# BUILDING A CONNECTED CLOUD NETWORK IN AWS

*A report submitted in partial fulfilment of the requirements for the Award of a Degree of*

**BACHELOR OF TECHNOLOGY**

**in**

**ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

**By**

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**21B91A54E4**

**Under Supervision of Mr. GURU SANTHOSH (Trainer name)**

**Blackbuck Engineers Pvt. Ltd, Road No 36, Jubilee Hills, Hyderabad**

**(Duration: 5th July 2023 to 5th September 2023)**


DEPARTMENT OF INFORMATION TECHNOLOGY

S.R.K.R. ENGINEERING COLLEGE

(Autonomous)

SRKR MARG, CHINNA AMIRAM, BHIMAVARAM-534204, A.P

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(Affiliated to JNTU, KAKINADA)

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF INFORMATION TECHNOLOGY


# CERTIFICATE

This is to certify that the Summer Internship Report titled "BUILDING A CONNECTED CLOUD NETWORK IN AWS" is the bonafide work done by Mr. Penugonda Sri Ram Karthik bearing Register Number 21B91A54E4 at the end of second year second semester at Blackbuck Engineers Pvt. Ltd, Road No 36, Jubilee Hills, Hyderabad

from 5th July 2023 to 5th September 2023 in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology in Information Technology.

**Department Internship Coordinator** **Dean -T & P Cell** **Head of the Department**

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BLACKBUCK ENGINEERS

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# Internship Certificate

**Certificate ID: BB231NT00659** **Issued Date: 9th September 2023**

**To Whom It May Concern**

This is to certify that **PENUGONDA SRI RAM KARTHIK** bearing **Reg No: 21B91A54E4** has successfully completed an internship at **Blackbuck Engineers Pvt Ltd** Hyderabad from **5th July 2023 to 5th September 2023.**

He/She has worked on a project titled **BUILDING A CONNECTED CLOUD NETWORK IN AWS** by learning and incorporating Amazon Web Services concepts under the supervision of our project mentor.

We found that he/she is sincere, hardworking, technically sound and result oriented. He/She worked well as part of a team during his tenure.

We wish him/her all the best for his/her future endeavors.

Best regards,

Kathyayani

**Kathyayani. R**
Project Head

Mounika

**Mounika Bezawada**
**HR Manager**

## BLACKBUCK INTERNSHIP WORK

### Title:

# Building a connected cloud network in AWS.

### Abstract:

The "Connected Cloud Network" project aims to create a robust and scalable cloud network infrastructure within the Amazon Web Services (AWS) ecosystem. This network will facilitate seamless communication and data exchange between various resources and services hosted on AWS, providing a secure and efficient environment for applications and systems to interact with each other. The successful completion of this project will result in a fully operational and secure connected cloud network, empowering organizations to leverage AWS's capabilities effectively for their applications and services.

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## Services used:

- EC2 (Elastic Compute Cloud)
- VPC (Virtual Private Cloud)
- IAM (Identity and Access Management)

### Description:

The "Connected Cloud Network" project aims to create a robust and scalable cloud network infrastructure within the Amazon Web Services (AWS) ecosystem. This network will facilitate seamless communication and data exchange between various resources and services hosted on AWS, providing a secure and efficient environment for applications and systems to interact with each other. The successful completion of this project will result in a fully operational and secure connected cloud network, empowering organizations to leverage AWS's capabilities effectively for their applications and service.

## Cloud computing

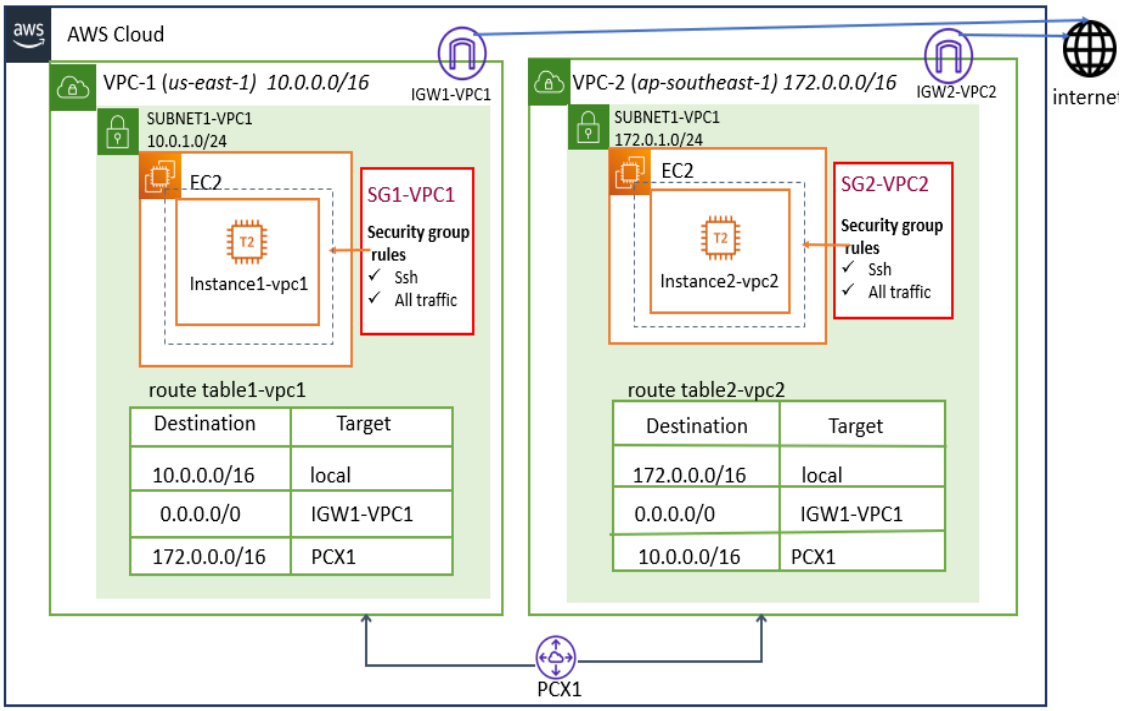
Cloud computing is on-demand access, via the internet, to computing resources—applications, servers (physical servers and virtual servers), data storage, development tools, networking capabilities, and more—hosted at a remote data center managed by a cloud services provider (or CSP). The CSP makes these resources available for a monthly subscription fee or bills them according to usage.

