Virtual Private Cloud (VPC)

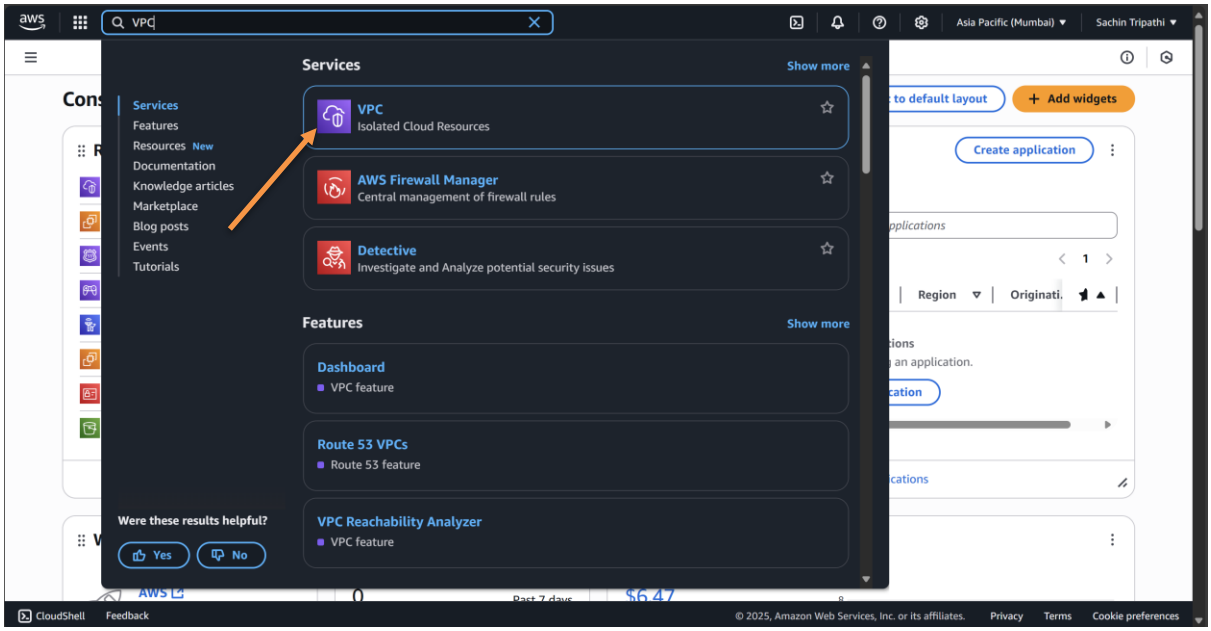
Introduction:

- **A Virtual Private Cloud (VPC)** is an isolated, private segment of the AWS cloud where you can design and manage your own virtual network.
- It enables you to deploy AWS resources like EC2 instances, databases, and load balancers within a secure, fully controlled environment.
- Using a VPC, you can define your own IP address range, create subnets, configure routing tables, and set up network gateways as per your requirements.
- By default, AWS allows the creation of **up to 5 VPCs per region**, and each VPC can contain **up to 200 subnets**.
- One of the biggest advantages of a VPC is **security**. You can leverage **Security Groups** and **Network ACLs** to manage and filter traffic entering or leaving your network, ensuring your cloud applications remain secure, scalable, and high-performing.

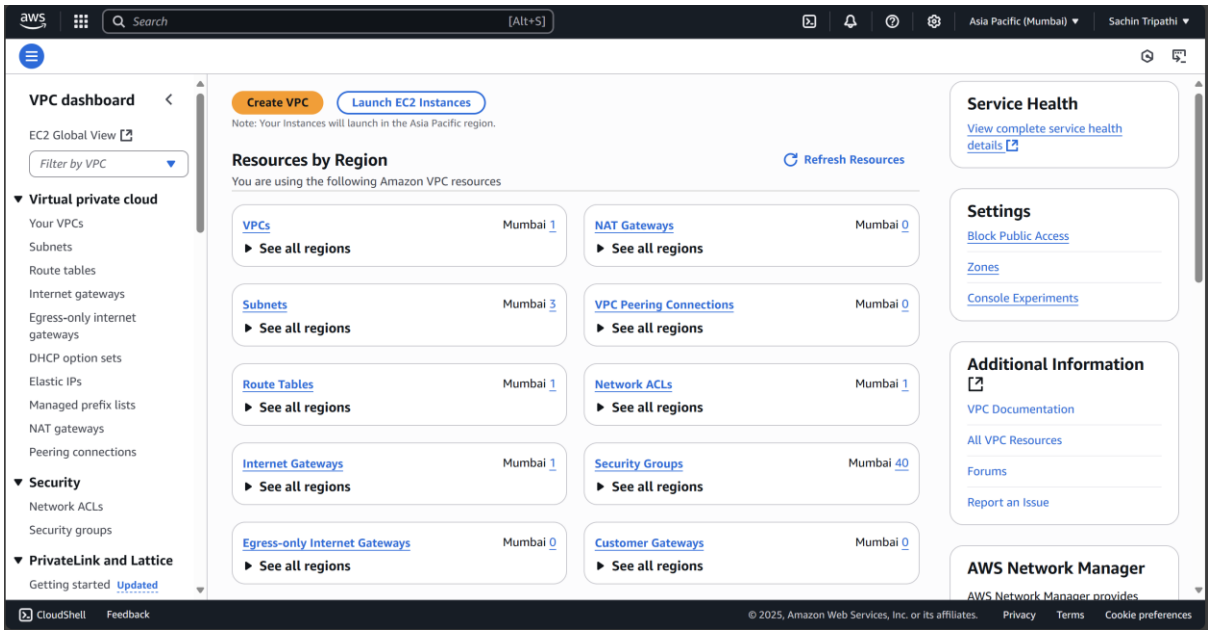
Step by Step Instructions:

Step 1:

- Open “AWS Management Console” on any browser.
- Search “VPC” and open it.



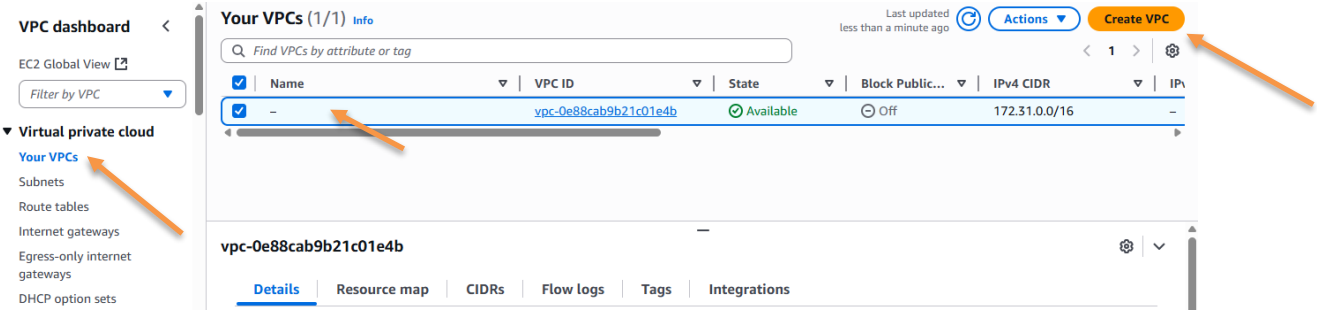
- The VPC Console will open.



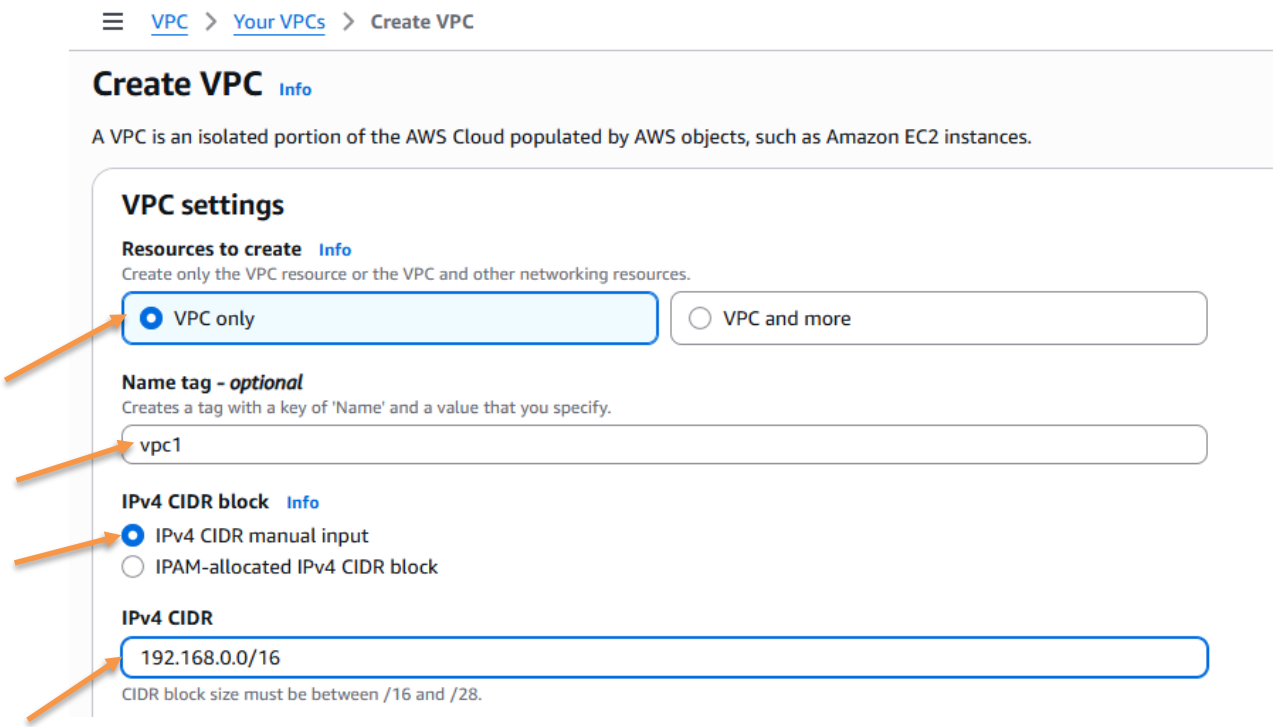
Creating a VPC:

Step 2:

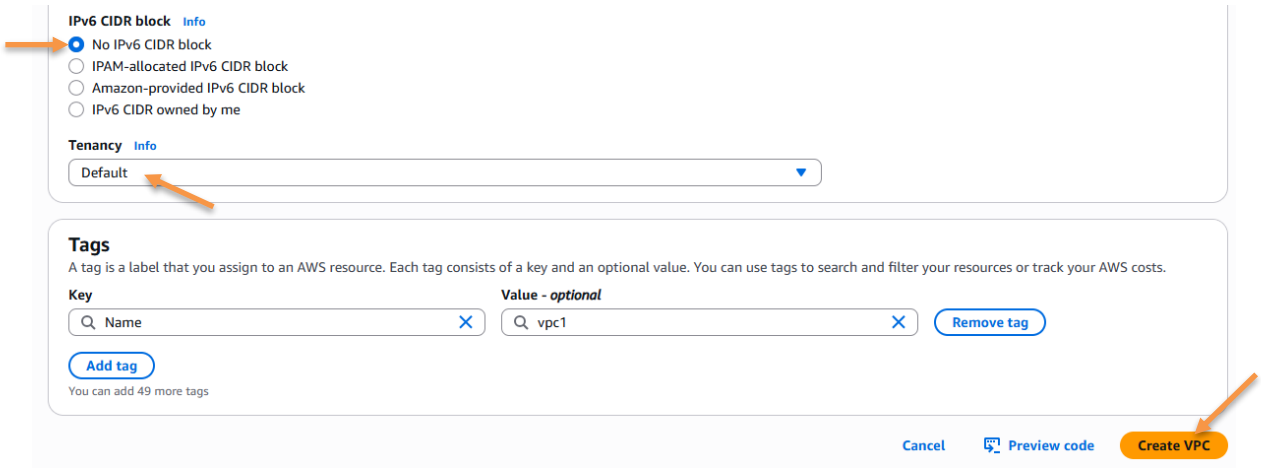
- Go to “Your VPCs”.
- Since we are in Mumbai region, we can see that by default, there is already 1 VPC created.
- Click on “Create VPC”.



