Networking and Security

Identity and Access Management
Networking basics
VPC networking and security
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Build your own VPC and Launch a Web Server

Identity and Access Management

1. Identity and Access Management

The *Identity and access management (IAM)* mechanism encompasses the components and policies necessary to control and track user identities and access privileges for IT resources, environments, and systems.

Specifically, IAM mechanisms exist as systems comprised of four main components:

Authentication – Username and password combinations remain the most common forms of user authentication credentials managed by the IAM system, which also can support digital signatures, digital certificates, biometric hardware (fingerprint readers), specialized software (such as voice analysis programs), and locking user accounts to registered IP or MAC addresses.

Authorization – The authorization component defines the correct granularity for access controls and oversees the relationships between identities, access control rights, and IT resource availability.

User Management – Related to the administrative capabilities of the system, the user management program is responsible for creating new user identities and access groups, resetting passwords, defining password policies, and managing privileges.

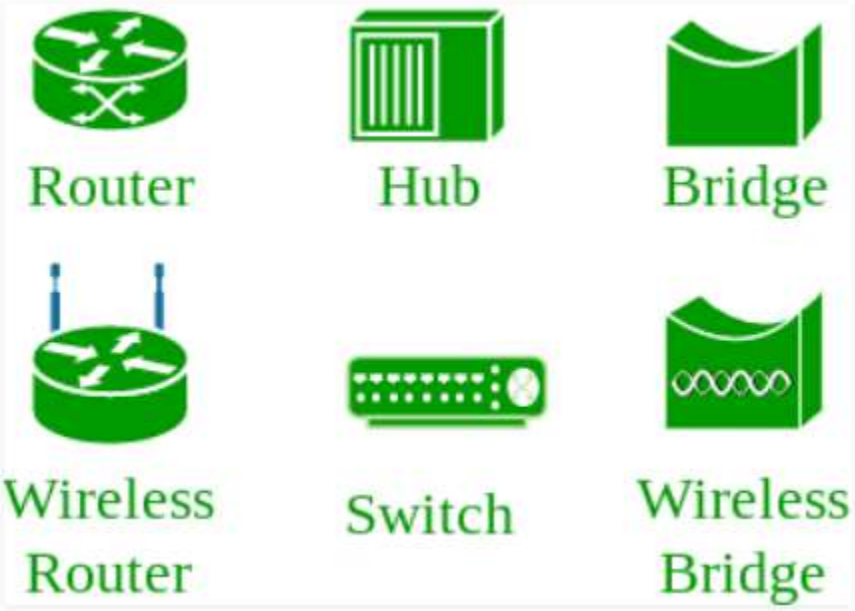
Credential Management – The credential management system establishes identities and access control rules for defined user accounts, which mitigates the threat of insufficient authorization.

The IAM mechanism is primarily used to counter the insufficient authorization, denial of service, and overlapping trust boundaries threats.