## Cloud Computing Services:

- IaaS (Infrastructure-as-a-Service)
- PaaS (Platform-as-a-Service)
- SaaS (Software-as-a-service)

are the three most common models of cloud services, and it's not uncommon for an organization to use all three.

## ARCHITECTURE:




## IaaS (Infrastructure-as-a-Service)

IaaS provides on-demand access to fundamental computing resources—physical and virtual servers, networking, and storage—over the internet on a pay-as-you-go basis. IaaS enables end users to scale and shrink resources on an as-needed basis, reducing the need for high, up-front capital expenditures or unnecessary on-premises or 'owned' infrastructure and for overbuying resources to accommodate periodic spikes in usage.

In contrast to SaaS and PaaS (and even newer PaaS computing models such as containers and serverless), IaaS provides the users with the lowest-level control of computing resources in the cloud.

IaaS was the most popular cloud computing model when it emerged in the early 2010s. While it remains the cloud model for many types of workloads, use of SaaS and PaaS is growing at a much faster rate

## PaaS (Platform-as-a-service)

PaaS provides software developers with on-demand platform—hardware, complete software stack, infrastructure, and even development tools—for running, developing, and managing applications without the cost, complexity, and inflexibility of maintaining that platform on-premises.

With PaaS, the cloud provider hosts everything—servers, networks, storage, operating system software, middleware, databases—at their data center. Developers simply pick from a menu to 'spin up' servers and environments they need to run, build, test, deploy, maintain, update, and scale applications.

Today, PaaS is often built around containers, a virtualized compute model one step removed from virtual servers. containers virtualize the operating system, enabling developers to package the application with only the operating system services it needs to run on any platform, without modification and without need for middleware.

## SaaS (Software-as-a-Service)

SaaS—also known as cloud-based software or cloud applications—is application software that's hosted in the cloud, and that user's access via a web browser, a dedicated desktop client, or an API that integrates with a desktop or mobile operating system. In most cases, SaaS users pay a monthly or annual subscription fee; some may offer 'pay-as-you-go' pricing based on your actual usage.

In addition to the cost savings, time-to-value, and scalability benefits of cloud, SaaS offers the following:

- **Automatic upgrades:** With SaaS, users take advantage of new features as soon as the provider adds them, without having to orchestrate an on-premises upgrade.

- **Protection from data loss:** Because SaaS stores application data in the cloud with the application, users don't lose data if their device crashes or breaks.

SaaS is the primary delivery model for most commercial software today—there are hundreds of thousands of SaaS solutions available, from the most focused industry and departmental applications to powerful enterprise software database and AI (artificial intelligence) software.

## Cloud Service Providers:

- Amazon Web Services
- Microsoft Azure
- Google Cloud Platform
- Oracle
- IBM cloud
- Salesforce

## Amazon Web Services:

Amazon Web Services, Inc. (AWS) is a subsidiary of Amazon that provides on-demand cloud computing platforms and APIs to individuals, companies, and governments, on a metered, pay-as-you-go basis. Oftentimes, clients will use this in combination with autoscaling (a process that allows a client to use more computing in times of high application usage, and then scale down to reduce costs when there is less traffic). These cloud computing web services provide various services related to networking, computing, storage, middleware, IoT and other processing capacity, as well as software tools via AWS server farms. This frees clients from managing, scaling, and patching hardware, and operating systems.

One of the foundational services is Amazon Elastic Compute Cloud (EC2), which allows users to have at their disposal a virtual cluster of computers, with extremely high availability, which can be interacted with over the internet via REST APIs, a CLI or the AWS console. AWS's virtual computers emulate most of the attributes of a real computer, including hardware central processing units (CPUs) and graphics processing units (GPUs) for processing; local/RAM memory; hard disk /SSD storage; a choice of operating systems; networking; and pre-loaded application software such as web servers, databases, and customer relationship management (CRM).

AWS services are delivered to customers via a network of AWS server farms located throughout the world. Fees are based on a combination of usage (known as a "Pay-as-you-go" model), hardware, operating system, software, or networking features chosen by the subscriber required availability, redundancy, security, and service options. Subscribers can pay for a single virtual AWS computer, a dedicated physical computer, or clusters of either.

Amazon provides select portions of security for subscribers (e.g., physical security of the data centers) while other aspects of security are the responsibility of the subscriber (e.g., account management, vulnerability scanning, patching). AWS operates for many global geographical regions including seven in North America.

Amazon markets AWS to subscribers as a way of obtaining large-scale computing capacity more quickly and cheaply than building an actual physical server farm. All services are billed based on usage, but each service measures usage in varying ways. As of 2021 Q4, AWS has 33% market share for cloud infrastructure while the next two competitors Microsoft Azure and Google Cloud have 21%, and 10% respectively, according to Synergy Grou

## List of AWS Services:

Amazon, the preeminent cloud vendor, broke new ground by establishing the first cloud computing service, Amazon EC2, in 2008. AWS offers more solutions and features than any other provider and has free tiers with access to the AWS Console, where users can centrally control their ministrations.
Designed around ease-of-use for various skill sets, AWS is tailored for those unaccustomed to software development utilities. Web applications can be deployed in minutes with AWS facilities, without provisioning servers or writing additional code.

