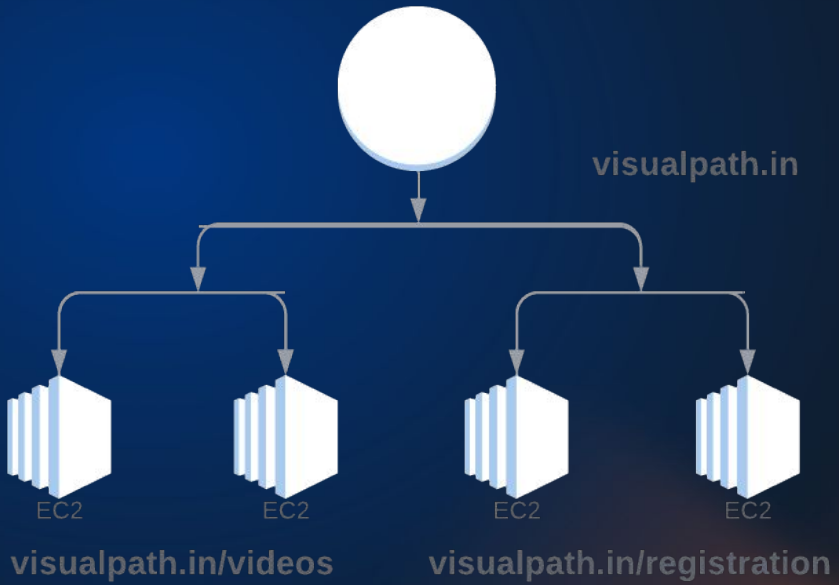
- The Classic Load Balancer that routes traffic based on either application or network level information
- The Classic Load Balancer is ideal for simple load balancing of traffic across multiple EC2 instances



CLASSIC LOAD BALANCER

APPLICATION LOAD BALANCER

- Application Load Balancer that routes traffic based on advanced application level information that includes the content of the request.



NETWORK LOAD BALANCER

- A Network Load Balancer functions at the fourth layer of the Open Systems Interconnection (OSI) model.

- It can handle millions of requests per second.
- Static IP

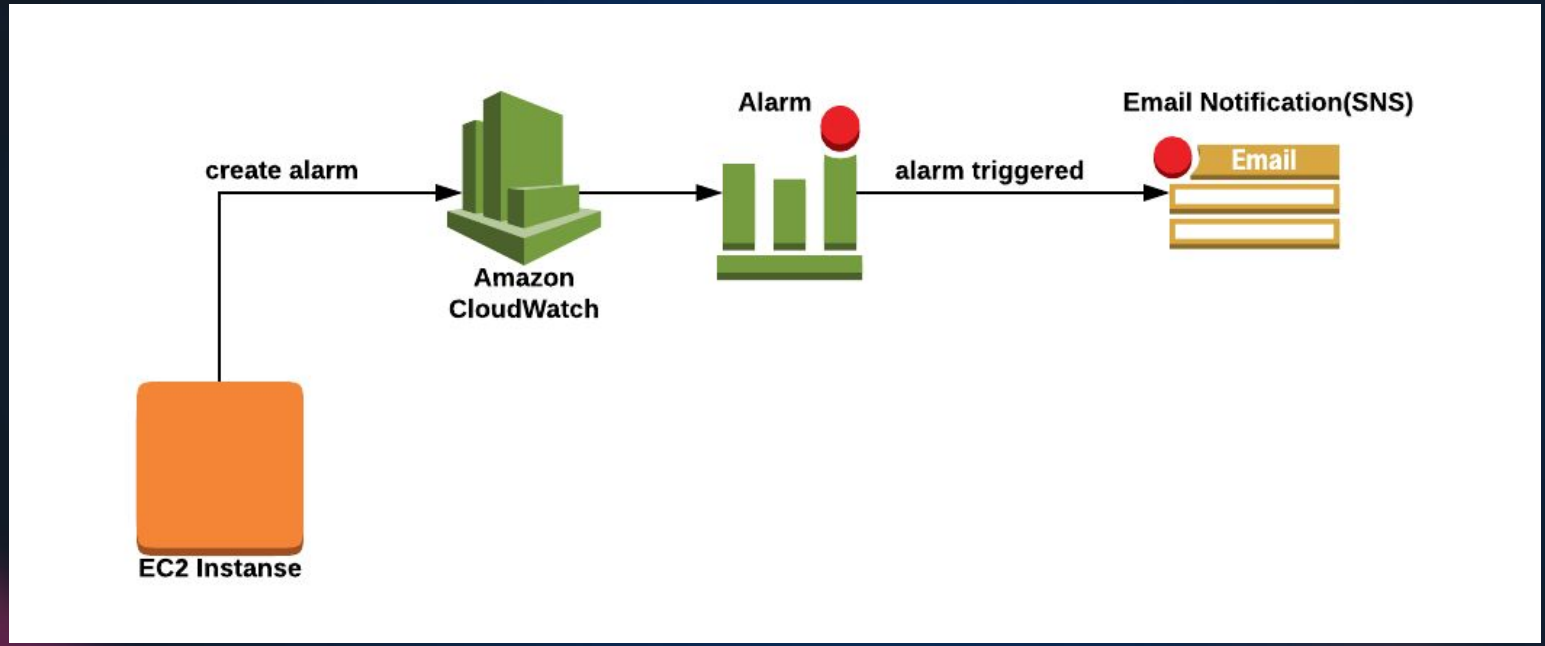
CLOUD WATCH

- Cloud Watch - Monitor performance of AWS environment - standard infrastructure metrics.
- **Metrics:**
  AWS cloud watch allows. you to record metrics for services such as EBS, EC2, ELB, Route53 Health checks, RDS, Amazon S3, cloudfront etc etc...
- **Events:**
  AWS Events delivers a near real-time stream of system events that describe changes in Amazon Web Services (AWS) resources
- **Logs:**
  You can use Amazon CloudWatch Logs to monitor, store, and access your log files from Amazon Elastic Compute Cloud (Amazon EC2) instances, AWS CloudTrail, Route 53, and other sources.