- In “Resources to create”, select “VPC only”.
- Give a name to your VPC (e.g. “vpc1”).
- In “IPv4 CIDR block”, select the CIDR manual input option and enter the IPv4 CIDR as “192.168.0.0/16”.

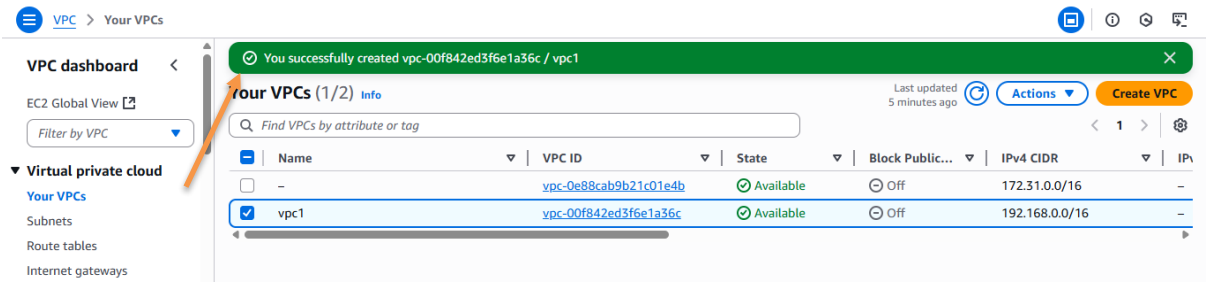


- In “IPv6 CIDR block”, select “No IPv6 CIDR block”.
- Leave the “Tenancy” at “Default”.
- Click on “Create VPC”.



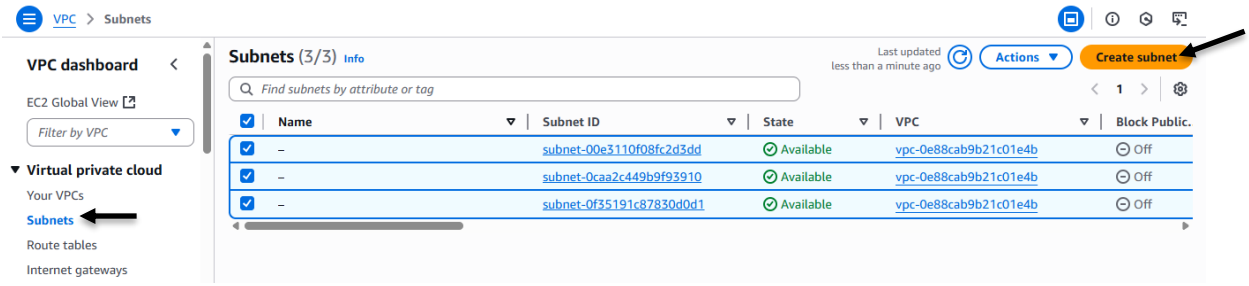
Step 3:

- Your VPC is now created.



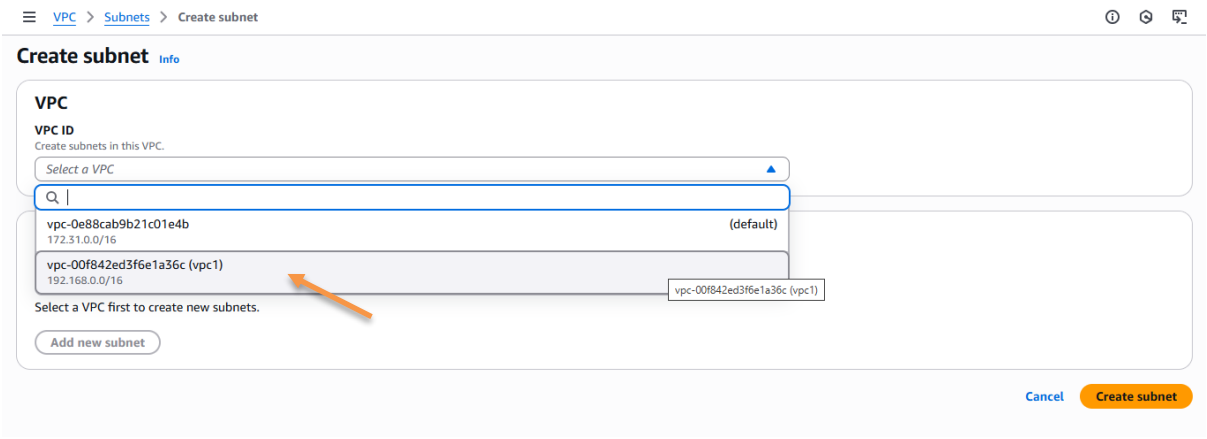
Creating a Subnet:

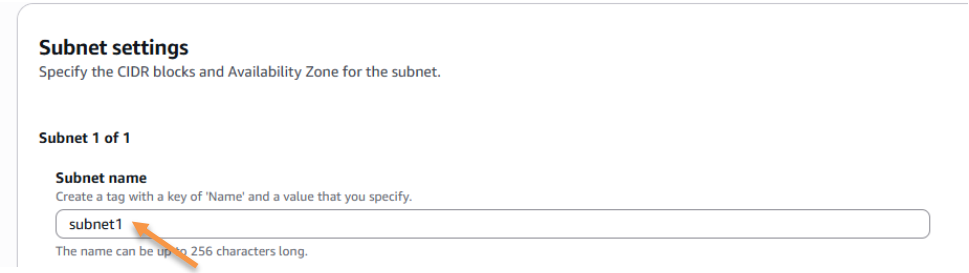
- Now go to “Subnets” under “Virtual private cloud” and there you can see 3 subnets are already created (for Mumbai region only).
- Click on “Create subnet”.



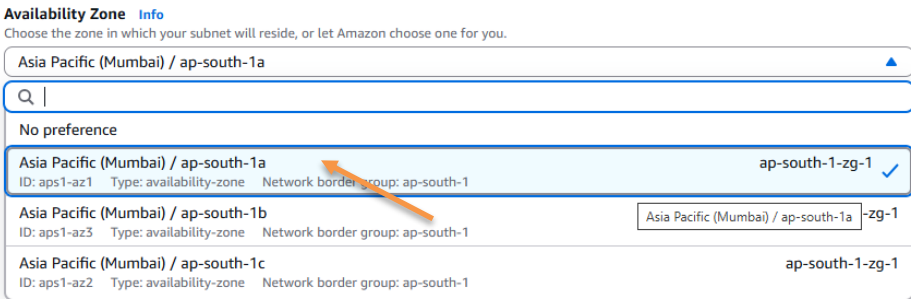
Step 4:

- In “VPC ID”, select the VPC that you just created i.e. “vpc1”.
- Under “Subnet settings”, give a name to your subnet (e.g. “subnet1”).

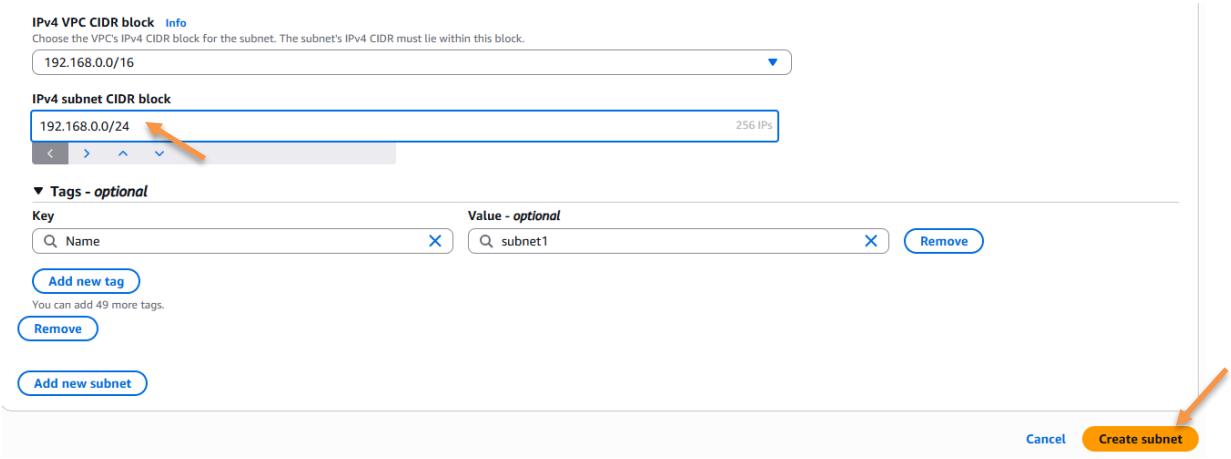




- In “Availability Zone”, select any zone as per your preference.
- I have selected “ap-south-1a”.

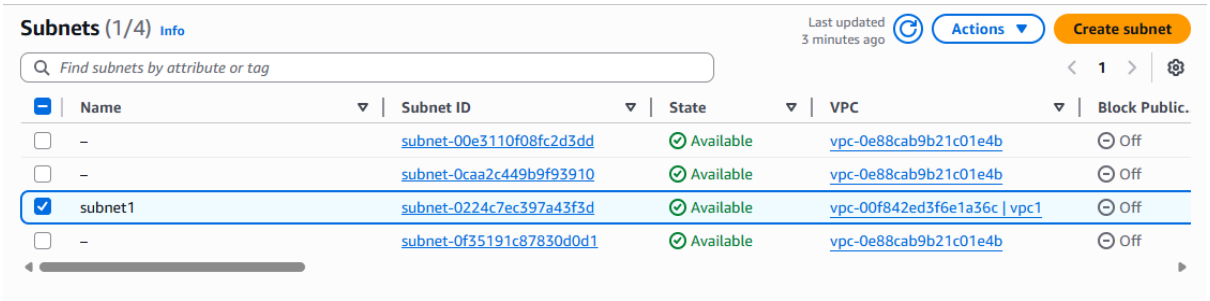


- Leave “IPv4 VPC CIDR block” as it is.
- In “IPv4 subnet CIDR block”, type “192.168.0.0/24”.
- Click on “Create subnet”.



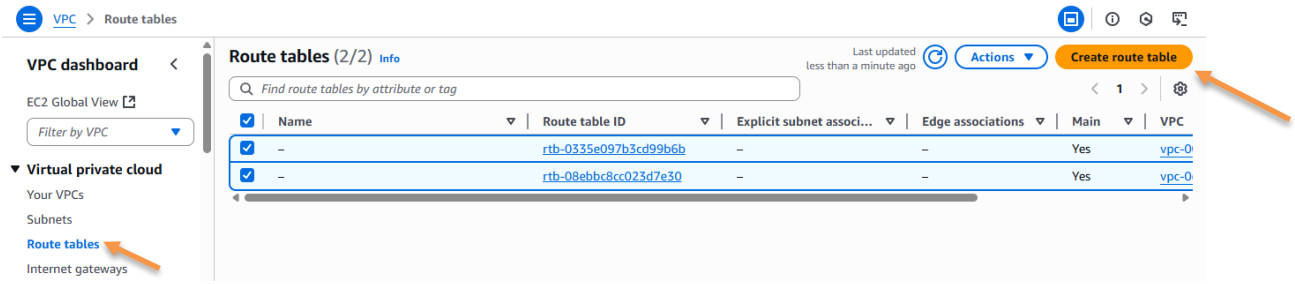
Step 5:

- Your subnet is now created.