- Amazon EC2 (Elastic Compute Cloud)
- Amazon RDS (Relational Database Services)
- Amazon S3 (Simple Storage Service)
- Amazon Lambda
- Amazon Cognito
- Amazon Glacier
- Amazon SNS (Simple Notification Service)
- Amazon VPC (Virtual Private Cloud)
- Amazon Lightsail
- Amazon CloudWatch
- Amazon Cloud9
- Amazon Elastic Beanstalk
- Amazon CodeCommit
- Amazon IAM (Identity and Access Management)
- Amazon Inspector
- Amazon Kinesis
- Amazon Dynamo DB
- Amazon Codecatalyst
- Amazon Kinesis
- AWS Athena
- AWS Amplify
- AWS Quicksight
- AWS Cloudformation

## Amazon EC2:

Amazon Elastic Compute Cloud (EC2) is a part of Amazon.com's cloud- computing platform, Amazon Web Services (AWS), that allows users to rent virtual computers on which to run their own computer applications. EC2 encourages scalable deployment of applications by providing a web service through which a user can boot an Amazon Machine Image (AMI) to configure a virtual machine, which Amazon calls an "instance", containing any software desired. A user can create, launch, and terminate server- instances as needed, paying by the second for active servers – hence the term "elastic". EC2 provides users with control over the geographical location of instances that allows for latency optimization and high levels of redundancy. In November 2010, Amazon switched its own retail website platform to EC2 and AWS.

## Amazon RDS:

**Amazon Relational Database Service** (or **Amazon RDS**) is a distributed relational database service by Amazon Web Services (AWS). It is a web service running "in the cloud" designed to simplify the setup, operation, and scaling of a relational database for use in applications. Administration processes like patching the database software, backing up databases and enabling point-in-time recovery are managed automatically. Scaling storage and compute resources can be performed by a single API call to the AWS control plane on-demand. AWS does not offer an SSH connection to the underlying virtual machine as part of the managed service.

## Amazon VPC:

Amazon Virtual Private Cloud (VPC) is a commercial cloud computing service that provides a virtual private cloud, by provisioning a logically isolated section of Amazon Web Services (AWS) Cloud. Enterprise customers are able to access the Amazon Elastic Compute Cloud (EC2) over an IPsec based virtual private network. Unlike traditional EC2 instances which are allocated internal and external IP numbers by Amazon, the customer can assign IP numbers of their choosing from one or more subnets.

## Amazon S3:

Amazon S3 manages data with an object storage architecture which aims to provide scalability, high availability, and low latency with high durability. The basic storage units of Amazon S3 are objects which are organized into buckets. Each object is identified by a unique, user-assigned key. Buckets can be managed using the console provided by Amazon S3, programmatically with the AWS SDK, or the REST application programming interface.

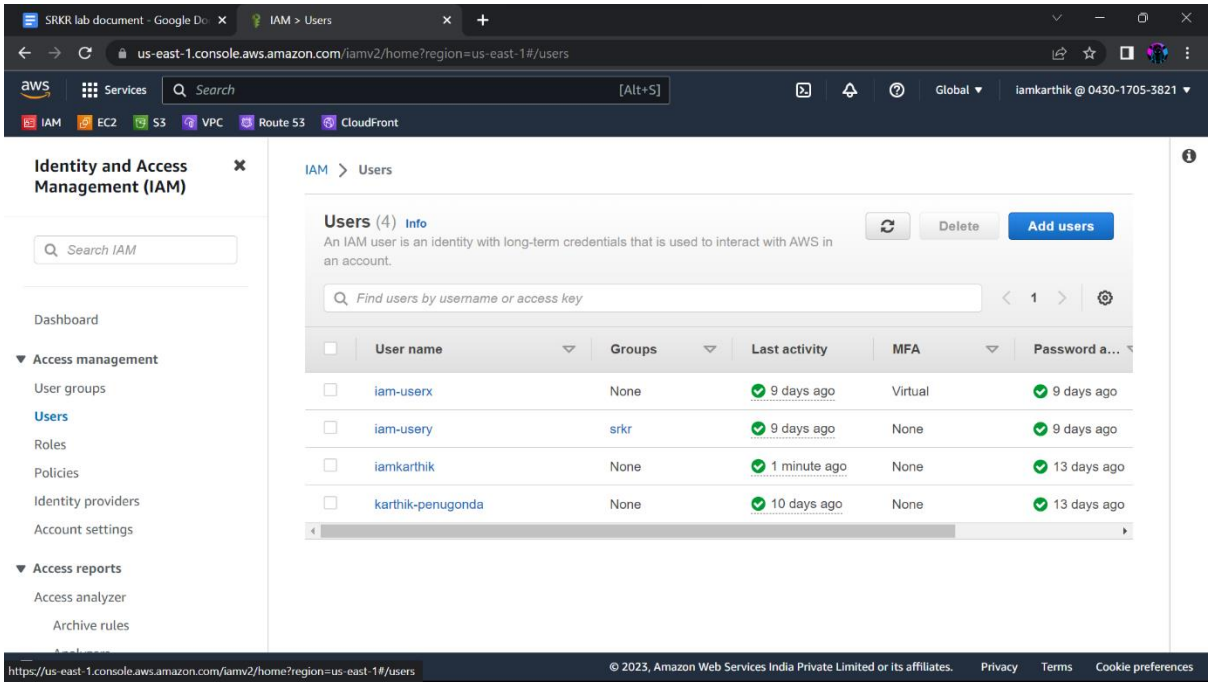
## Amazon IAM:

IAM provides the infrastructure necessary to control authentication and authorization for your AWS account. The IAM infrastructure is illustrated by the following diagram.