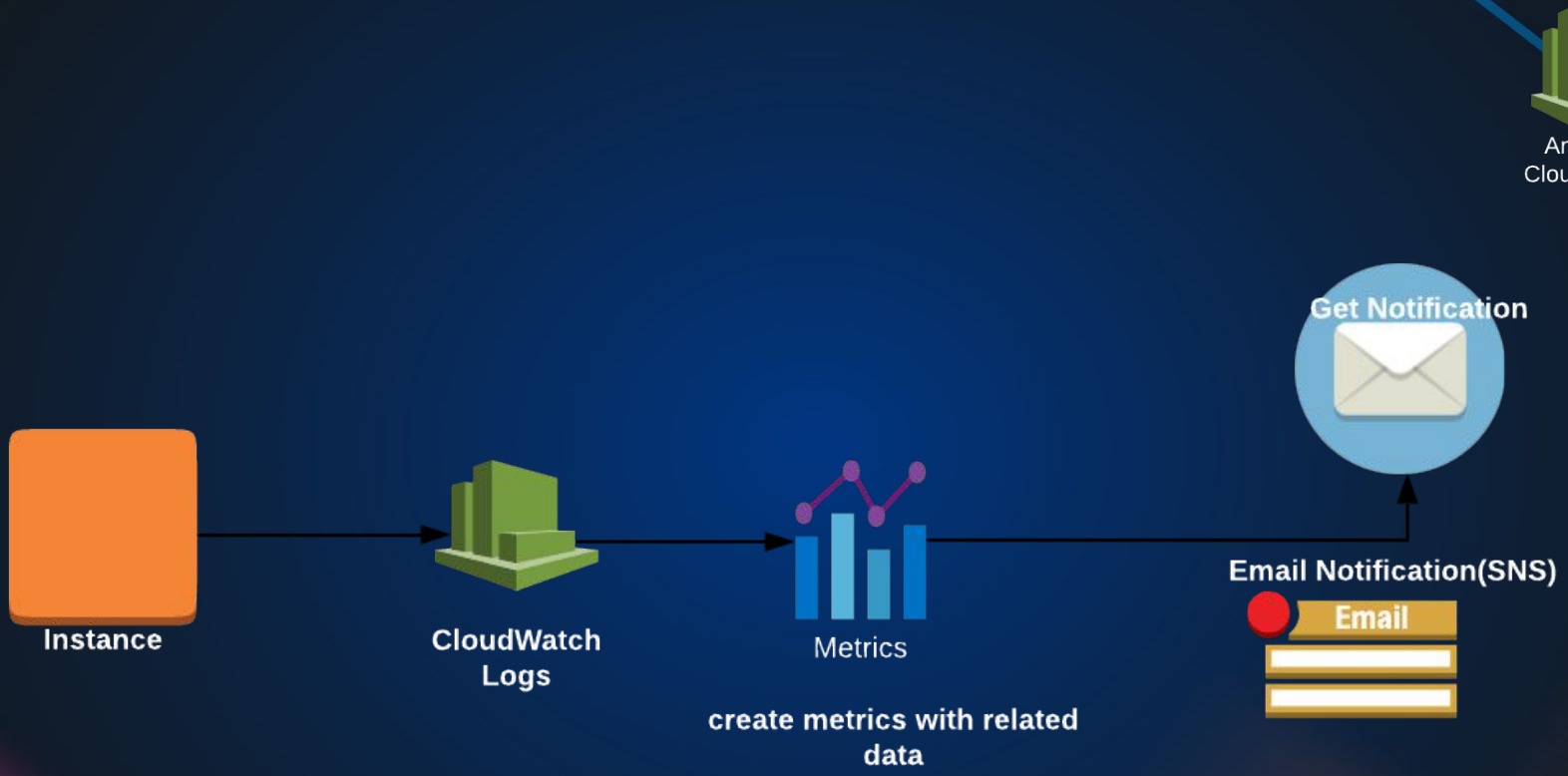
Amazon CloudWatch

Alarm monitors CloudWatch metrics for Instances.

Simple Notification Service (Amazon **SNS**) is a web service that coordinates and manages the delivery or sending of messages to subscribing endpoints or clients.



Amazon
CloudWatch

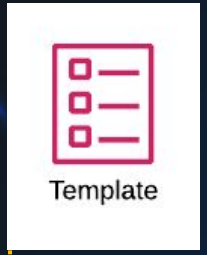

Amazon
CloudWatch
Get Notification
Instance
CloudWatch
Logs
Metrics
Email Notification(SNS)
Email
create metrics with related
data

AUTO SCALING

AUTO SCALING

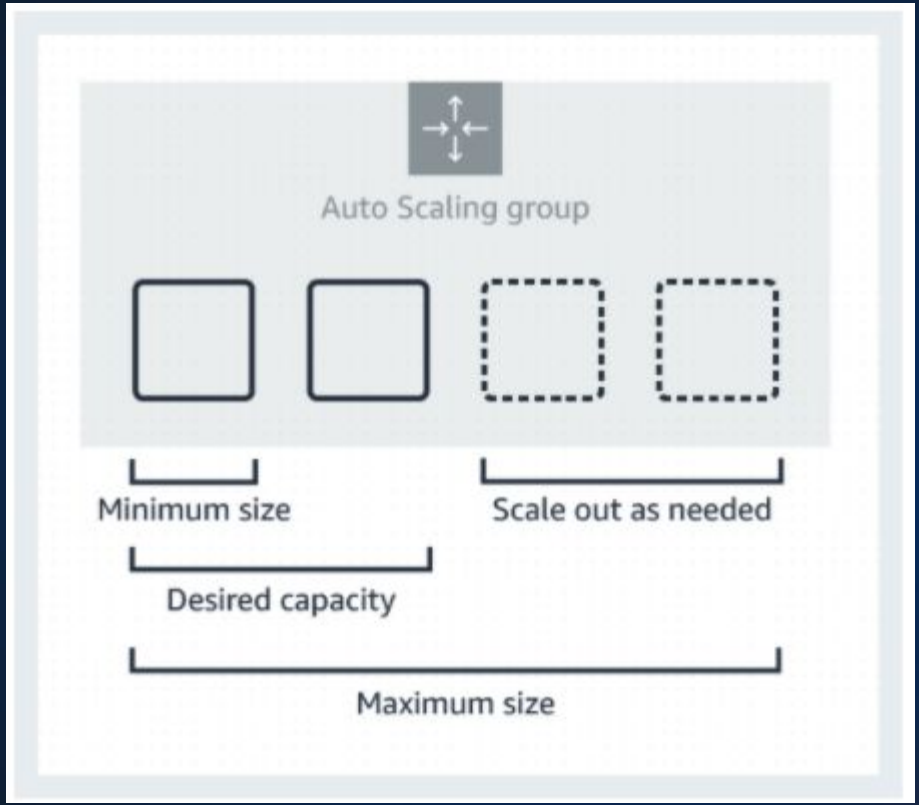
Auto Scaling is a service that automatically monitors and adjusts compute resources to maintain performance for applications hosted in the AWS.

Alarm monitors CloudWatch metrics for Instances.