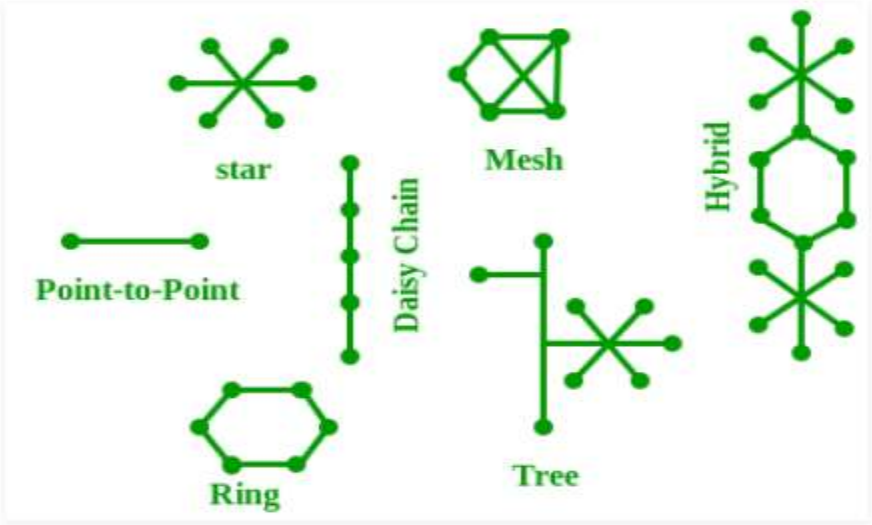
2. Networking basics

Networking basics

Open system:
A system which is connected to the network and is ready for communication.
Closed system:
A system which is not connected to the network and can't be communicated with.
Computer Network:
An interconnection of multiple devices, also known as hosts, that are connected using multiple paths for the purpose of sending/receiving data or media. Computer networks can also include multiple devices/mediums which help in the communication between two different devices; these are known as **Network devices** and include things such as routers, switches, hubs, and bridges.



Network Topology:
The layout arrangement of the different devices in a network. Common examples include: Bus, Star, Mesh, Ring, and Daisy chain.



OSI:
OSI stands for **Open Systems Interconnection**. It is a reference model that specifies standards for communications protocols and also the functionalities of each layer.

Protocol:
A protocol is the set of rules or algorithms which define the way how two entities can communicate across the network and there exists different protocol defined at each layer of the OSI model. Few of such protocols are TCP, IP, UDP, ARP, DHCP, FTP and so on.

UNIQUE IDENTIFIERS OF NETWORK

Host name:
Each device in the network is associated with a unique device name known as Hostname.
Command: `hostname`
IP Address (Internet Protocol address):
Also known as the Logical Address, the IP Address is the network address of the system across the network.
Command: *ipconfig*
MAC Address (Media Access Control address):
Also known as physical address, the MAC Address is the unique identifier of each host and is associated with its NIC (Network Interface Card).
A MAC address is assigned to the NIC at the time of manufacturing.
Command: *ipconfig/all*

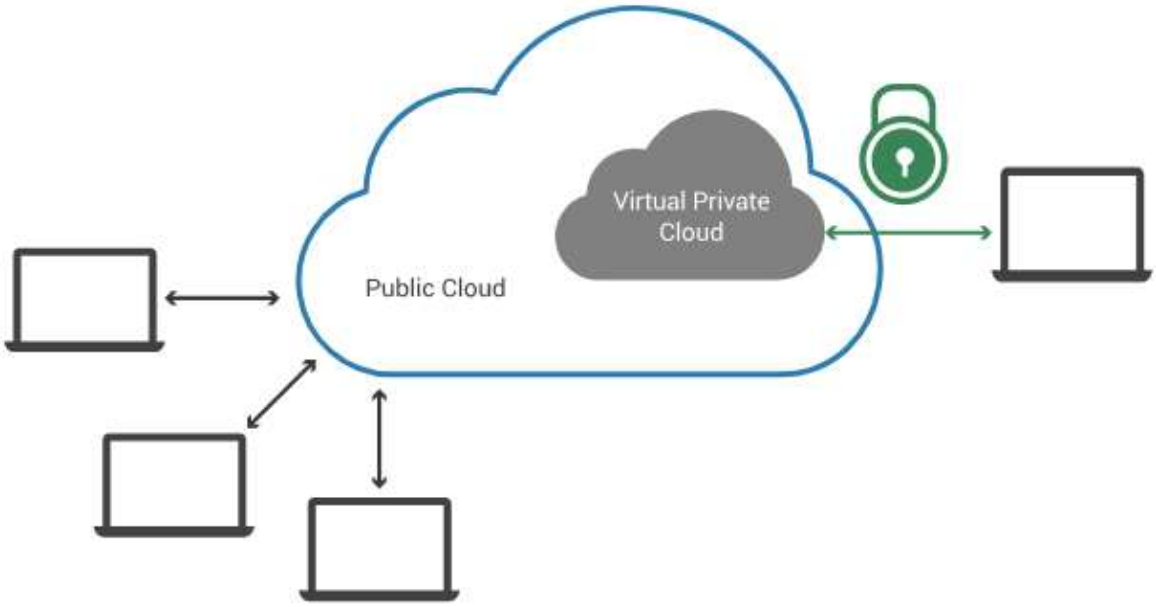
DNS Server:
DNS stands for **Domain Name system**.