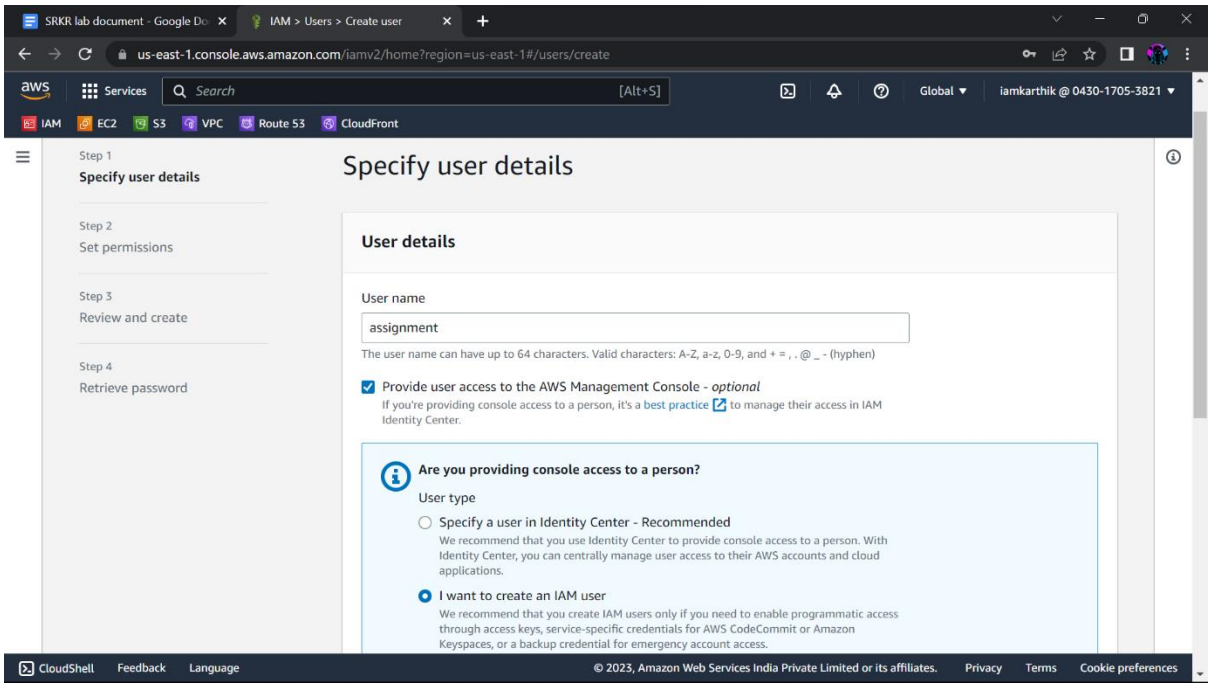
# IMPLEMENTATION

## *Creating an IAM user with EC2 full access*

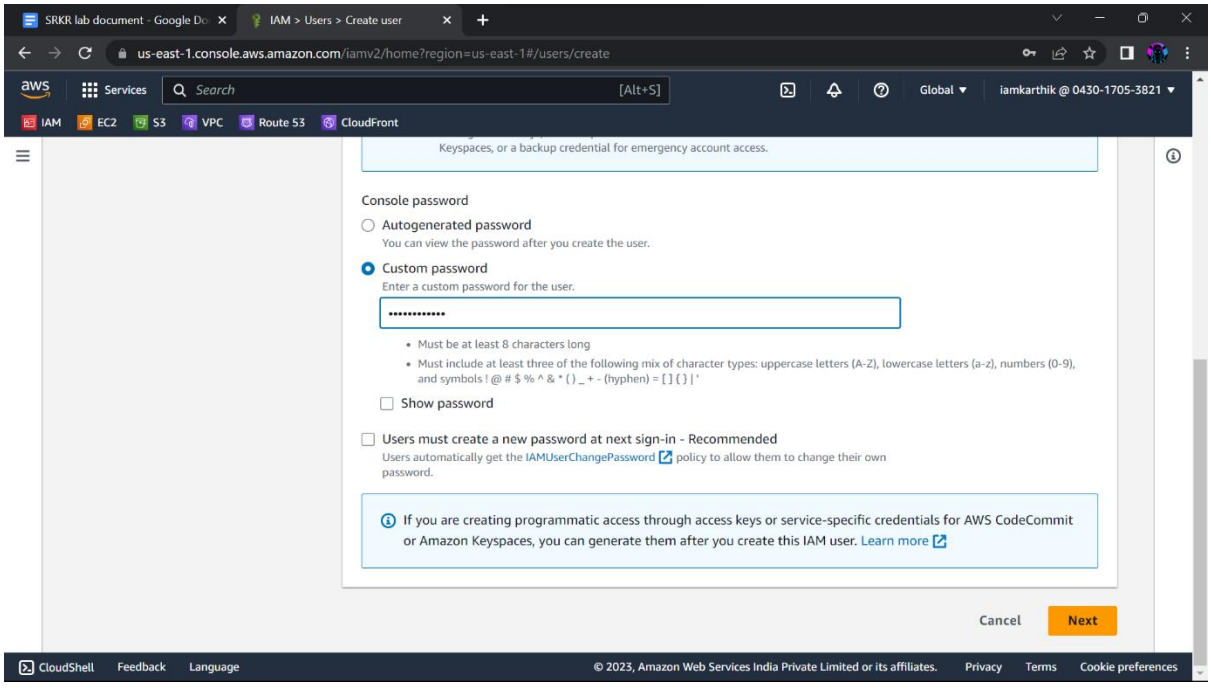
Step-1 : Select ***users*** section in IAM management console and then select ***add users***.