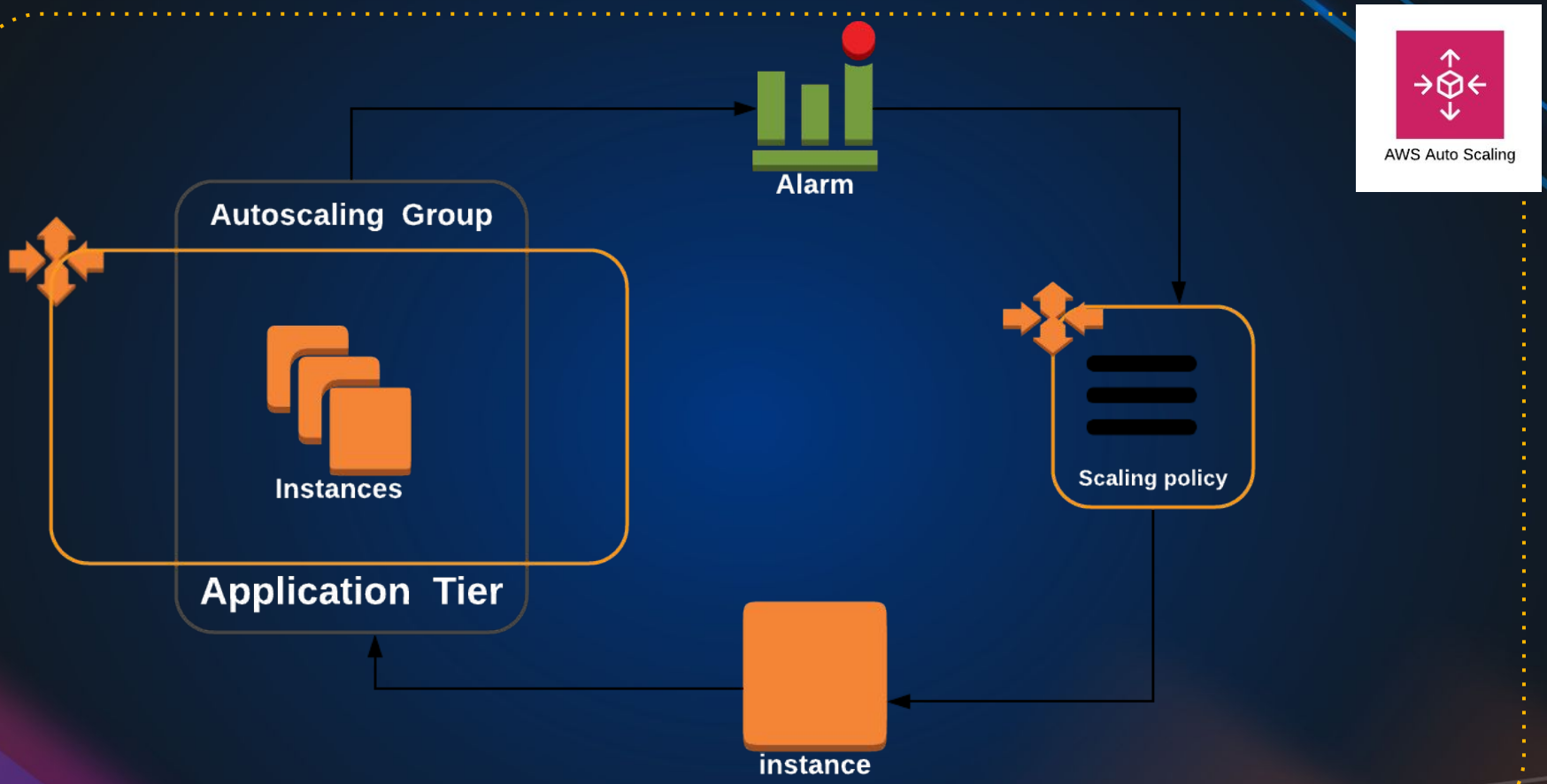


A launch configuration/Template is an instance configuration template that an Auto Scaling group uses to launch EC2 instances.

Scaling policy is used to increase and decrease the number of running instances in the group dynamically to meet changing conditions.



AWS Auto Scaling


AWS Auto Scaling
Alarm
Autoscaling Group
Instances
Application Tier
Scaling policy
instance

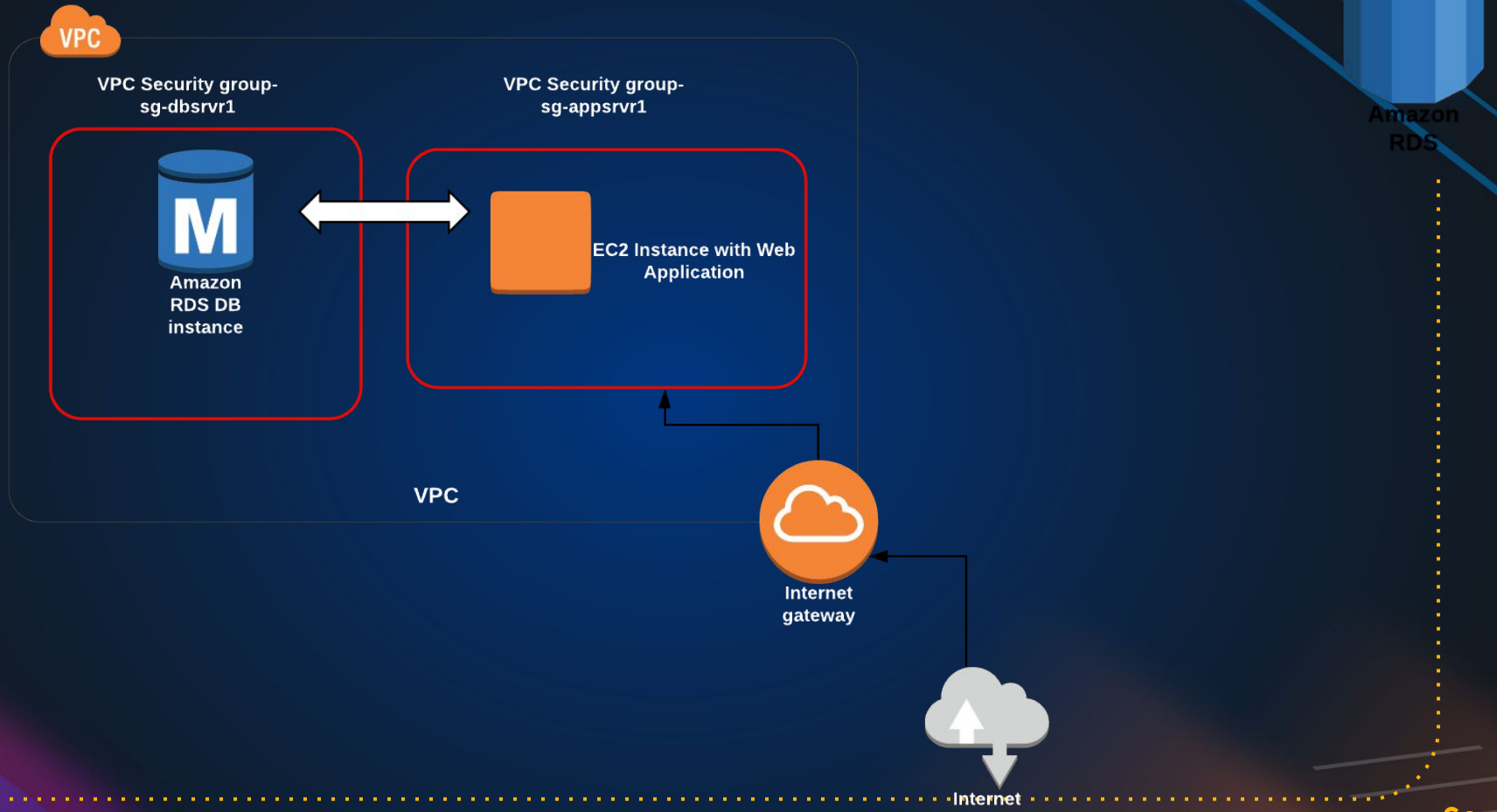
Relational DataBase (RDS)

DB Administration

- Installs
- Patching
- Monitoring
- Performance Tuning
- Backups
- Scaling
- Security
- Hardware upgrades
- Storage Management

RDS

- Amazon Relational Database Service is a distributed relational database service.
- High Availability Multi-AZ Deployments.
- Effortless Scaling.
- Read Replicas for performance


VPC
VPC Security group-
sg-dbsrvr1
VPC Security group-
sg-appsrvr1
Amazon
RDS DB
instance
EC2 Instance with Web
Application
VPC
Internet
gateway
Internet
Amazon
RDS

AWS CLI

- **AWS Command Line** Interface (**AWS CLI**) is an Amazon Web Services tool that enables to control Amazon public cloud services by typing commands on a specified line.
  Here, we can create any AWs service through AWS CLI.