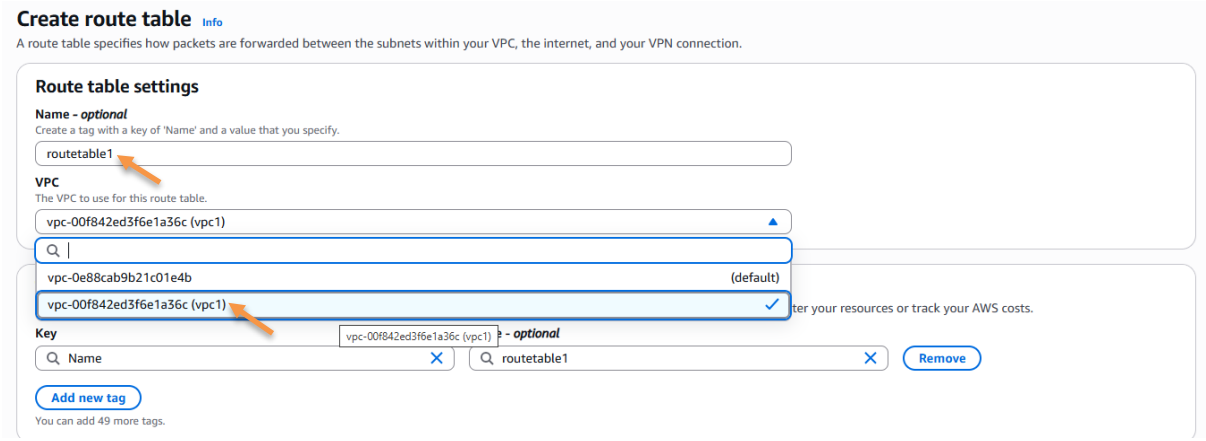
Creating a Route Table:

- Under “Virtual private cloud”, go to “Route tables”.
- There you can see 2 route tables are already created (for Mumbai region only).
- Click on “Create route table”.

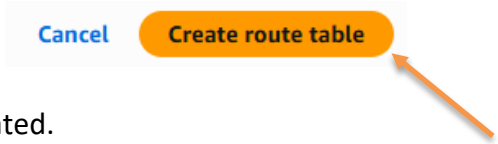


Step 6:

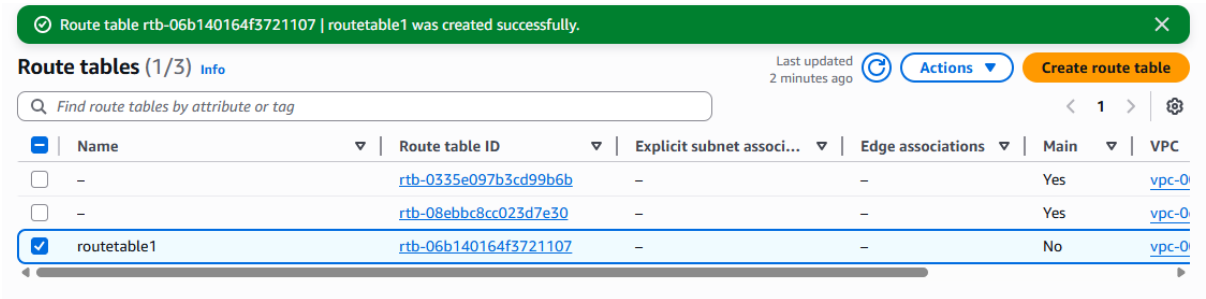
- Give a name to your route table (e.g. “routetable1”).
- In “VPC”, select the VPC that you have created i.e. “vpc1”.



- Click on “Create route table”.



- Your route table is created.

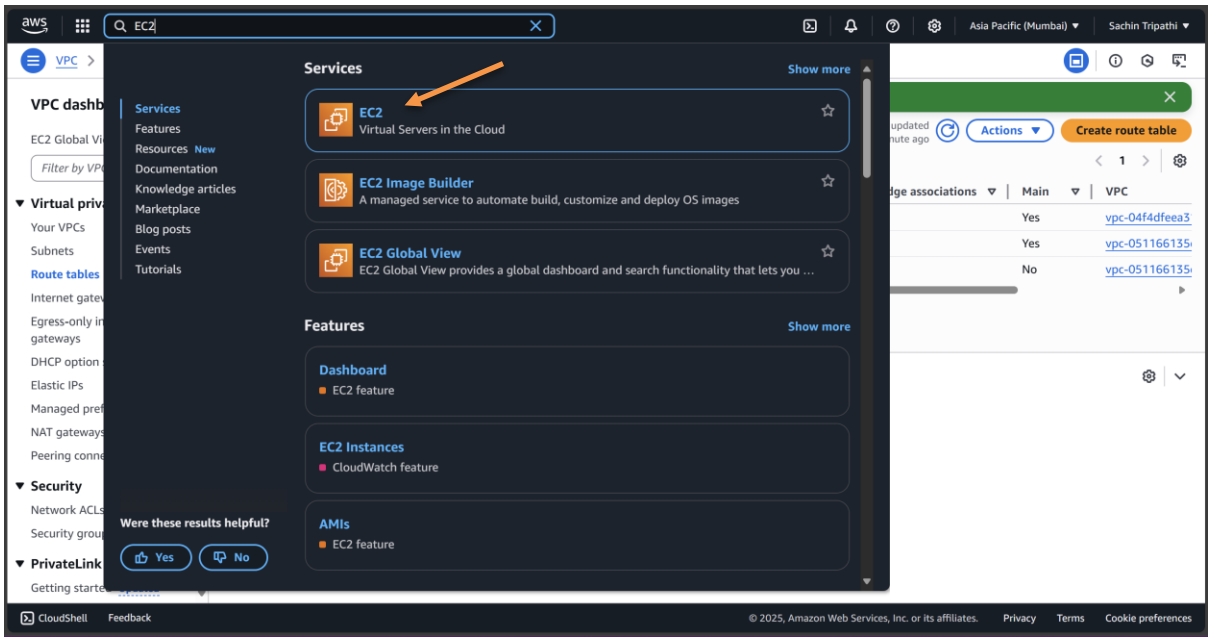


Now Launch an Instance:

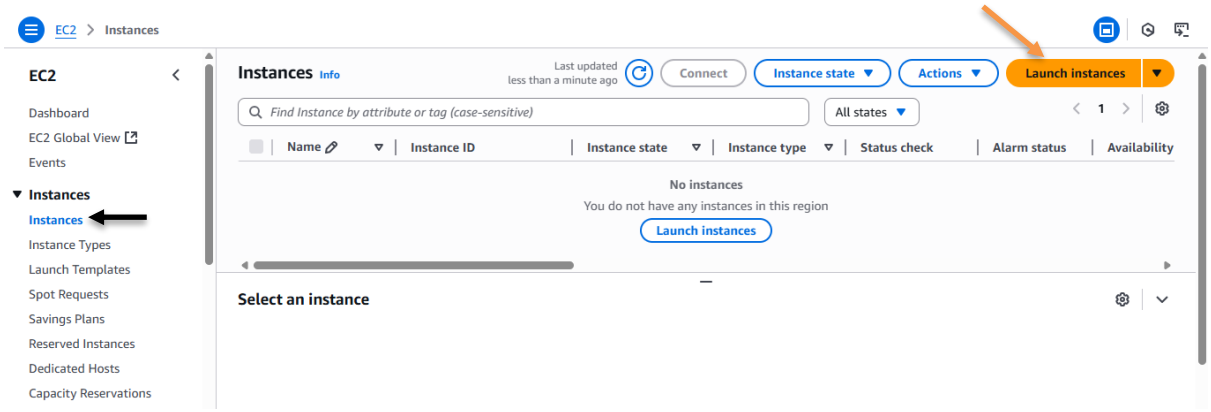
Step 7:

- Now duplicate the tab.

- Search and open “EC2”.

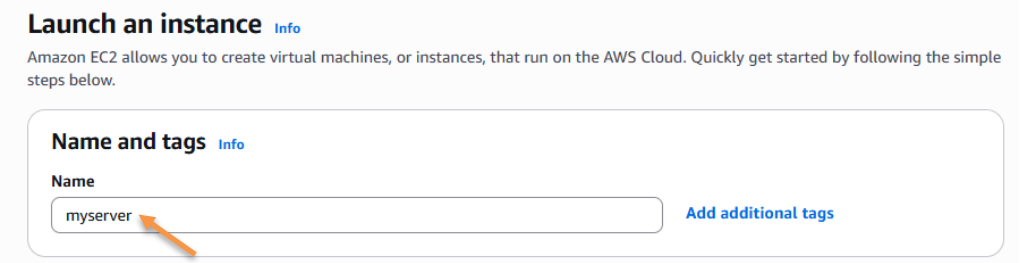


- Under “Instances”, click on “Launch instances”.

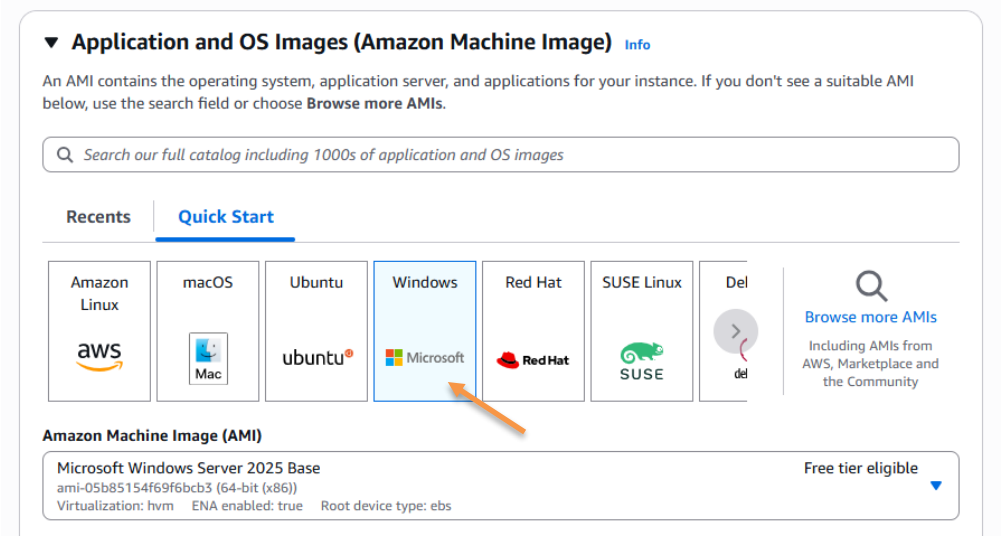


Step 8:

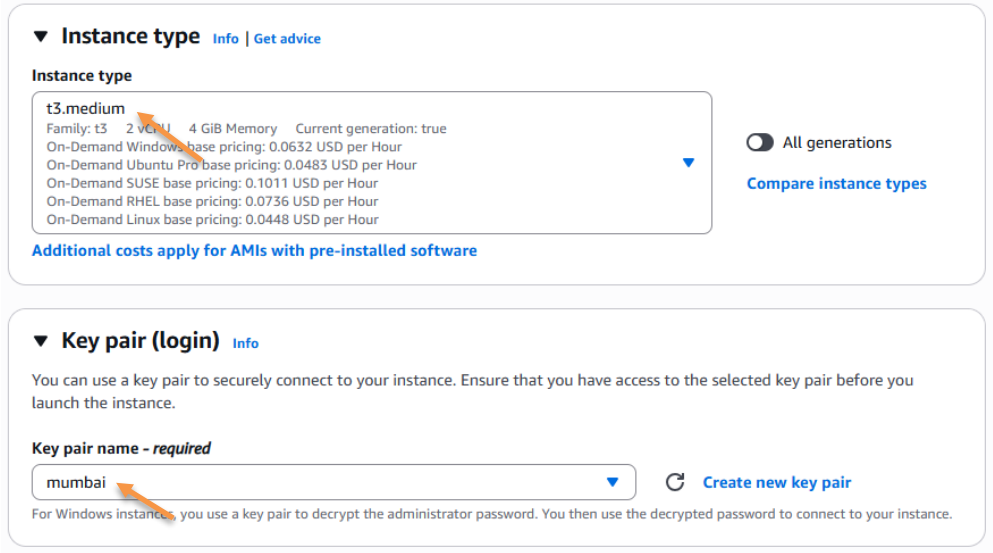
- Give a name to your server.