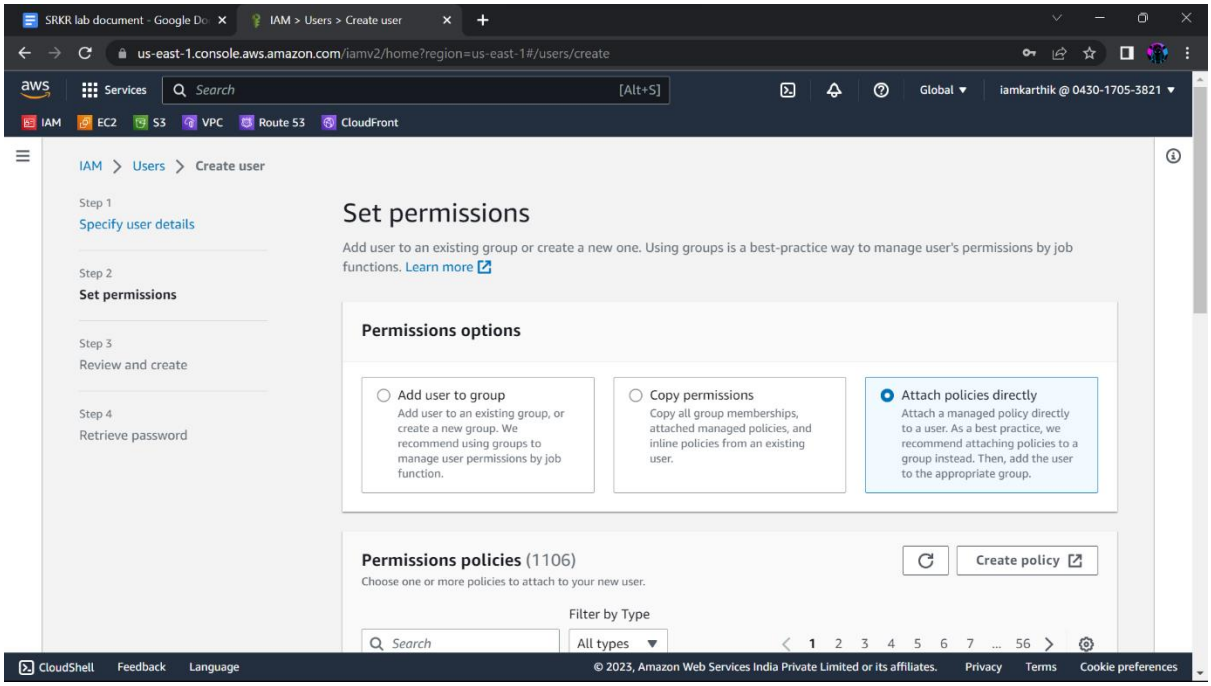
Step-2: Give the username, select the checkbox and select ***I want to create an IAM user.***



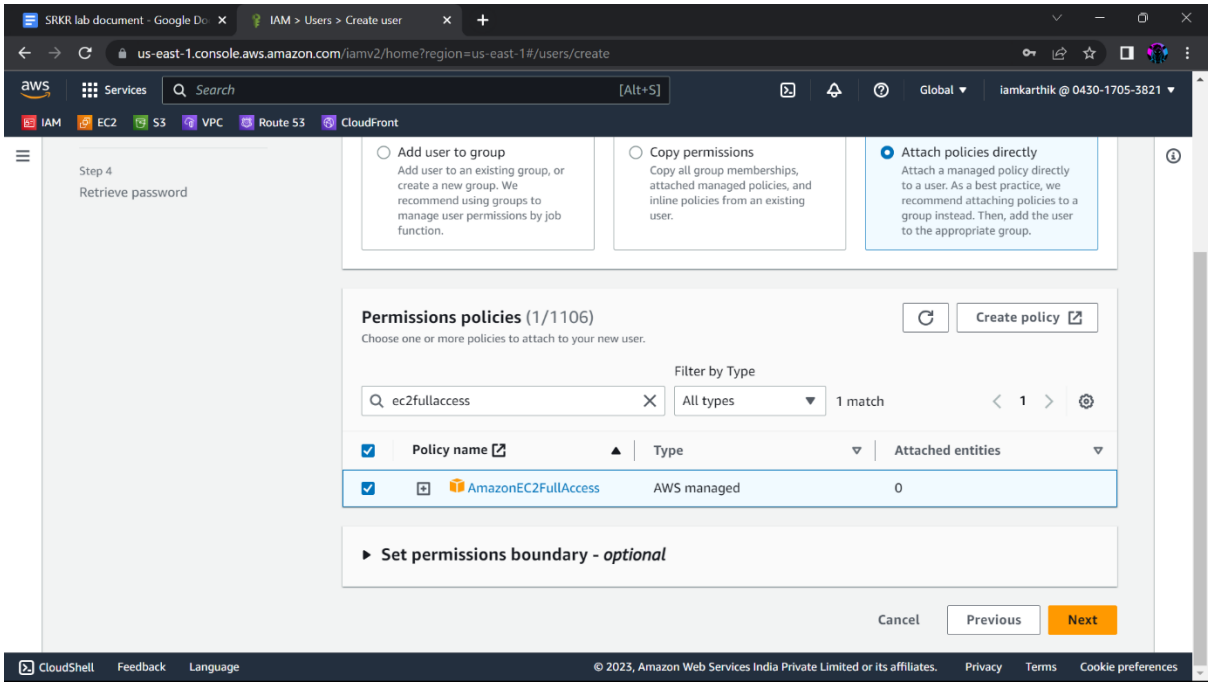

Step-3: Give a password to your IAM account and select ***Next***.