DNS is basically a server which translates web addresses or URLs (ex: www.google.com) into their corresponding IP addresses. We don't have to remember all the IP addresses of each and every website.
Command: **nslookup**

3. VPC networking and security

networking and security

A virtual private cloud (VPC) is a secure, isolated private cloud hosted within a public cloud. VPC customers can run code, store data, host websites, and do anything else they could do in an ordinary private cloud, but the private cloud is hosted remotely by a public cloud provider.



Features of VPC:

1. Agility

A VPC provides full control over the size of your network and the ability to deploy and scale resources at any time.

2. Security

Although a VPC is part of a public cloud, VPCs are logically isolated networks so your data and applications are entirely separate from your provider's other clients. Access is limited to your resources, unless you grant this.

3. Affordability

VPCs are cost-effective. You'll save money on hardware, labor, and other related cloud resources. The cloud provider will be responsible for all maintenance and upkeep for all physical servers and software.

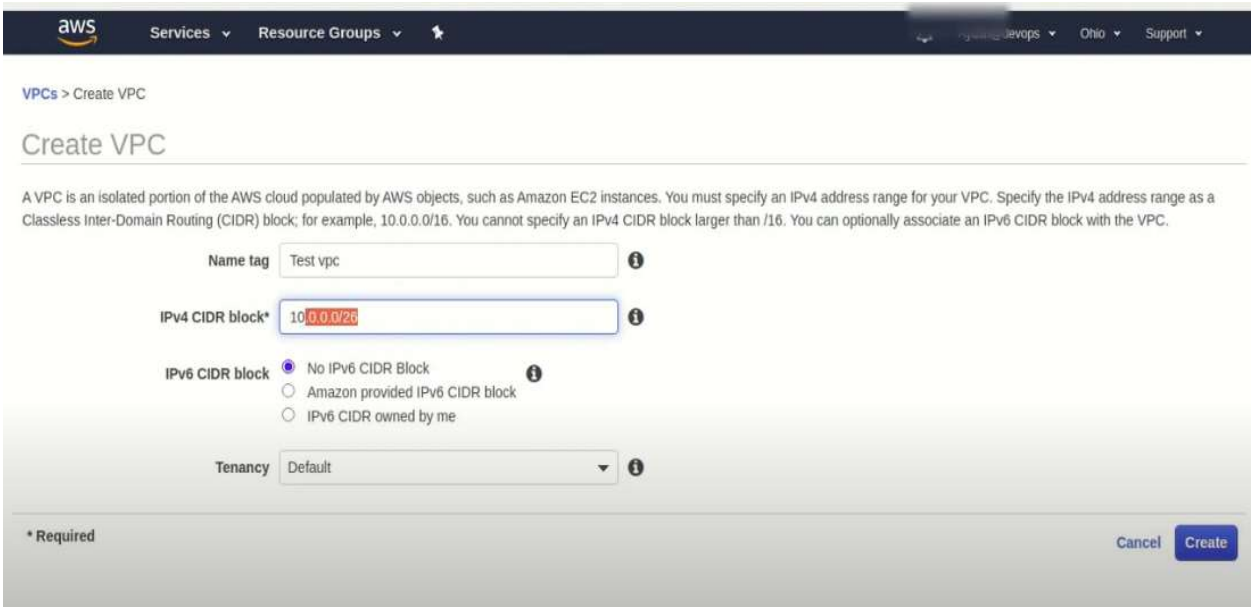
4. Availability

A virtual private cloud offers redundancy and fault-tolerant availability zone architectures to decrease downtime and keep applications and workloads available every moment.