S3 Command Line

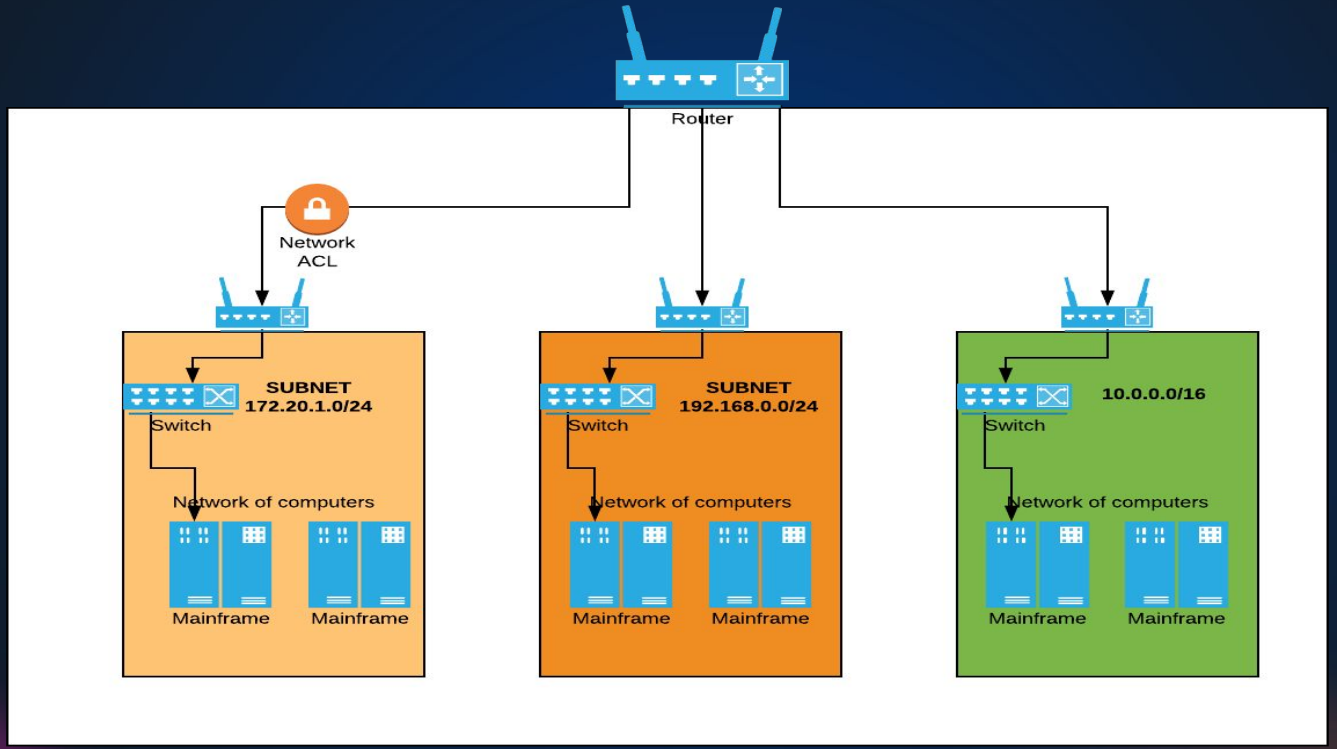
S3 from CLI

- **aws s3 commands:** create, update, delete, sync data etc
- **S3fs :** Mount S3 bucket as a Volume
- **S3 Authentication:**
- IAM User Access Keys
- IAM Roles

Virtual Private Cloud (VPC)

Corporate Datacenter

AMAZON VPC



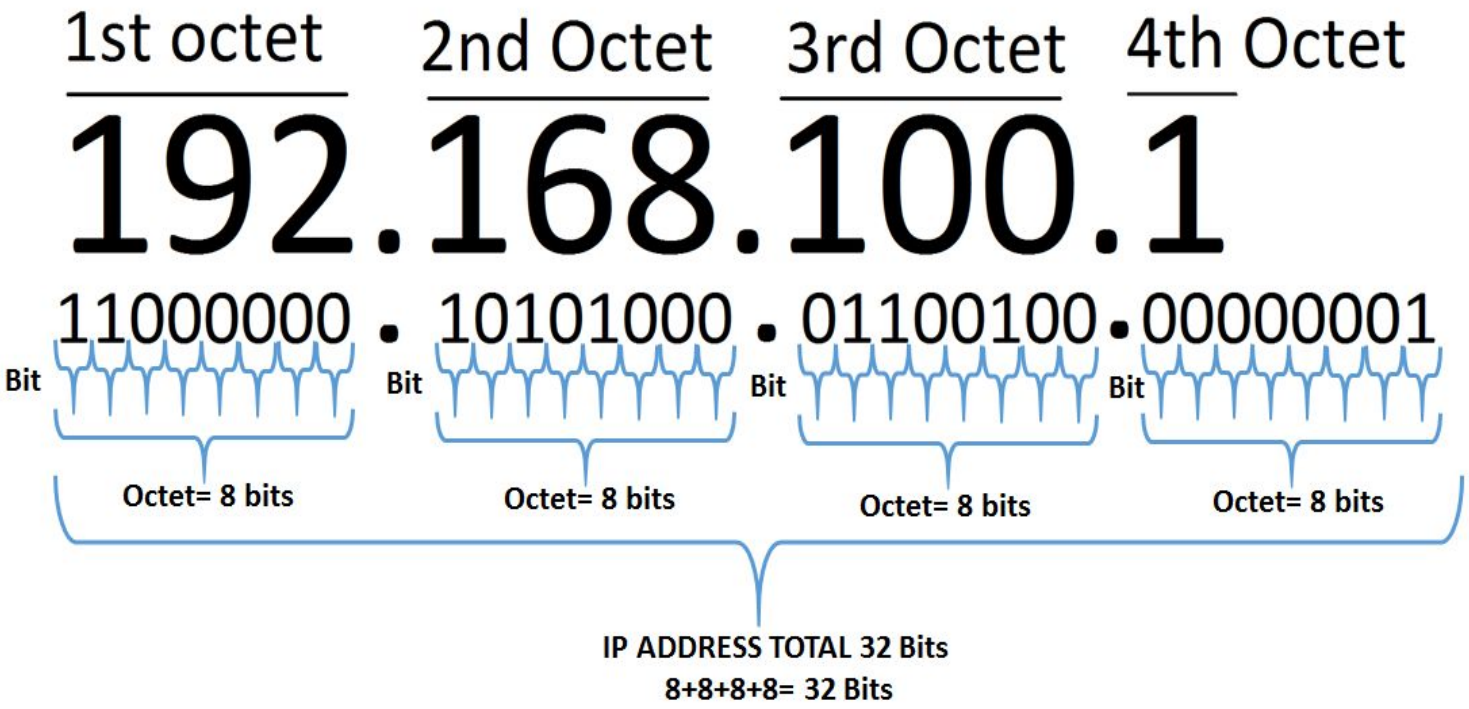
VPC Network

AMAZON VPC

Virtual Private Cloud (VPC)

- VPC is a logical data center within an AWS Region.
- virtual private cloud is an on-demand configurable pool of shared computing resources allocated within a public cloud environment.
- Control over network environment, select IP address range, subnets and configure route tables and gateways.