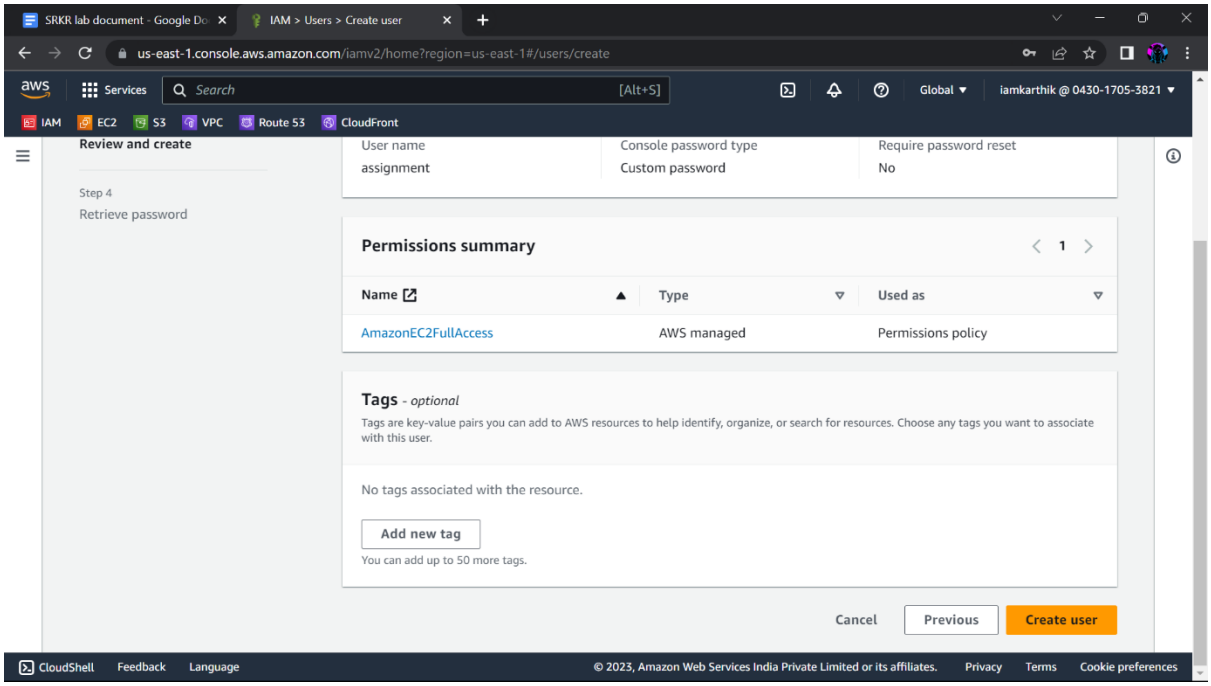
Step-4: Select ***Attach policies directly*** in Permissions options.



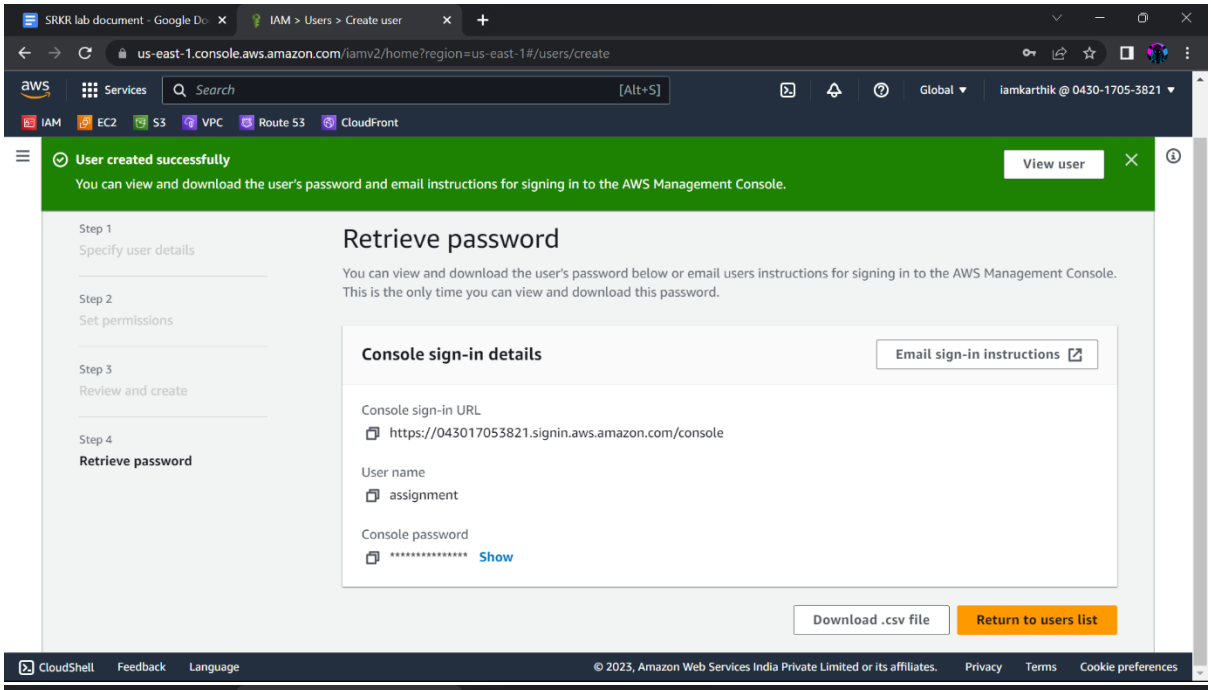

In Permission policies, select ***AmazonEC2FullAccess*** and select ***Next***.