Virtual Private Clouds: Cloud inside cloud. Subnet portion inside cloud is dedicated to specific user only. In that specific portion only admin has specific authority to Add or Delete resource according to requirements. It is most secure as per application point of view.

`Design a VPC`

Create VPC: **VPCs → Create VPC**



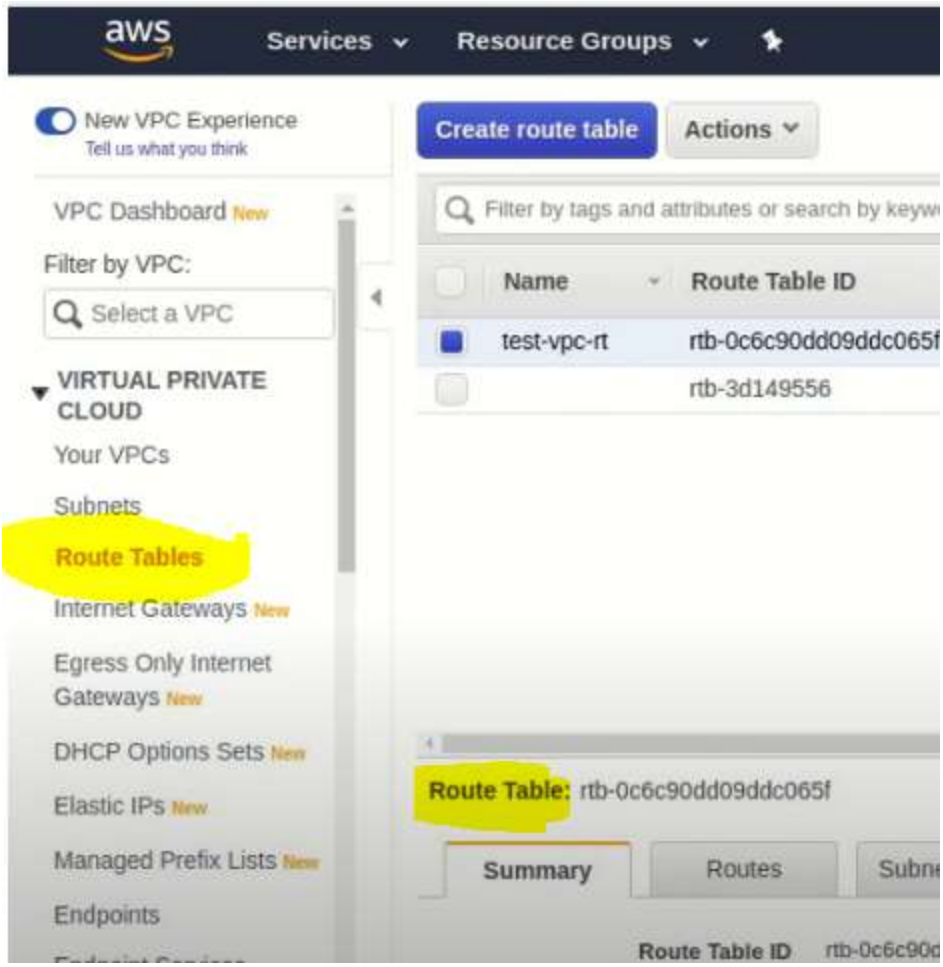
IPv4 CIDR Block: 10.0.0.0 / 26 …… (26 is Subnet Mask)

32 – 26 = 6

2 ^ 6 = 64 so 64 IP addresses are available in this range.