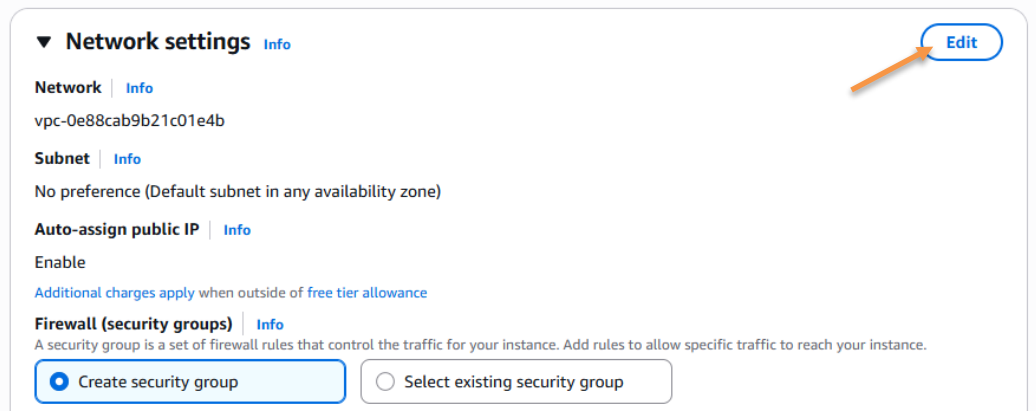
- Select “Windows” under “Application and OS Images (AMI)”.



- Select any instance type as per your preference (e.g. “t3.medium”).
- Select any key pair of Mumbai region (e.g. “mumbai”).

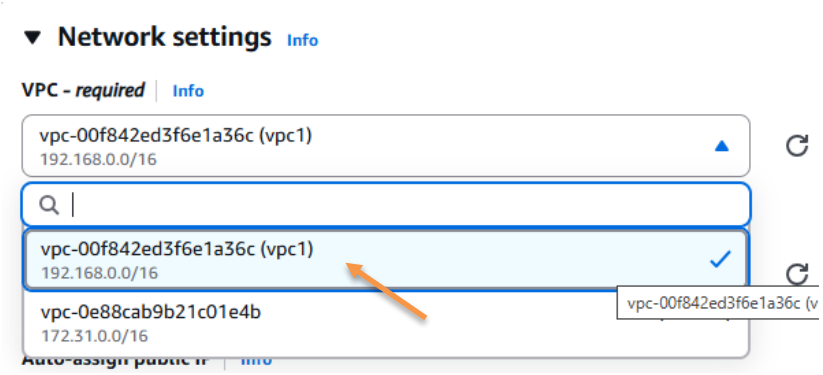


- In “Network settings”, click on “Edit” button.

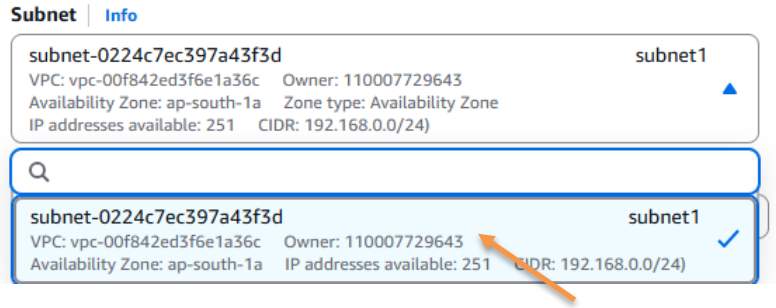


Step 9:

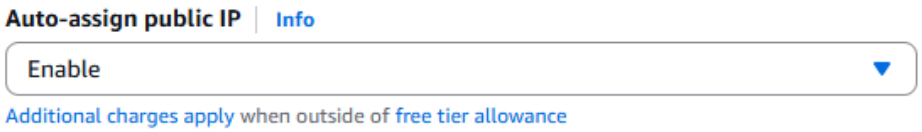
- In “VPC - required”, select “vpc1” that you have created.



- In “Subnet”, select “subnet1” that you have created.

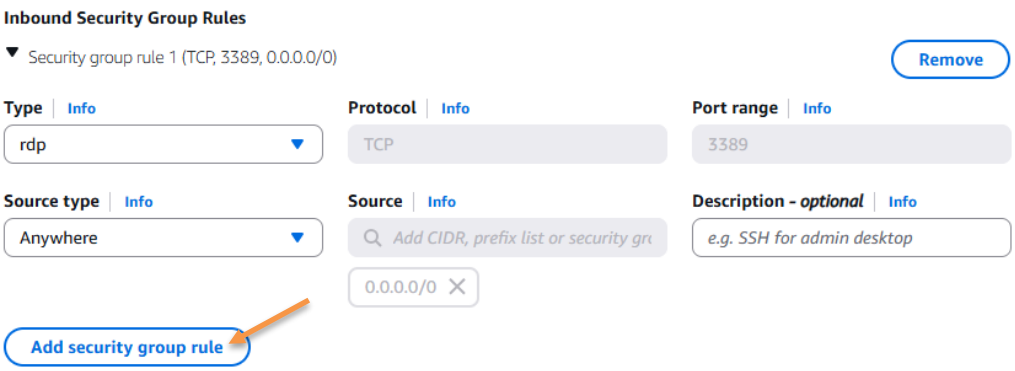


- Select “Enable” option in “Auto-assign public IP”.

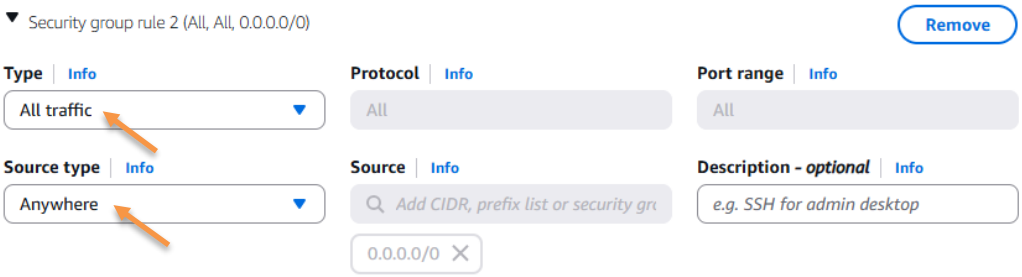


- Give a name to the security group (e.g. “SG1”).

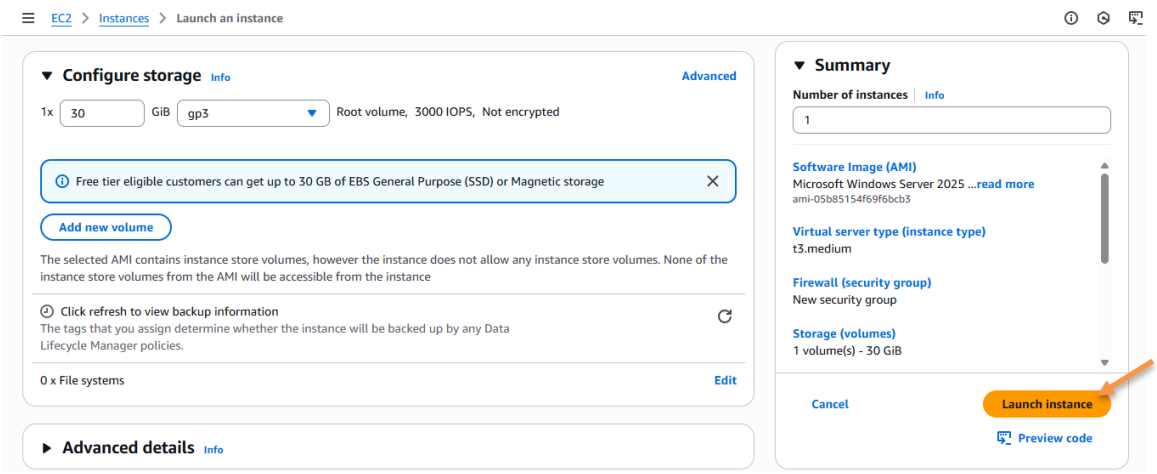
- Under “Inbound Security Group Rules”, leave the first rule as it is i.e. “RDP – Anywhere”.
- Click on “Add security group rule”.



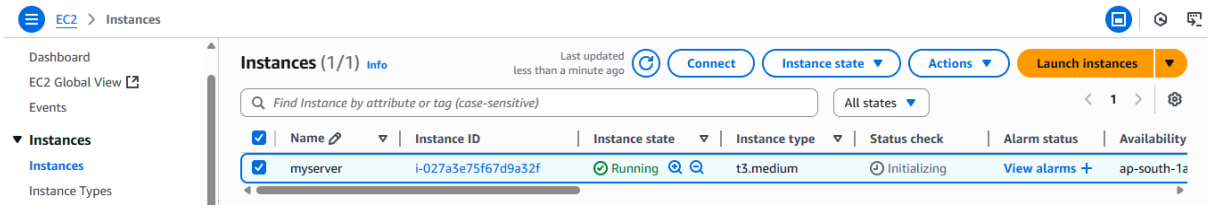
- Add second rule as “All traffic - Anywhere”.



- Leave the other settings as it is and click on “Launch instance”.



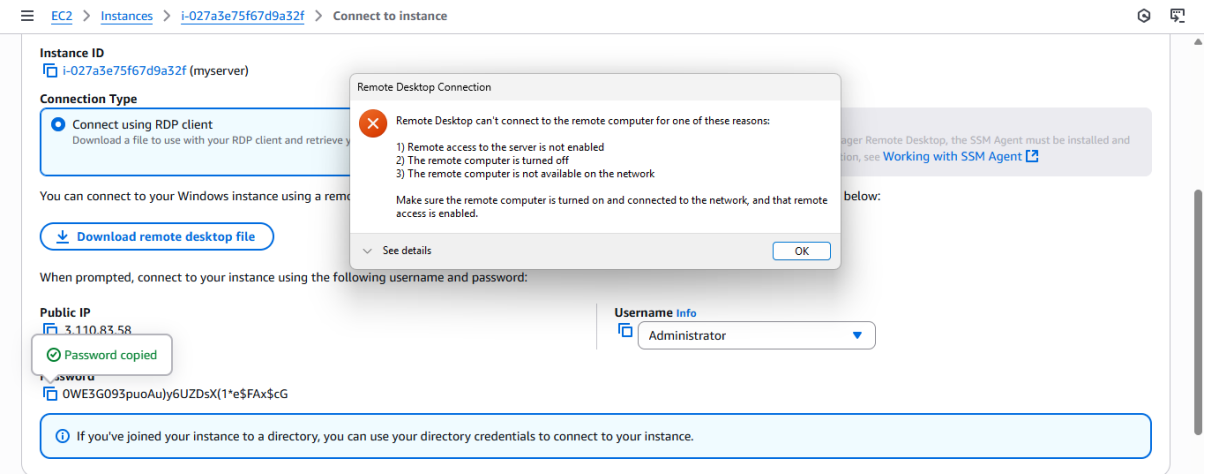
- Your instance is launched and is running.



Step 10:

- Now if you try to connect your instance, it will not be connected.

- To connect an instance, we need to create an internet gateway.