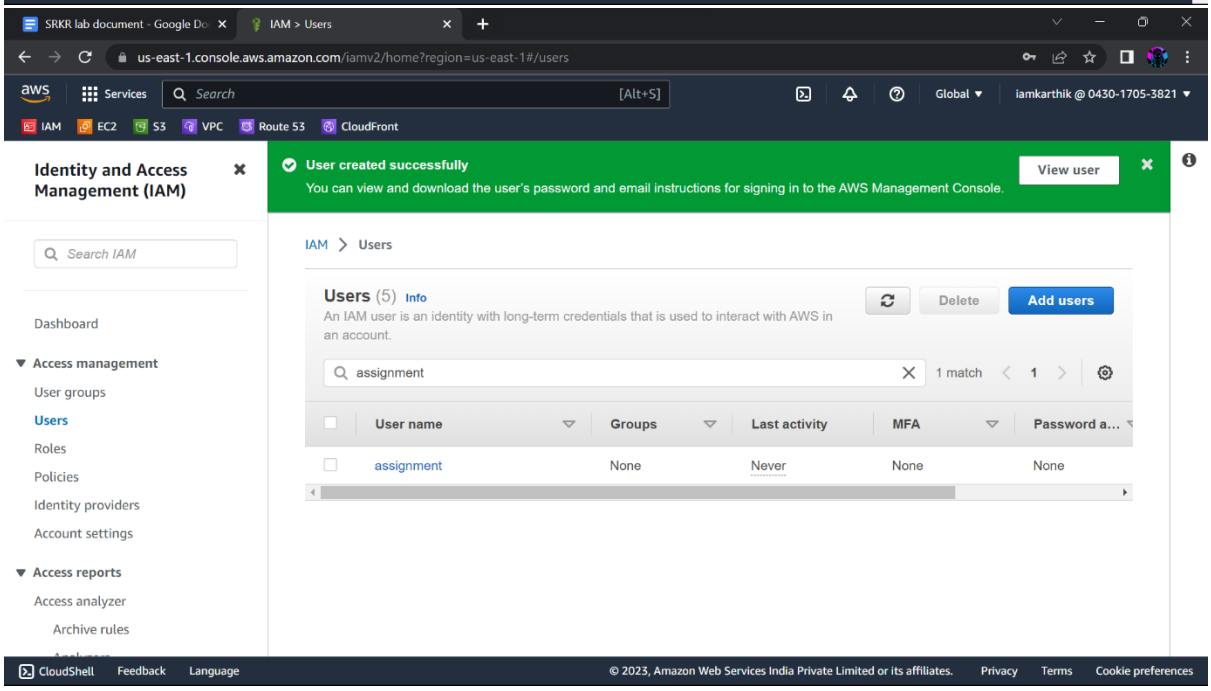


Step-5: In the next step Review and Create, click on ***Create user.***



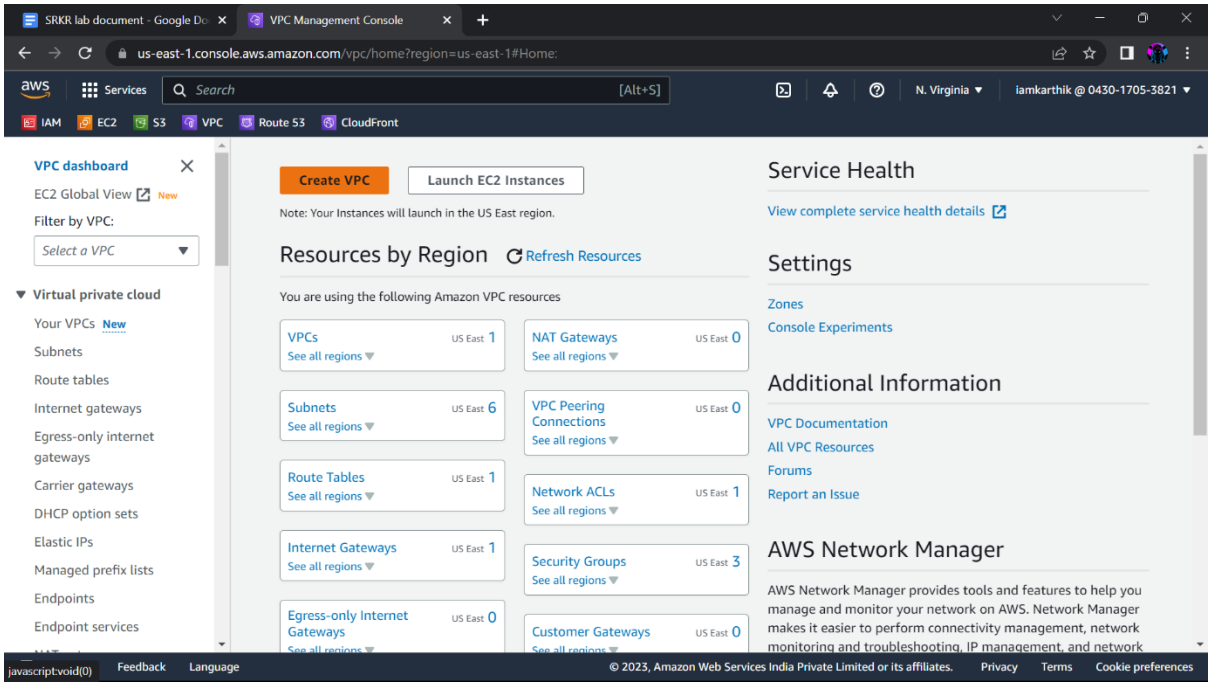
Step-6: IAM user created successfully with EC2 full access permissions.