Build your own VPC and Launch a Web Server

Create Route Table for VPC: Click on option Route Tables



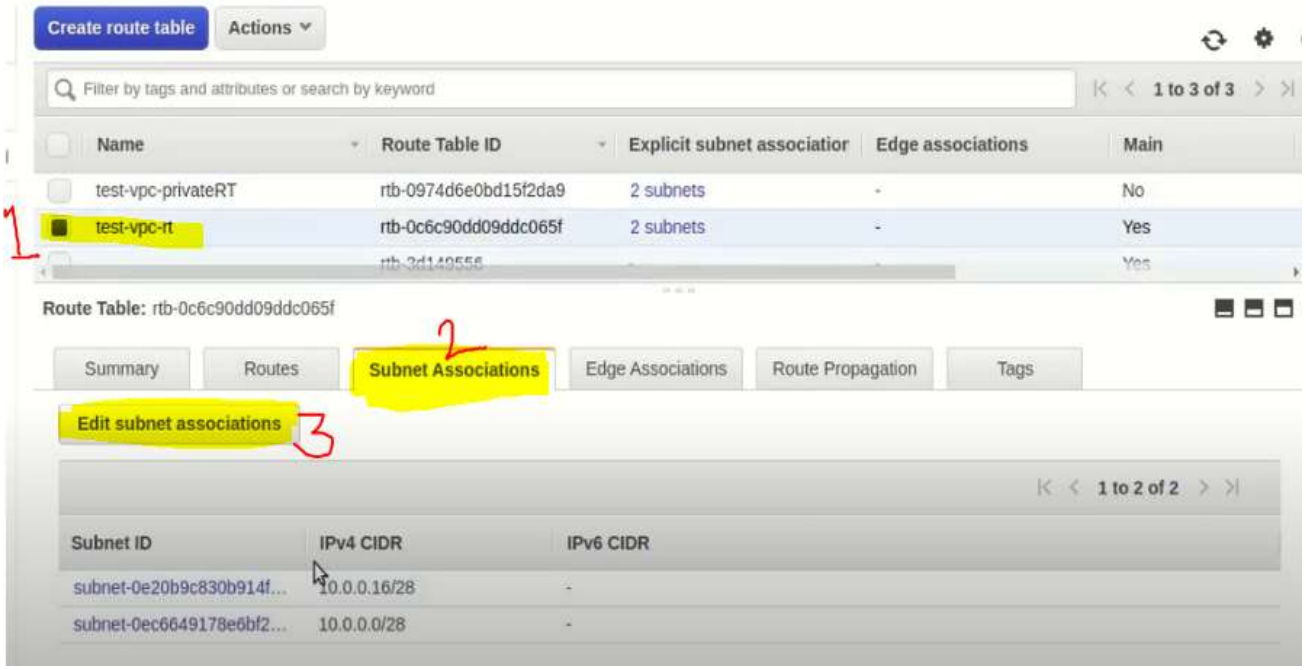
Create Subnet:

We will Create Two Public Subnets and Two Private Subnets.
So IPv4 CIDR Block address should be 10.0.0.0 / 28
10.0.0.16 / 28

10.0.0.32 / 28
10.0.0.48 / 28

It will Looks Like:

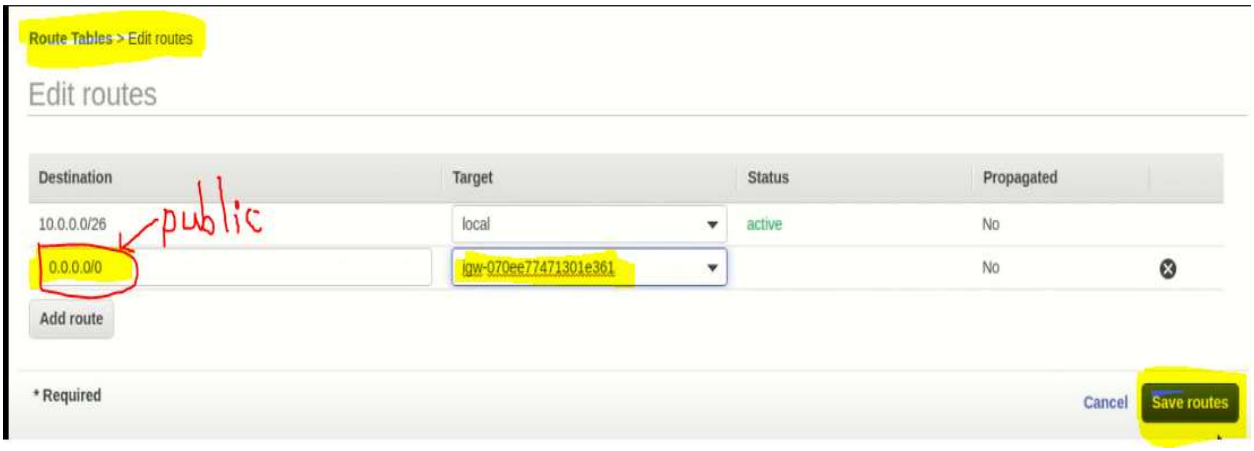
Again go to Route Tables and associate that route tables to Subnets