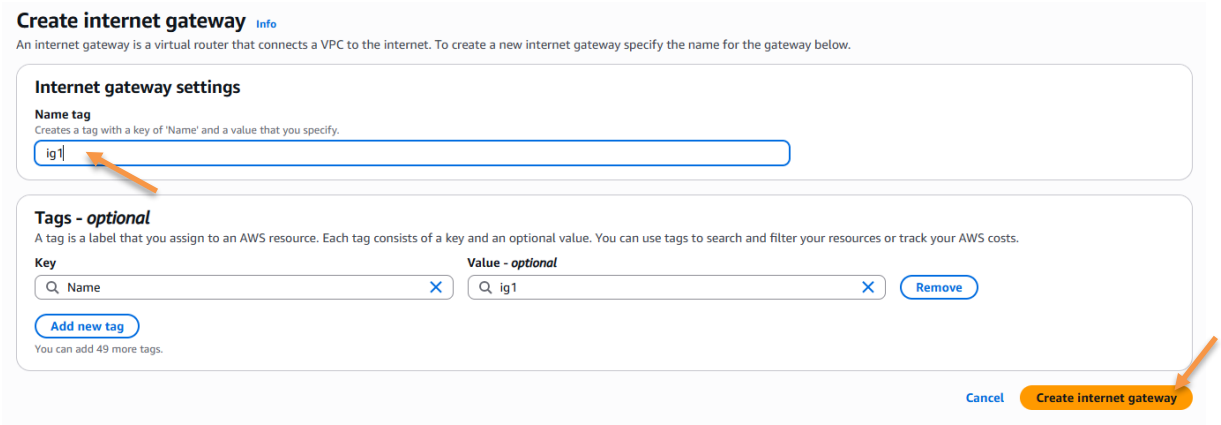
Creating an Internet Gateway:

Step 11:

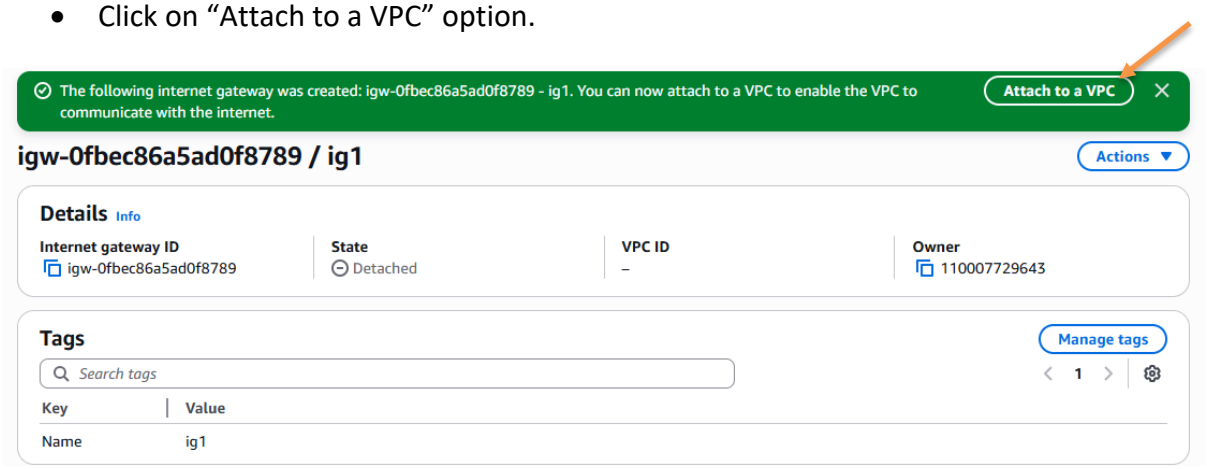
- Go back to “VPC” tab and click on “Internet gateways”.
- There you can see that 1 internet gateway is already created (for Mumbai region only).
- Click on “Create internet gateway”.

Step 12:

- In “Internet gateway settings”, name your internet gateway (e.g. “ig1”).
- Click on “Create internet gateway”.

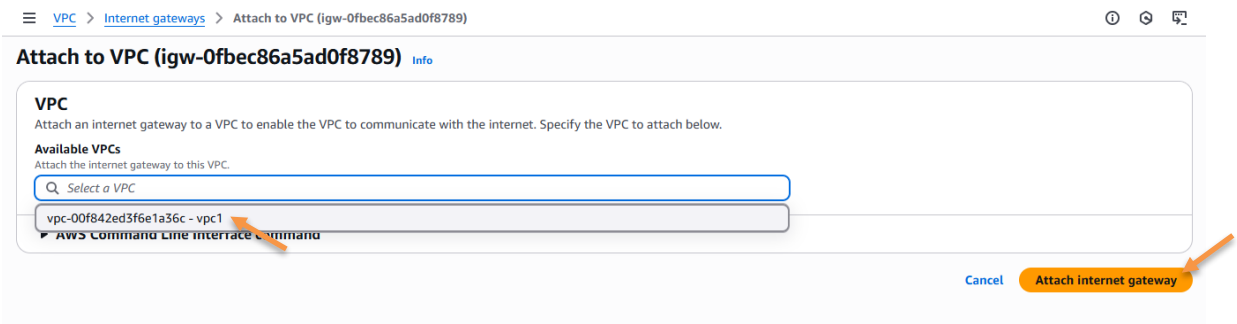


- Your internet gateway is now created.
- Click on “Attach to a VPC” option.

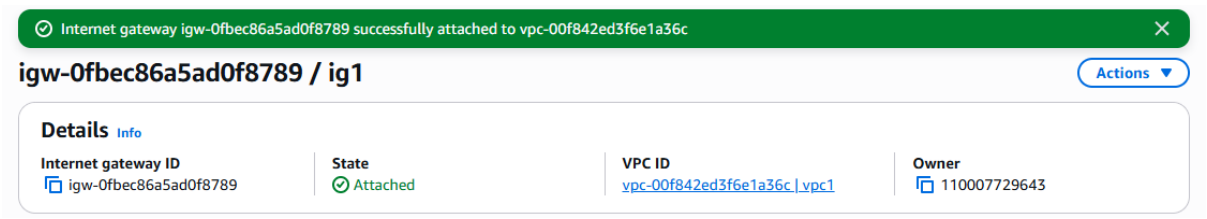


Step 13:

- Under “Available VPCs”, select your VPC i.e. “vpc1”.
- Click on “Attach internet gateway”.

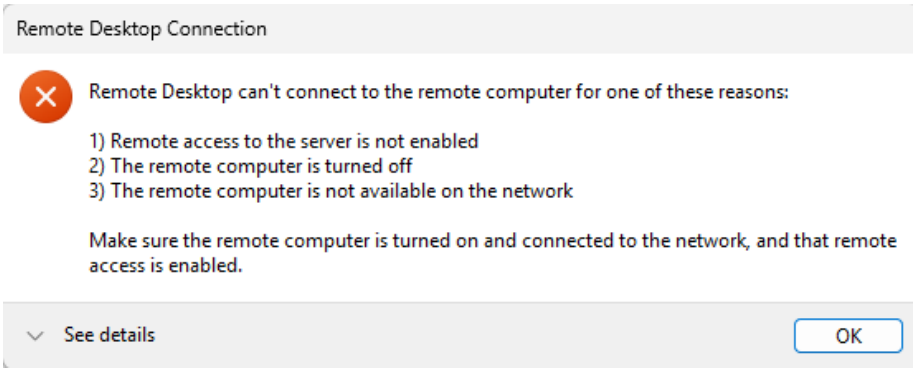


- The internet gateway “ig1” is successfully attached to your VPC “vpc1”.



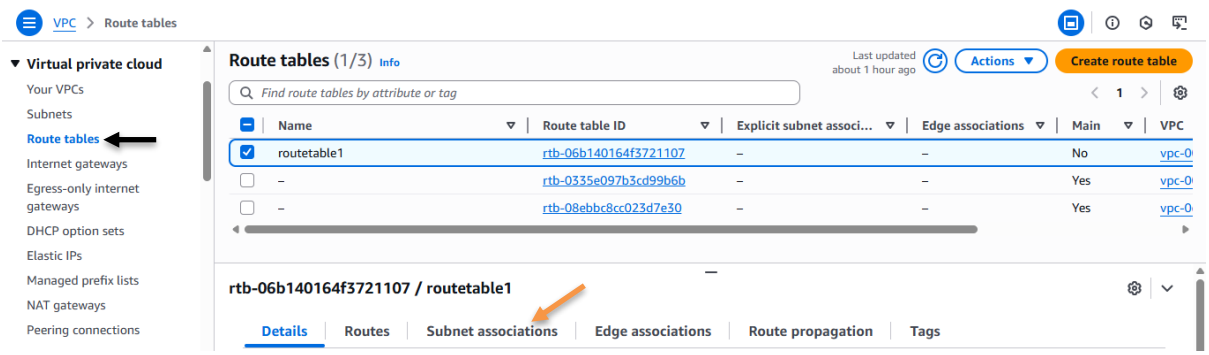
Step 14:

- Go to “EC2” tab and once again, try to connect your instance.
- It still won’t get connected because we have not added rules to the route table yet.



Adding Rules to the Route Table:

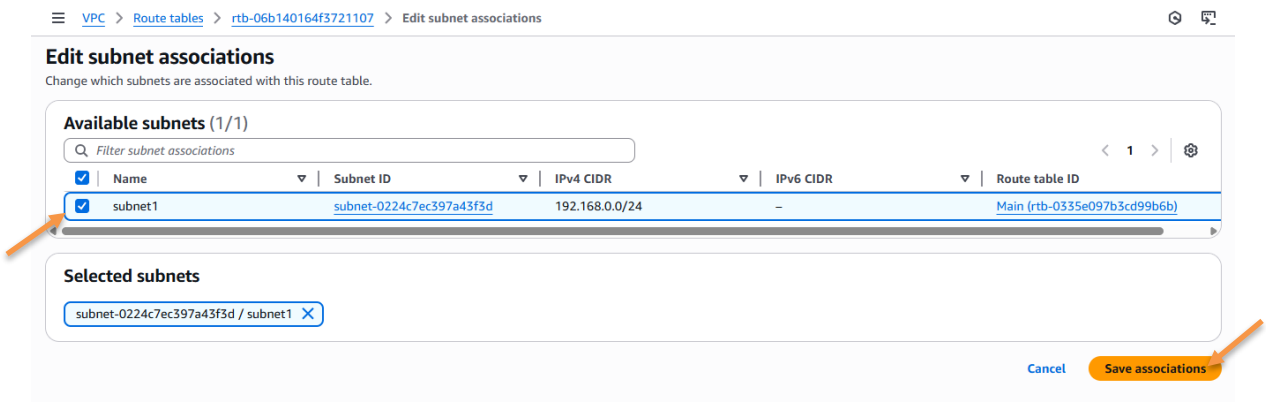
- Again, go back to the “VPC” tab.
- Under “Route tables”, select the route table that you have created.
- From the options below, click on “Subnet associations”.



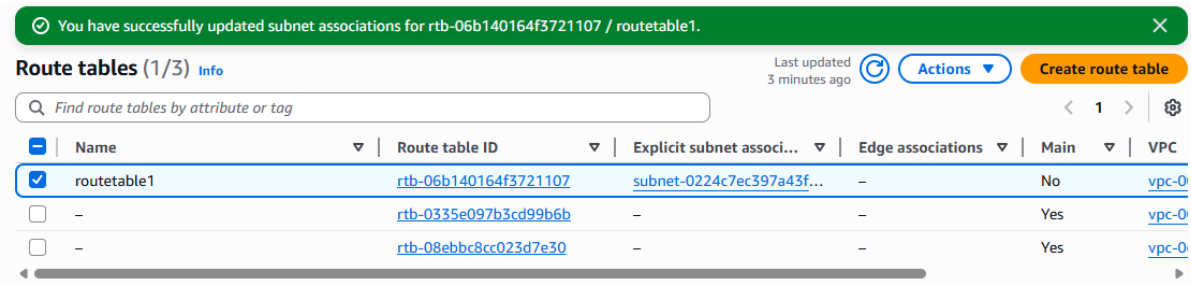
Step 15:

- Now click on “Edit subnet associations” button.