IPv4 Address



IPv4 Range

- 0.0.0.0 – 255.255.255.255
- 00000000.00000000.00000000.00000000 (0.0.0.0)
- 11111111.11111111.11111111.11111111 (255.255.255.255)

Public and Private IP Division

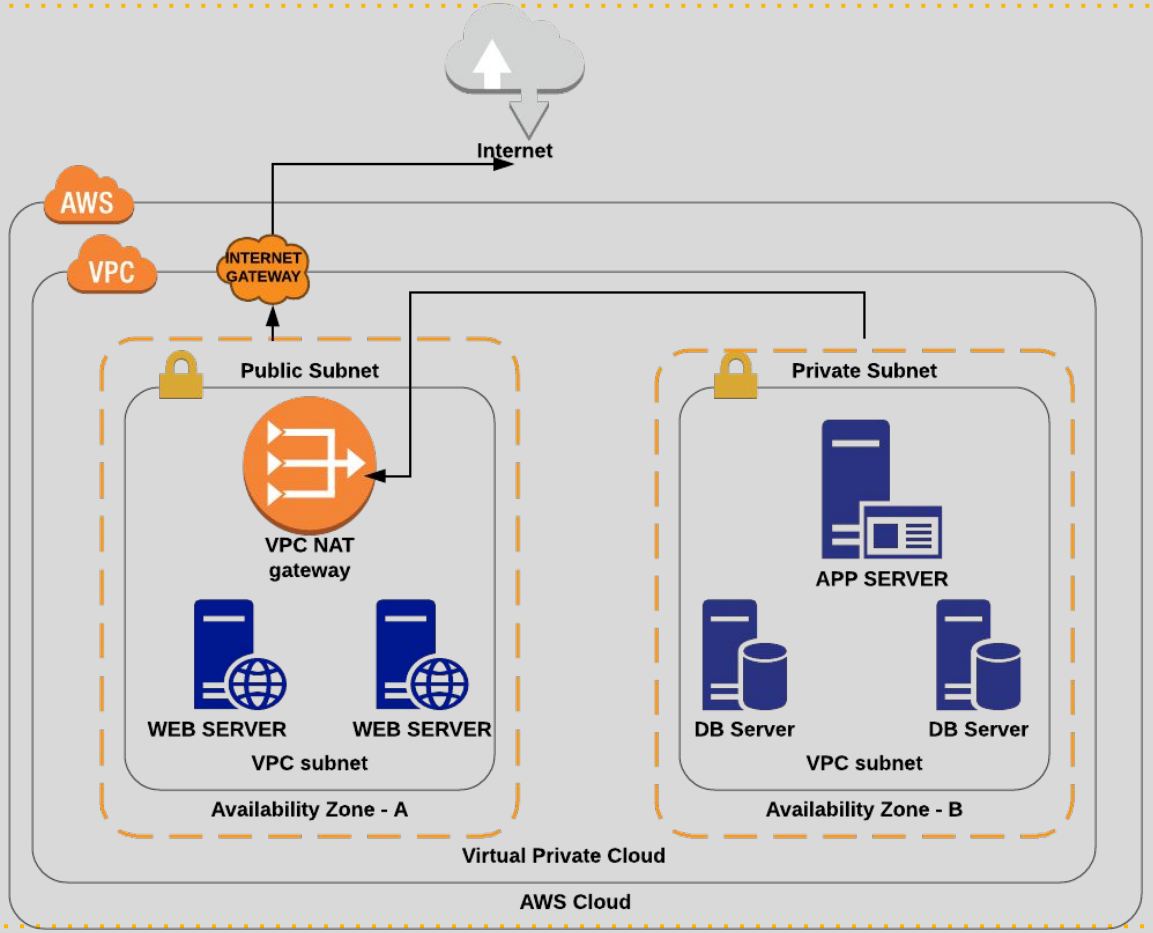
- Public IP => Internet
  - E:g 54.86.23.90
- Private IP => For local network design
  - E:g 192.168.1.10

Private IP Ranges

- Class A 10.0.0.0 - 10.255.255.255
- Class B 172.16.0.0 - 172.31.255.255
- Class C 192.168.0.0 - 192.168.255.255

Subnet Masks

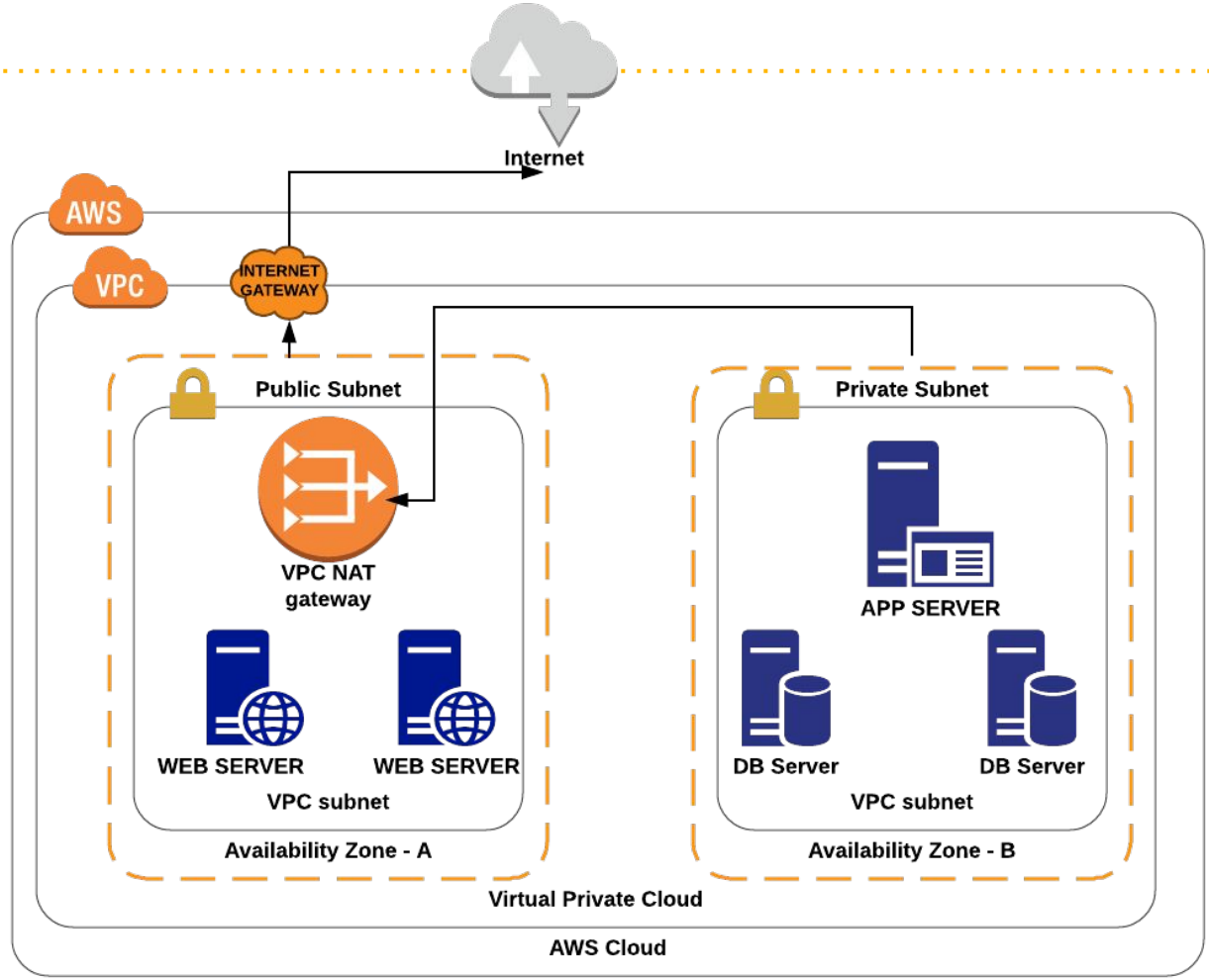
- 255.0.0.0
- 255.255.0.0
- 255.255.255.0