Now we have created two Route Tables (Public and Private) but How it can be Public and Private logically? → It can be done by using **Internet Gateway**

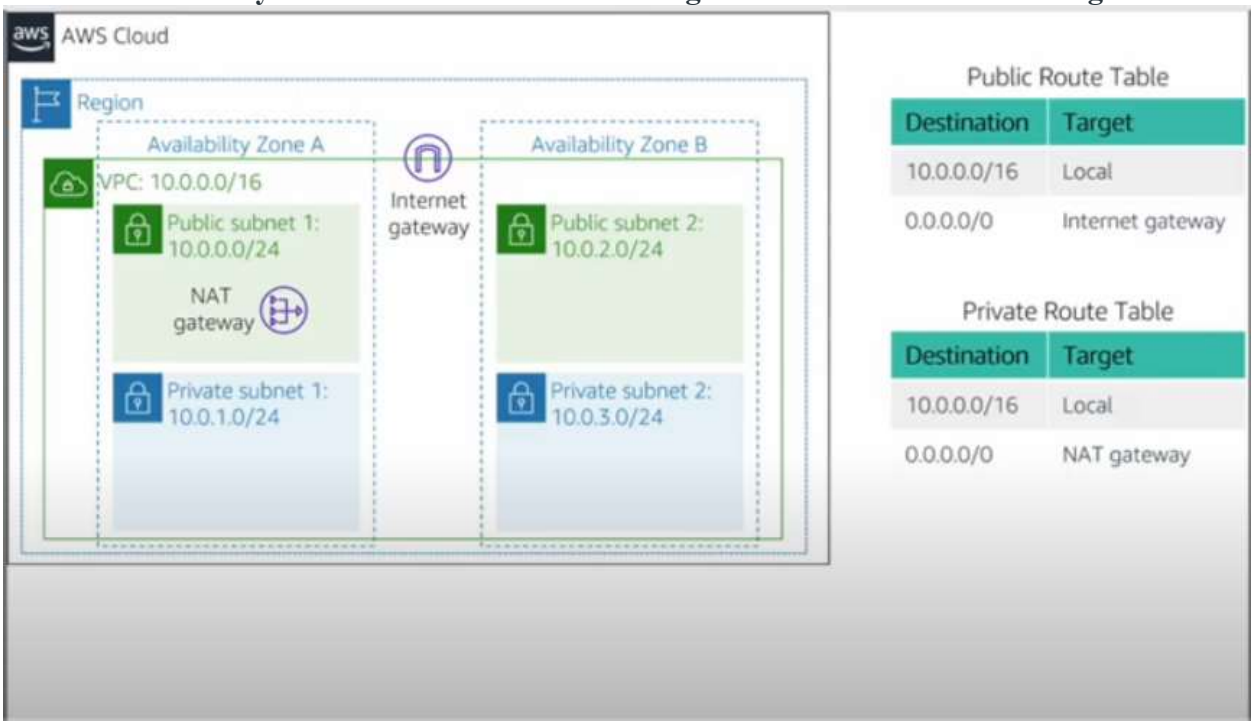
Internet Gateway is attached to VPC via Route Table.