- Under “Available subnets”, select the subnet that you have created i.e. “subnet1”.
- Now click on “Save associations”.

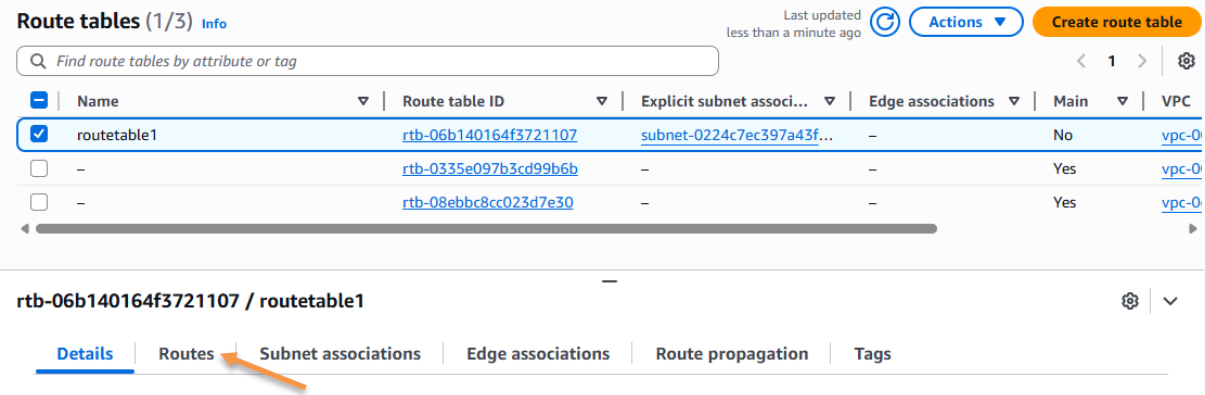


- Subnet association is successfully updated.

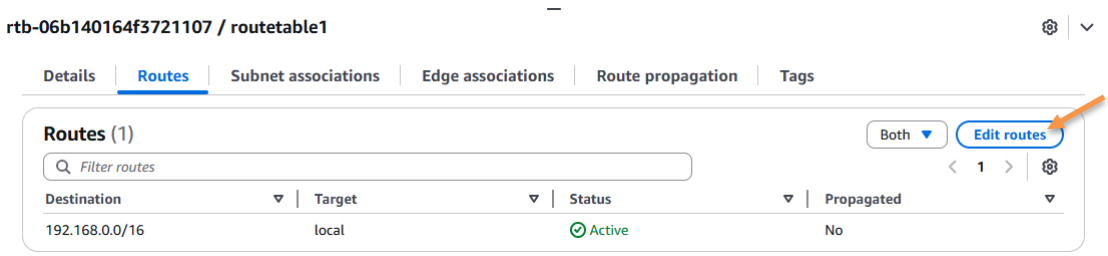


Step 16:

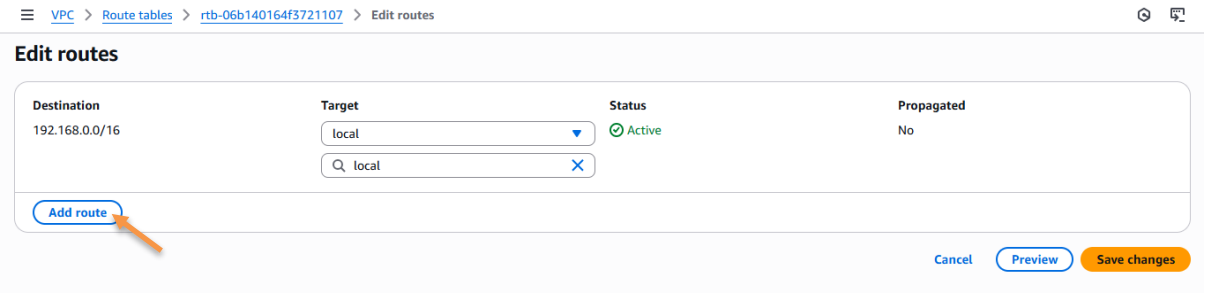
- Again, select the route table that you have created.
- From the options below, click on “Routes”.



- You can see that one route is already added.
- Now click on “Edit routes”.

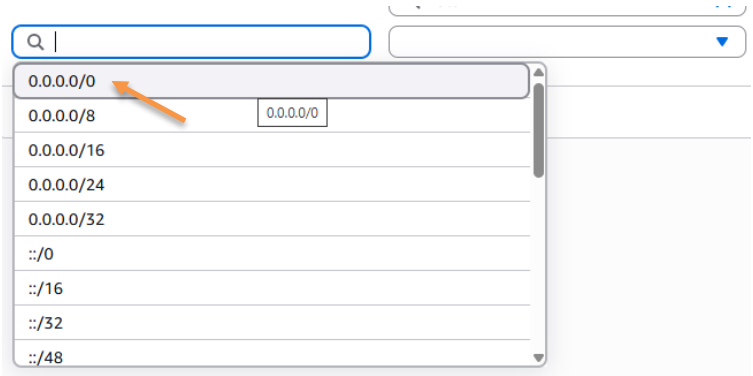


- Click on “Add route” button.

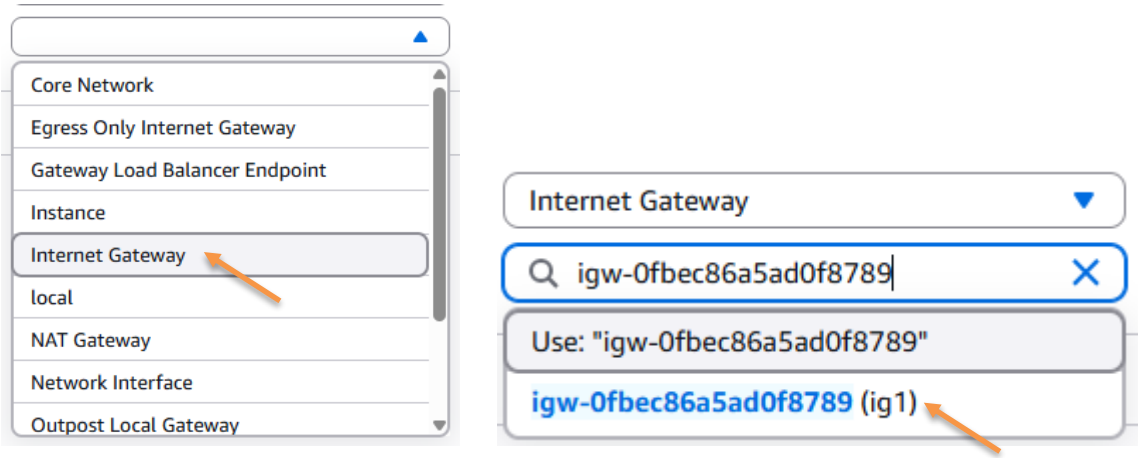


Step 17:

- Add route “0.0.0.0/0” in destination from the options.

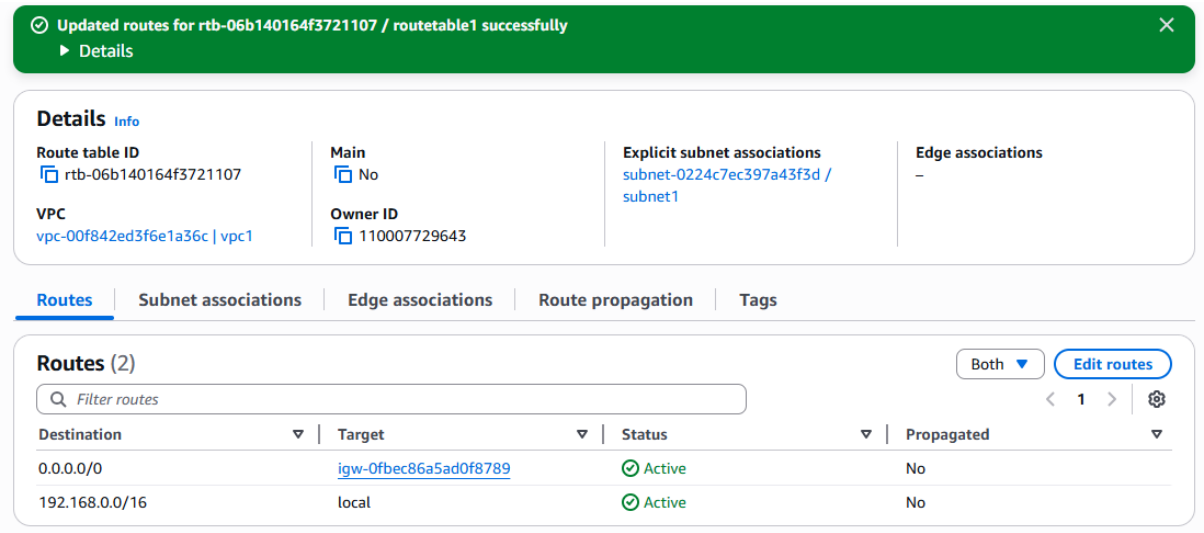


- In “Target”, add “Internet Gateway”.
- Select the internet gateway that you have created.



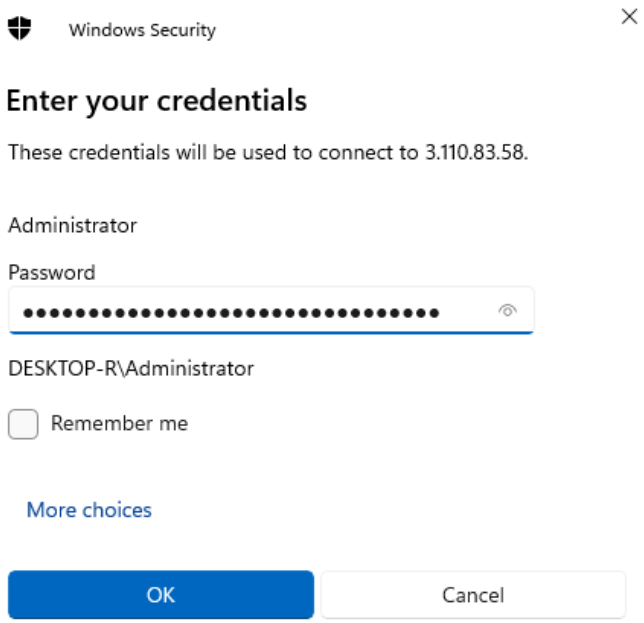
- Click on “Save changes”.

- The routes are now updated for the route table.