Internet
AWS
VPC
INTERNET GATEWAY
Public Subnet
Private Subnet
VPC NAT gateway
APP SERVER
WEB SERVER
WEB SERVER
DB Server
DB Server
VPC subnet
VPC subnet
Availability Zone - A
Availability Zone - B
Virtual Private Cloud
AWS Cloud

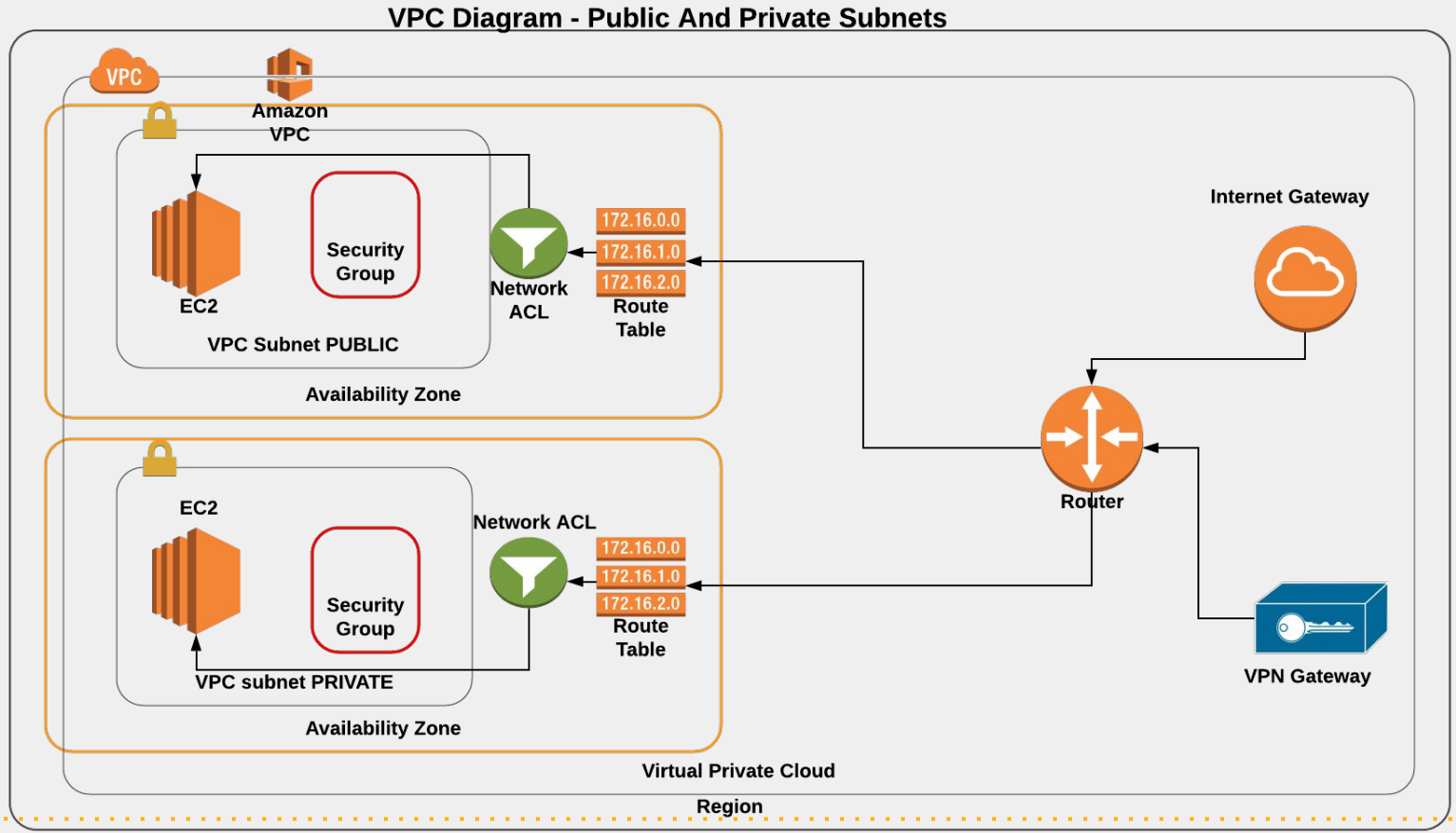
AMAZON VPC

Network Address Translation (NAT) gateway to enable instances in a private subnet to connect to the internet or other AWS services.

An internet gateway is a horizontally scaled, redundant, and highly available VPC component that allows communication between instances in your VPC and the internet.