Create Internet Gateway → Attach to VPC → Route Tables → Click on **Routes** → Edit Routes → Add Route

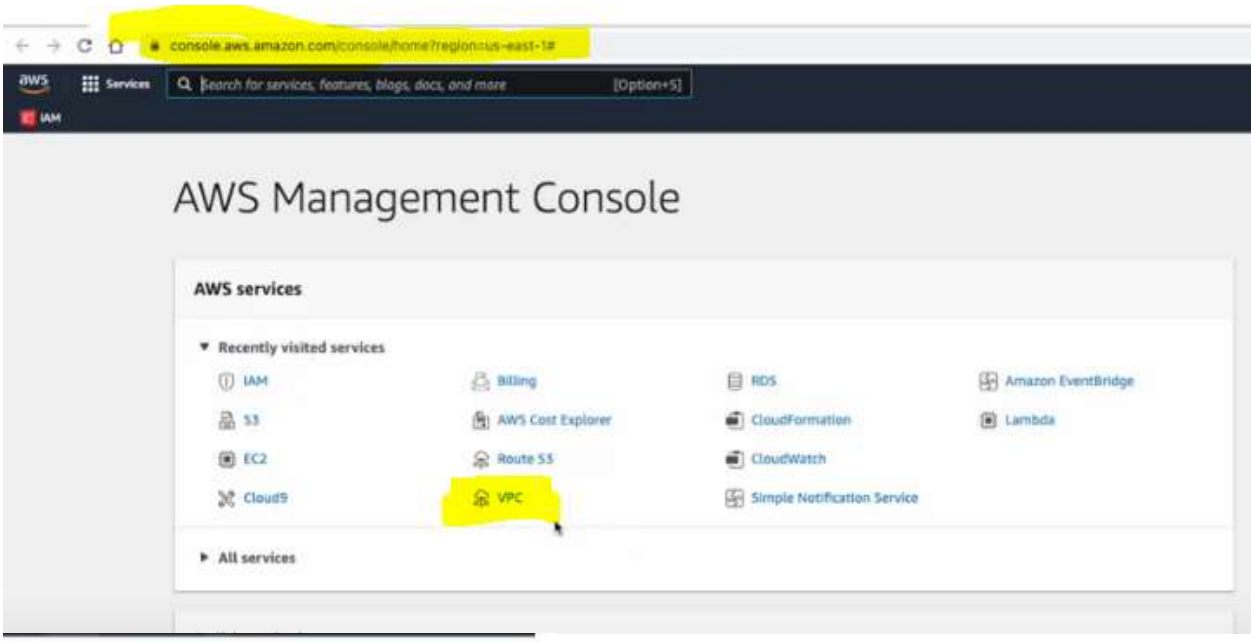


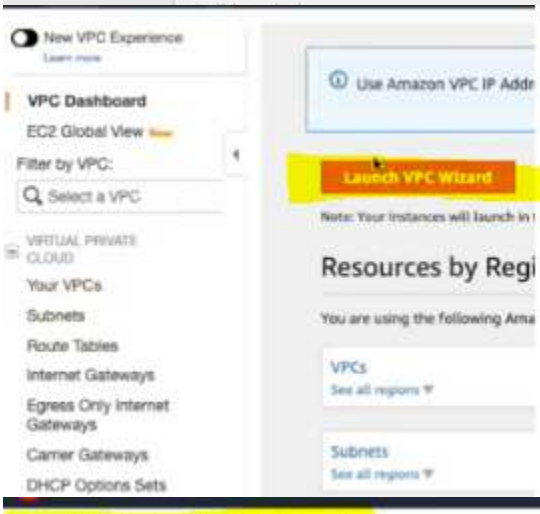
Build Your Own VPC and Launch a Web Server