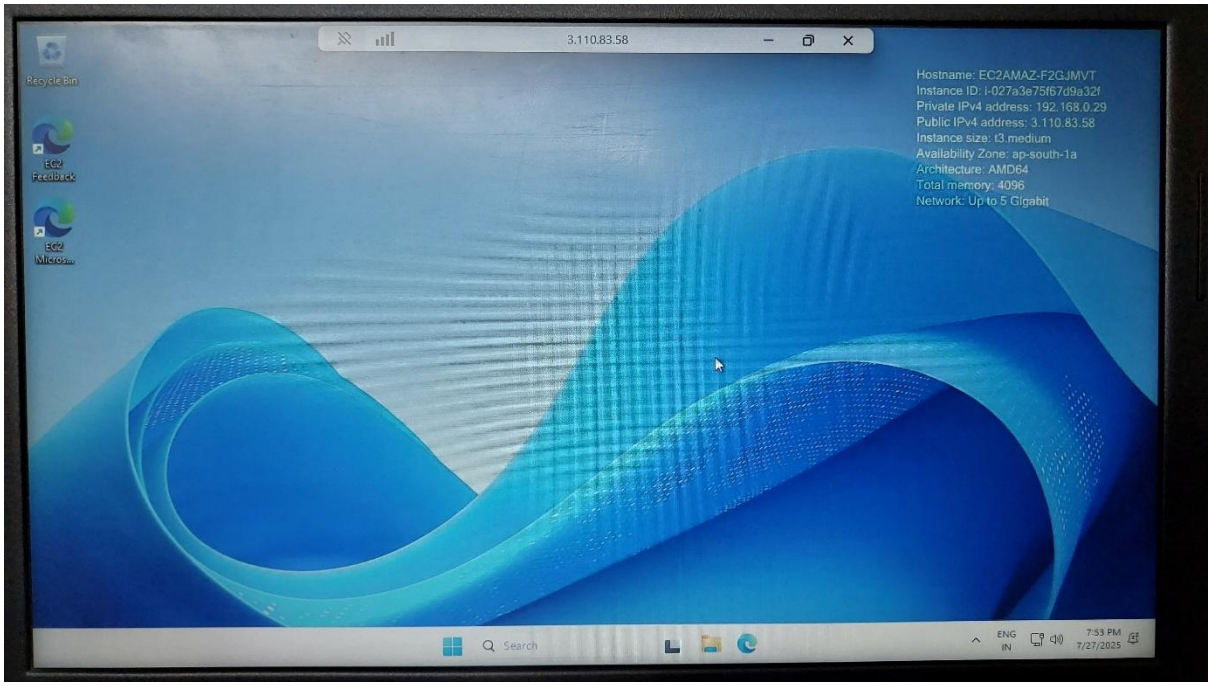


Step 18:

- Go back to “EC2” tab and try to connect your instance again.
- Generate the password as usual, decrypt it and paste there.



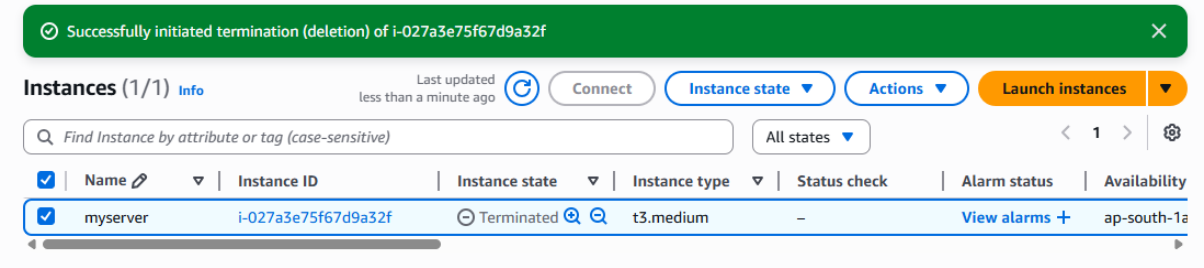
- Click on “OK”.
- Your instance is now connected.
- This shows that if we are creating our own VPC, subnet and route table, then it is necessary to attach them to an internet gateway.
- Only then the server will get connected.



Now terminate your instance:

Step 19:

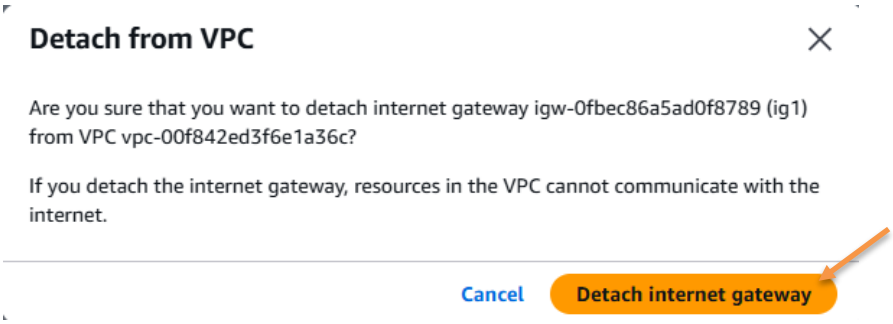
- On the “EC2” tab, go to “Instances” and terminate your instance.



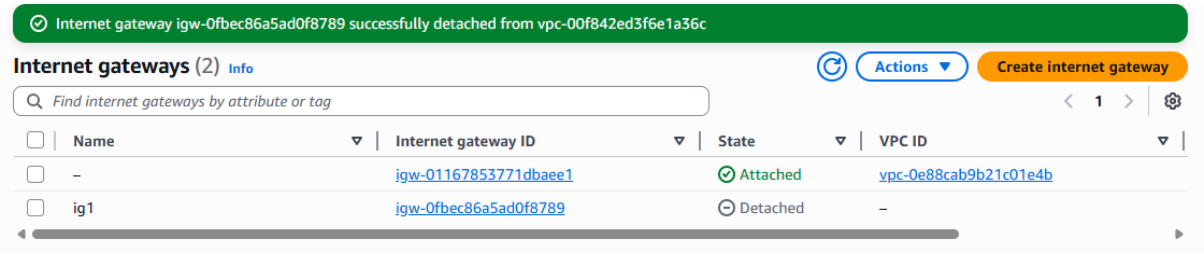
Deleting Internet Gateway:

- Go back to “VPC” tab and under “Internet gateways”, select the internet gateway that you have created.
- Click on “Actions” and then click on “Detach from VPC”.

- Click on “Detach internet gateway”.

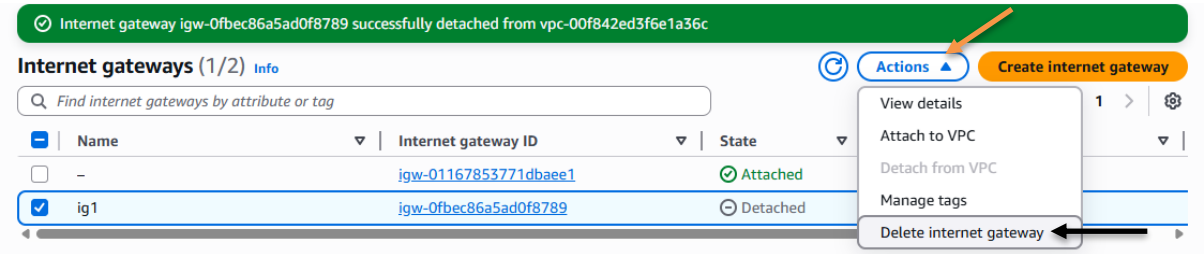


- Your internet gateway is successfully detached.

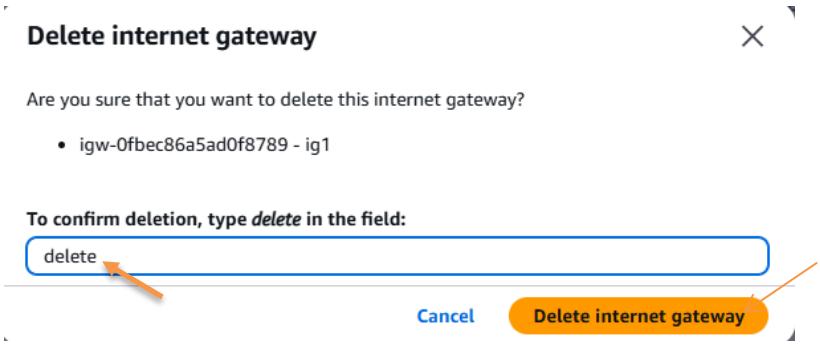


Step 20:

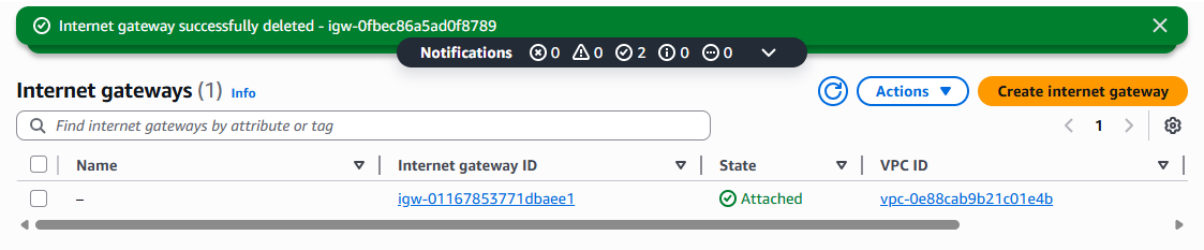
- Now select your internet gateway again and go to “Actions”.
- Click on “Delete internet gateway”.



- Type “delete” and click on “Delete internet gateway”.



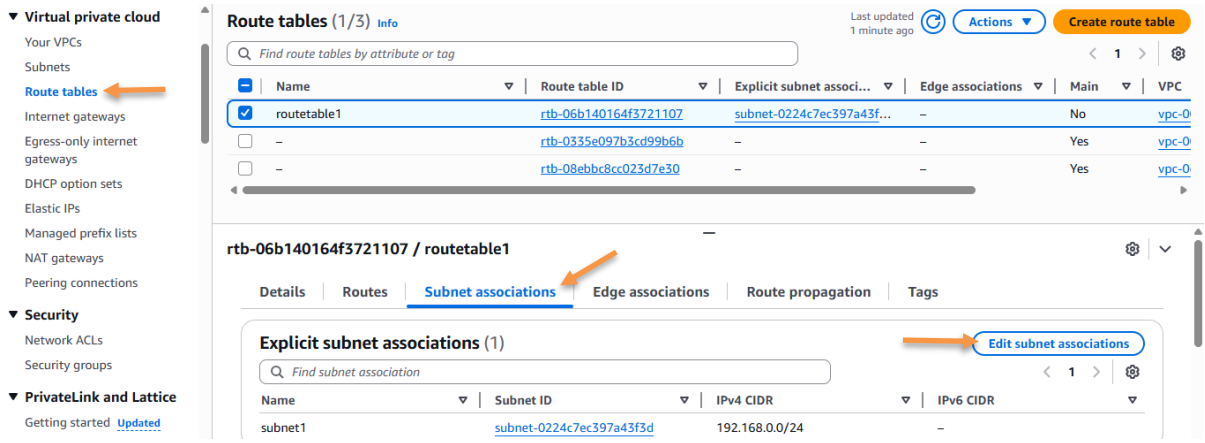
- Your internet gateway is deleted successfully.