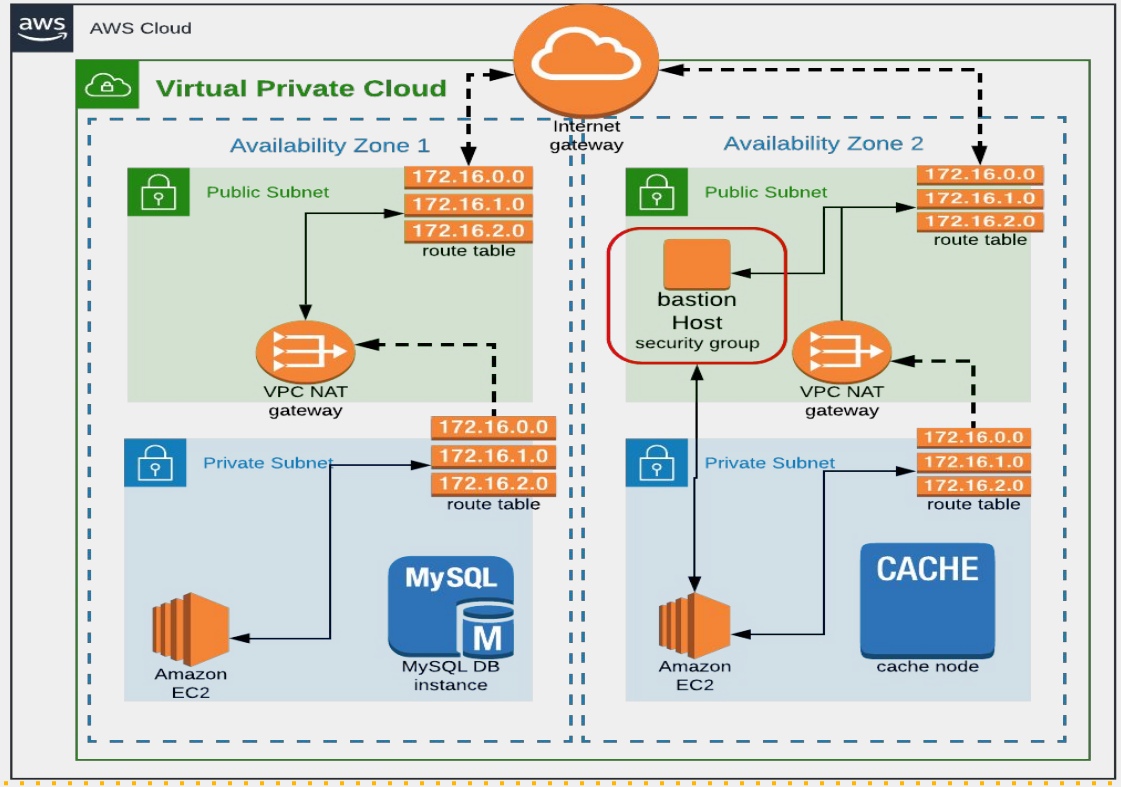

Internet
AWS
VPC
INTERNET GATEWAY
Public Subnet
VPC NAT gateway
WEB SERVER
WEB SERVER
VPC subnet
Availability Zone - A
Private Subnet
APP SERVER
DB Server
DB Server
VPC subnet
Availability Zone - B
Virtual Private Cloud
AWS Cloud

AMAZON VPC

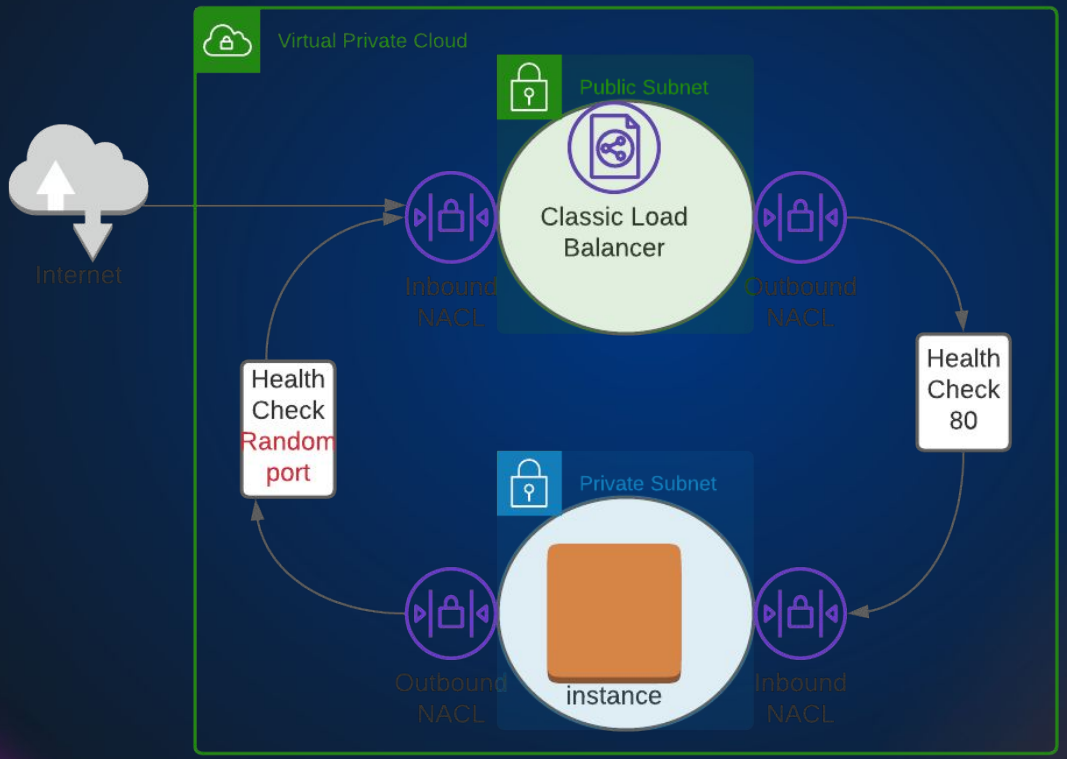

VPC Diagram - Public And Private Subnets
VPC
Amazon VPC
EC2
Security Group
VPC Subnet PUBLIC
Availability Zone
Network ACL
172.16.0.0
172.16.1.0
172.16.2.0
Route Table
Internet Gateway
Router
EC2
Security Group
VPC subnet PRIVATE
Availability Zone
Network ACL
172.16.0.0
172.16.1.0
172.16.2.0
Route Table
VPN Gateway
Virtual Private Cloud
Region