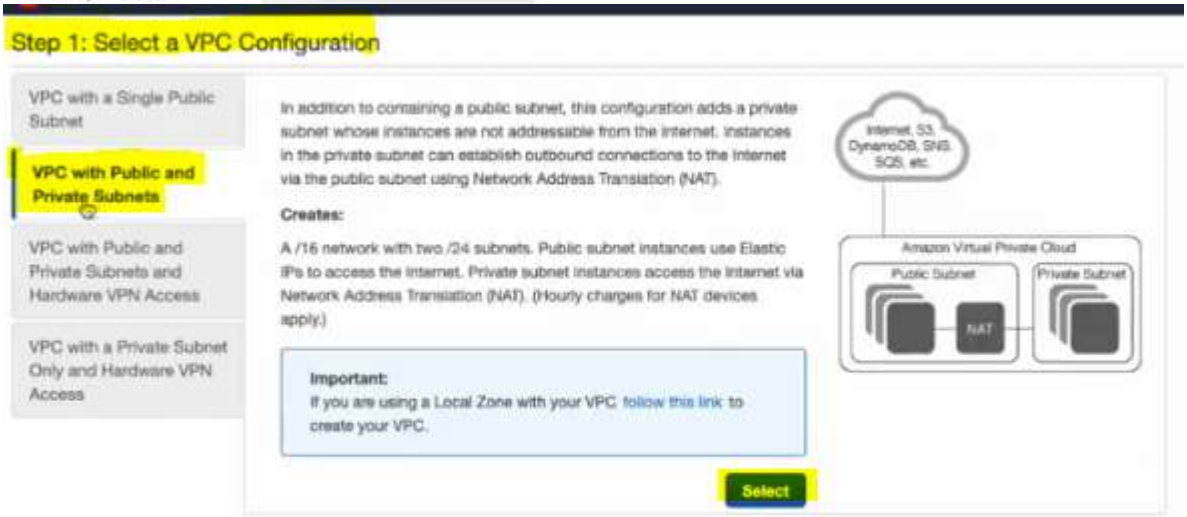
As we have already created VPC above. Following is structure of VPC we designed.



AWS Management Console → VPC console → Launch VPC wizard


console.aws.amazon.com/console/home?region=us-east-1#
aws
Services
Search for services, features, blogs, docs, and more
[Option+S]
IAM
AWS Management Console
AWS services
Recently visited services
IAM
Billing
RDS
Amazon EventBridge
S3
AWS Cost Explorer
CloudFormation
Lambda
EC2
Route 53
CloudWatch
Cloud9
VPC
Simple Notification Service
All services


New VPC Experience
VPC Dashboard
EC2 Global View
Filter by VPC:
Select a VPC
VIRTUAL PRIVATE CLOUD
Your VPCs
Subnets
Route Tables
Internet Gateways
Egress Only Internet Gateways
Carrier Gateways
DHCP Options Sets
Use Amazon VPC IP Addr
Launch VPC Wizard
Note: Your instances will launch in
Resources by Regi
You are using the following Ama
VPCs
See all regions
Subnets
See all regions


Step 1: Select a VPC Configuration
VPC with a Single Public Subnet
VPC with Public and Private Subnets
VPC with Public and Private Subnets and Hardware VPN Access
VPC with a Private Subnet Only and Hardware VPN Access
In addition to containing a public subnet, this configuration adds a private subnet whose instances are not addressable from the Internet. Instances in the private subnet can establish outbound connections to the Internet via the public subnet using Network Address Translation (NAT).
Creates:
A /16 network with two /24 subnets. Public subnet instances use Elastic IPs to access the Internet. Private subnet instances access the Internet via Network Address Translation (NAT). (Hourly charges for NAT devices apply.)
Important:
If you are using a Local Zone with your VPC follow this link to create your VPC.
Select
Internet, S3, DynamoDB, SNS, SQS, etc.
Amazon Virtual Private Cloud
Public Subnet
Private Subnet
NAT