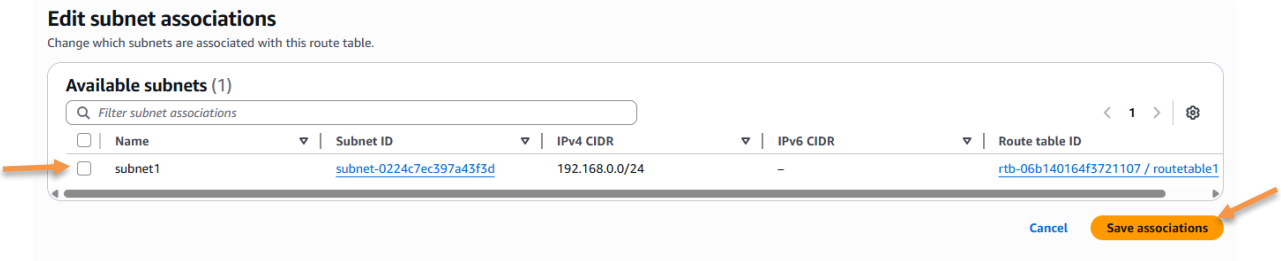
Deleting Route Table:

Step 21:

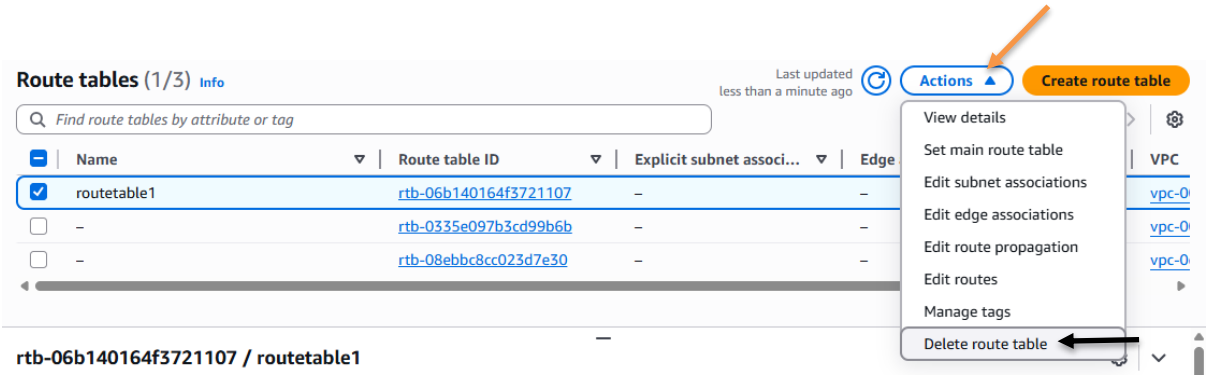
- **Now go to “Route tables” under “Virtual private cloud” and select the route table that you have created.**
- **Go to “Subnet associations” and then click on “Edit subnet associations”.**



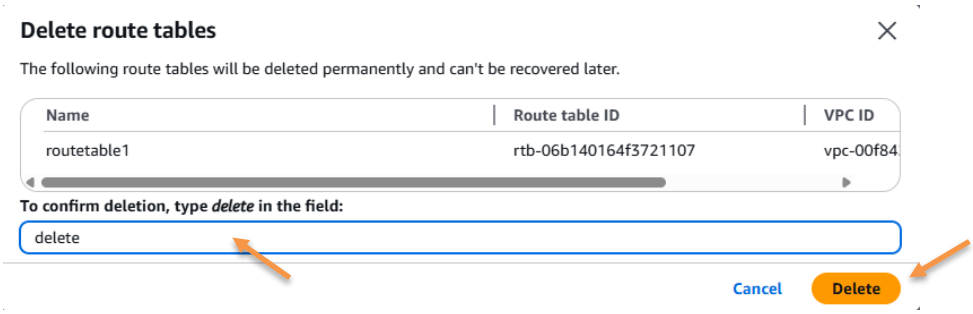
- **Remove “subnet1” from “Available subnets”.**
- **Click on “Save associations”.**



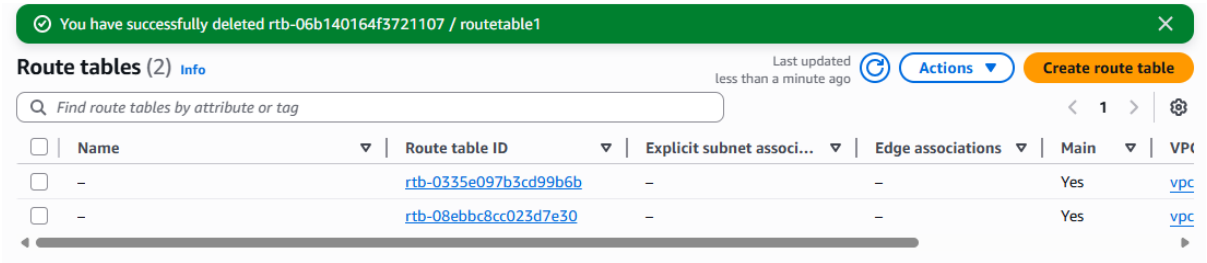
- **Now select the route table and go to “Actions”.**
- **Click on “Delete route table”.**



- **Type “delete” and click on “Delete” button.**



- **Your route table is successfully deleted.**

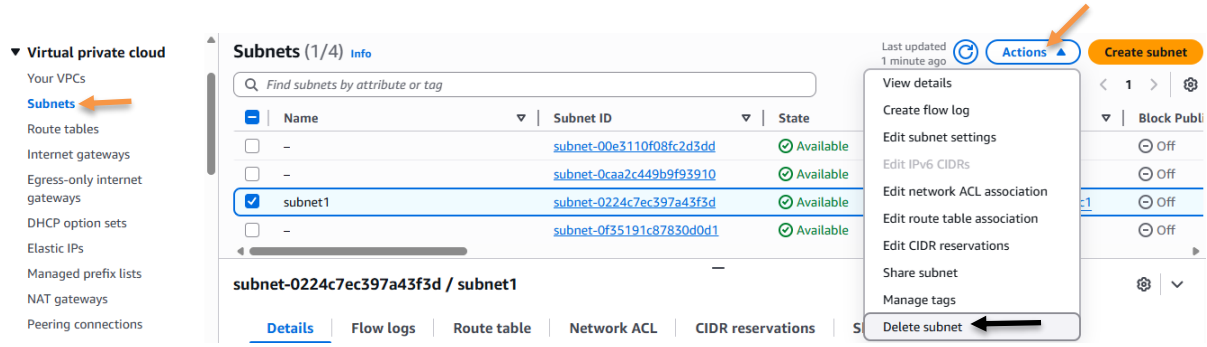


Deleting Subnet:

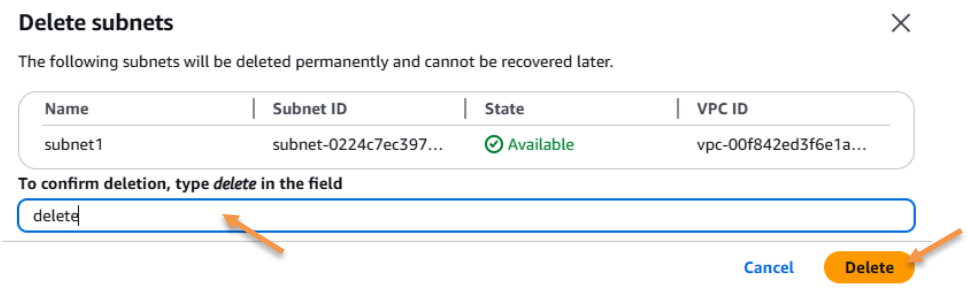
Step 22:

- **Go to “Subnets” under “Virtual private cloud” and select the subnet that you have created.**

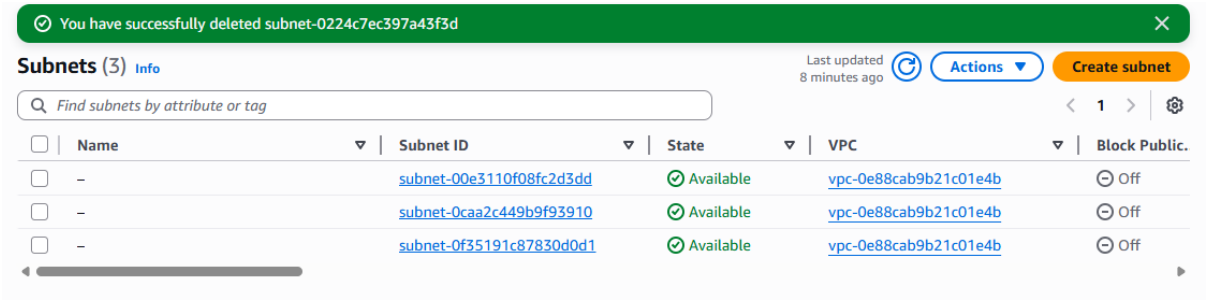
- **Click on “Actions” and then click on “Delete subnet”.**



- **Type “delete” and click on “Delete” button.**



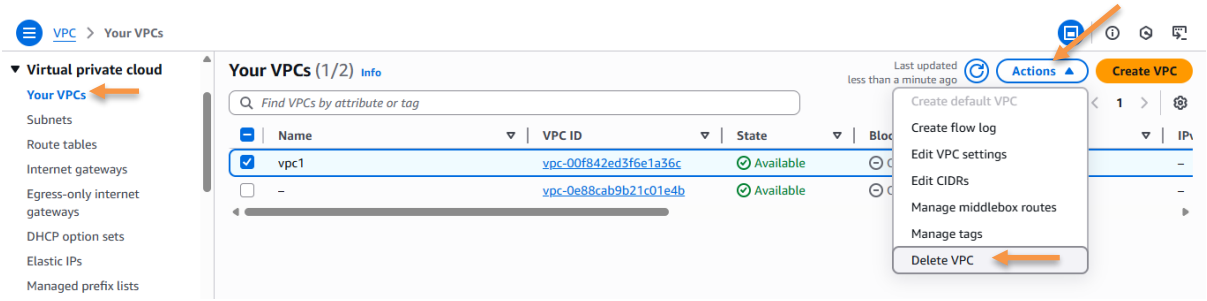
- **Your subnet is successfully deleted.**



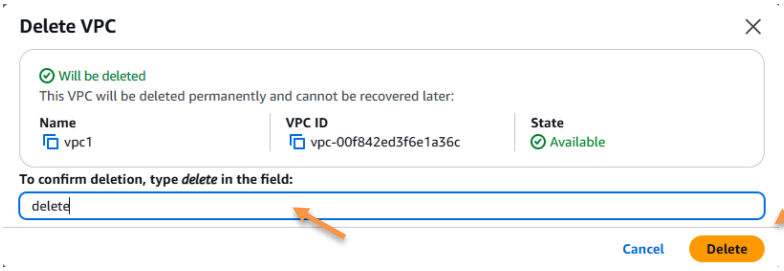
Deleting VPC:

Step 23:

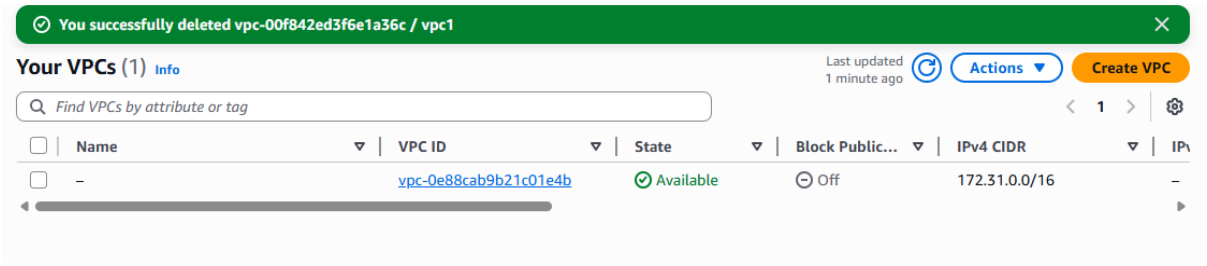
- **Go to “Your VPCs” under “Virtual private cloud” and select the VPC that you have created.**
- **Click on “Actions” and then click on “Delete VPC”.**



- **Type “delete” and click on “Delete” button.**



- **Your VPC is also deleted successfully.**



Some Important Terms:

"Subnet"

- **A "Subnet" is a smaller part of a VPC that divides the network into sections.**
- **It helps organize and isolate resources within the VPC.**
- **You can have public and private subnets based on internet access.**

"CIDR" (Classless Inter-Domain Routing)

- **"CIDR" defines the IP address range for your VPC and subnets.**
- **It uses a format like "192.168.0.0/16" to show how many IPs are available.**
- **It helps in managing IP allocation and network size.**

"Internet Gateway"

- **An "Internet Gateway" allows communication between resources in a VPC and the internet.**
- **It is attached to the VPC and linked with public subnets.**

- **Without it, instances cannot send or receive data from the internet.**

“Route Table”

- **A “Route Table” contains rules (routes) that decide where network traffic goes.**
- **Each subnet in a VPC must be linked to a route table.**
- **It helps control traffic flow between subnets and to the internet.**

“Security Groups”

- **“Security Groups” act like virtual firewalls for your instances.**
- **They control incoming and outgoing traffic based on rules you define.**
- **They are stateful, meaning allowed return traffic is automatically permitted.**