AMAZON VPC

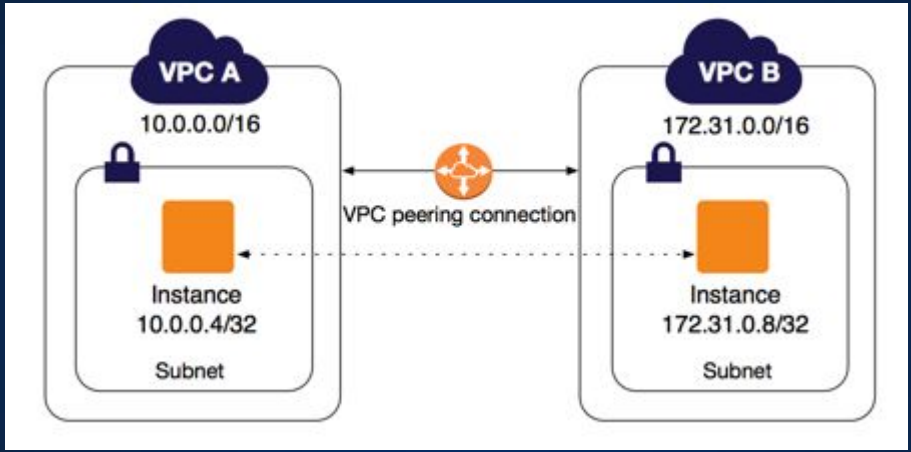
High Availability | VPC



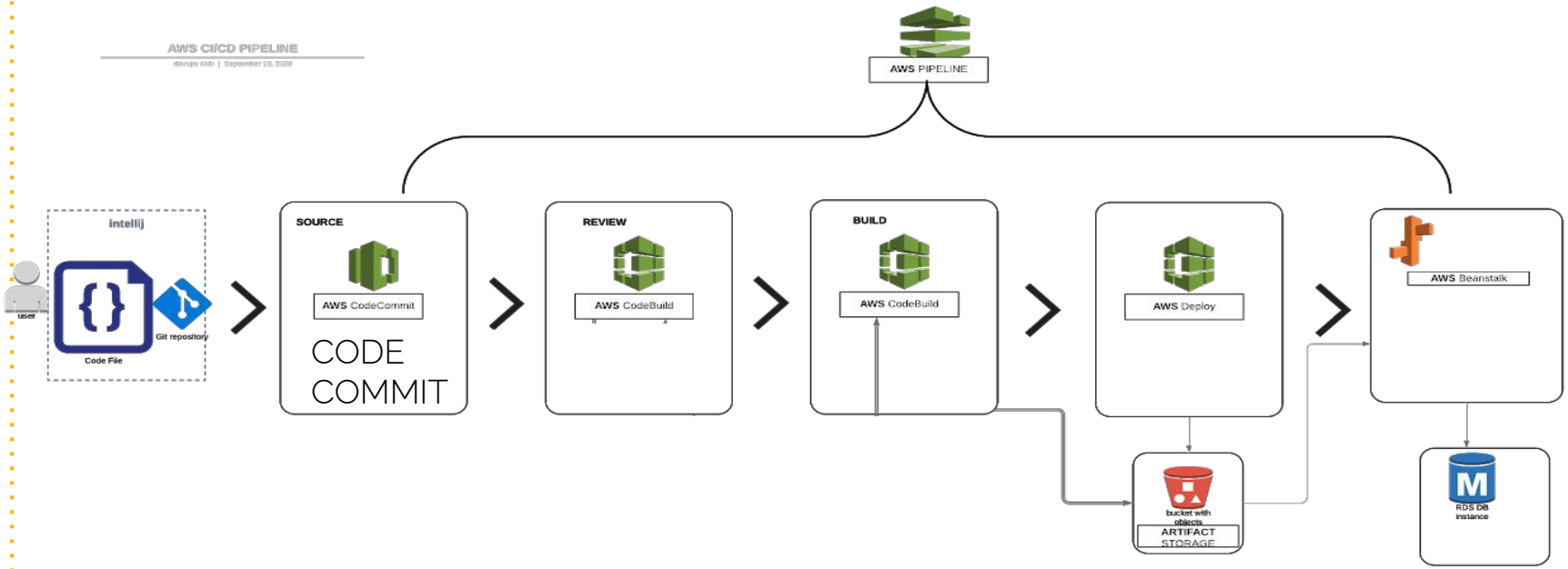
NACL


Virtual Private Cloud
Public Subnet
Internet
Classic Load Balancer
Inbound NACL
Outbound NACL
Health Check Random port
Health Check 80
Private Subnet
Outbound NACL
instance
Inbound NACL

VPC Peering


VPC A
10.0.0.0/16
Instance
10.0.0.4/32
Subnet
VPC peering connection
VPC B
172.31.0.0/16
Instance
172.31.0.8/32
Subnet

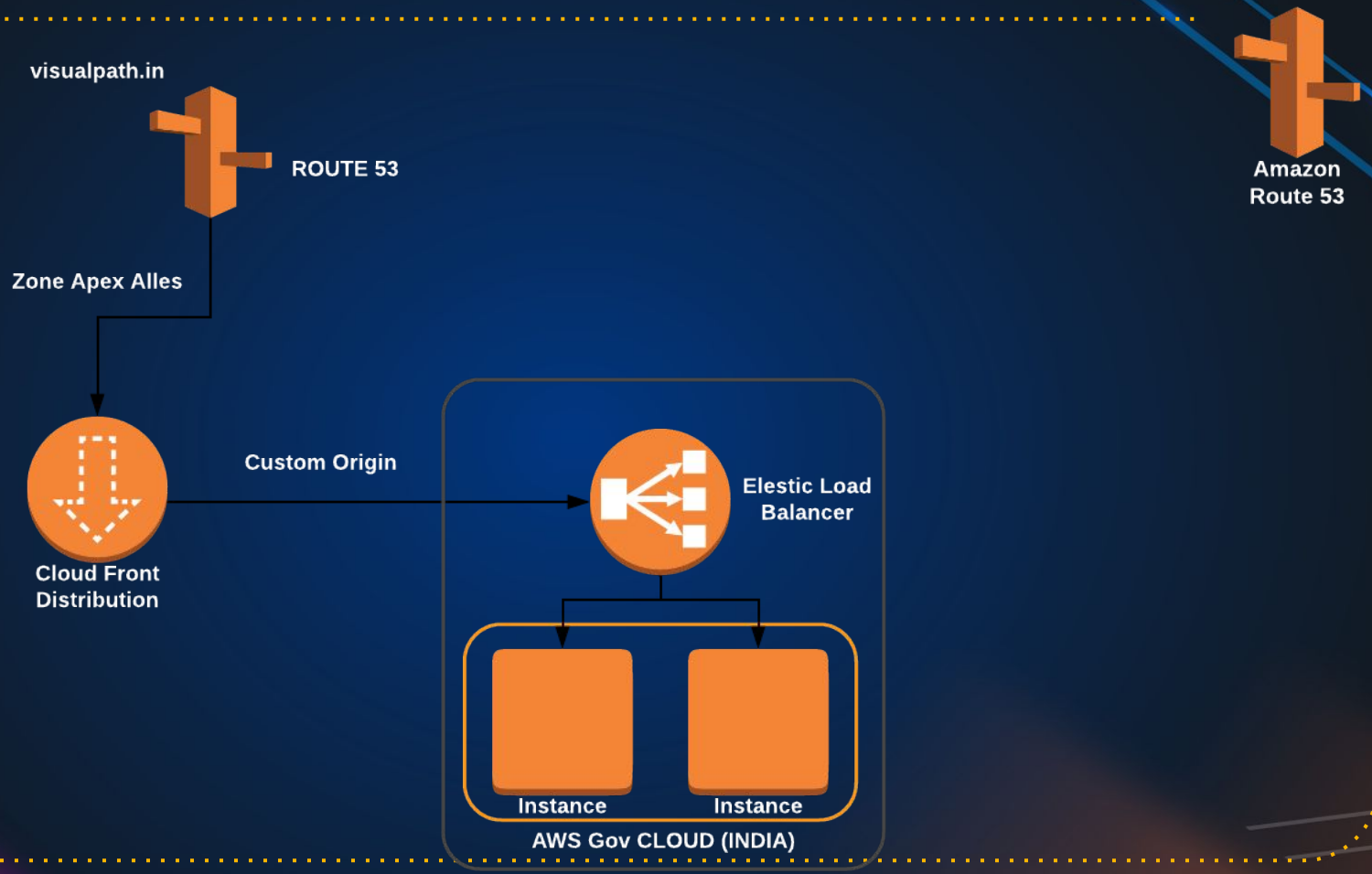
AWS CI/CD PROJECT



Route 53

Amazon Route 53 is a highly available and scalable Domain Name System (DNS) web service.

Route 53 to perform three main functions in any combination Domain registration, DNS routing, and health checking.


visualpath.in
ROUTE 53
Amazon
Route 53
Zone Apex Alles
Custom Origin
Elestic Load
Balancer
Cloud Front
Distribution
Instance
Instance
AWS Gov CLOUD (INDIA)