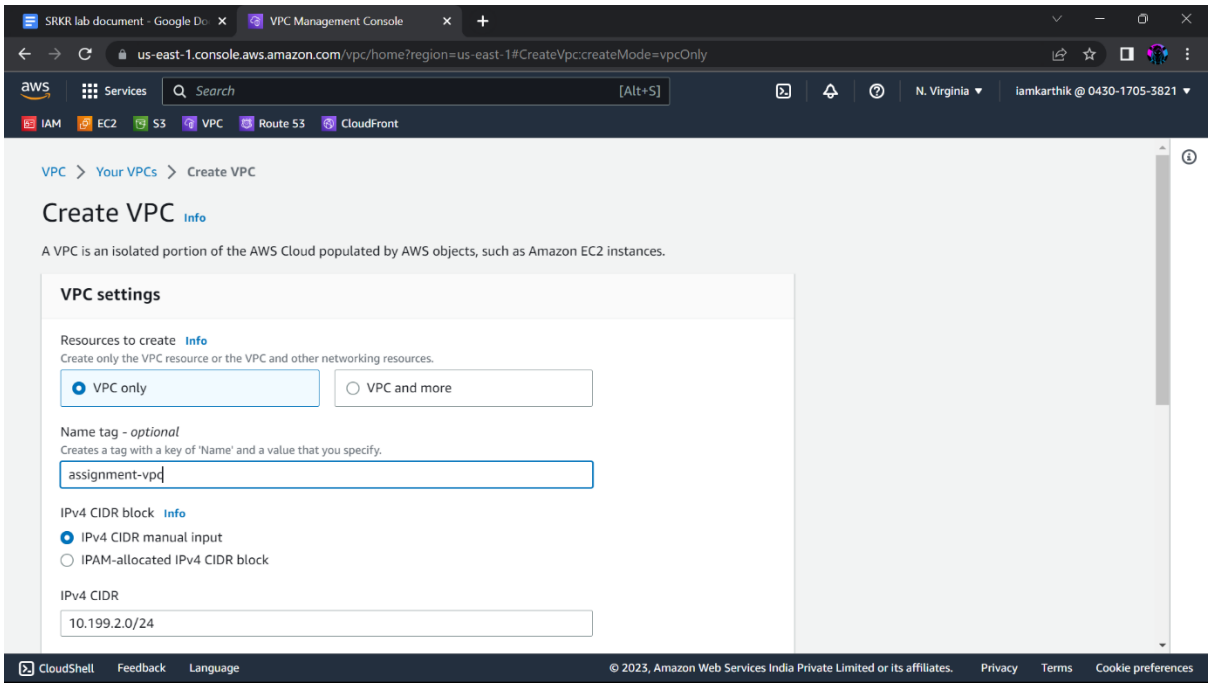



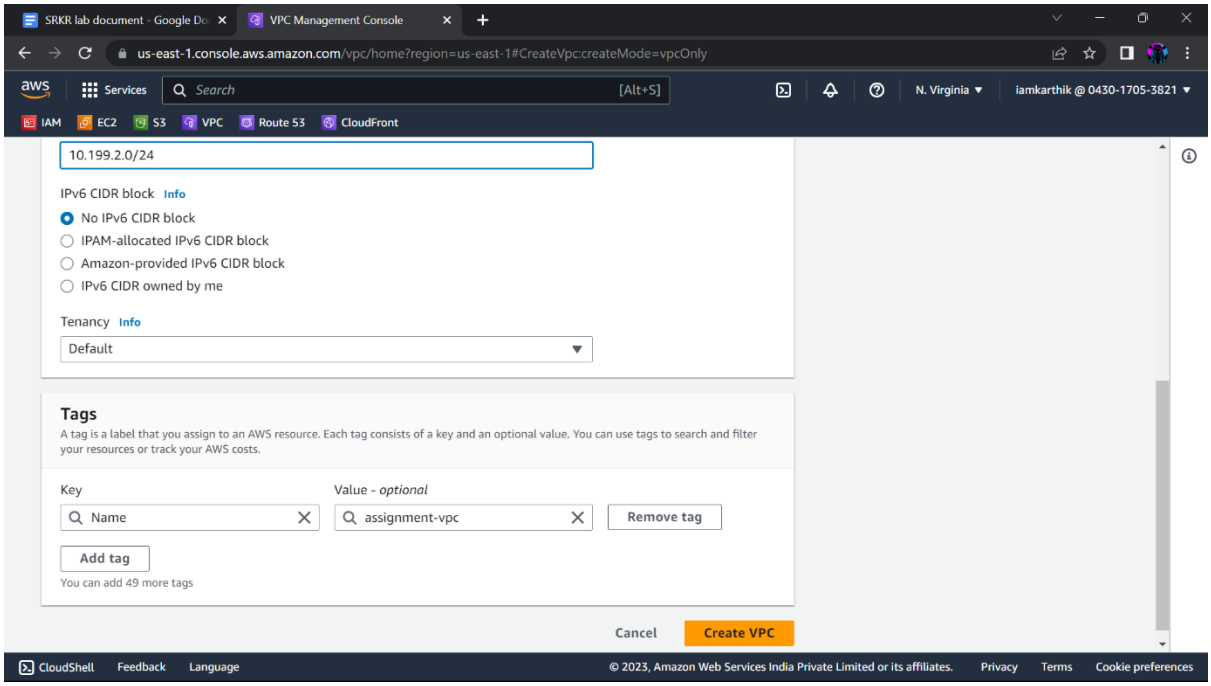
# ***Creating a VPC with VPC only wizard, subnet, internet gateway and route table***

Step-1: Select ***Create VPC*** in VPC Management Console.




Step-2: Select ***VPC only wizard*** and give IPV4 CIDR then select ***Create VPC.***

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VPC Management Console
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Services
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N. Virginia
iamkarthik @ 0430-1705-3821
IAM
EC2
S3
VPC
Route 53
CloudFront
10.199.2.0/24
IPv6 CIDR block Info
No IPv6 CIDR block
IPAM-allocated IPv6 CIDR block
Amazon-provided IPv6 CIDR block
IPv6 CIDR owned by me
Tenancy Info
Default
Tags
A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.
Key
Value - optional
Name
assignment-vpc
Remove tag
Add tag
You can add 49 more tags
Cancel
Create VPC
CloudShell
Feedback
Language
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Terms
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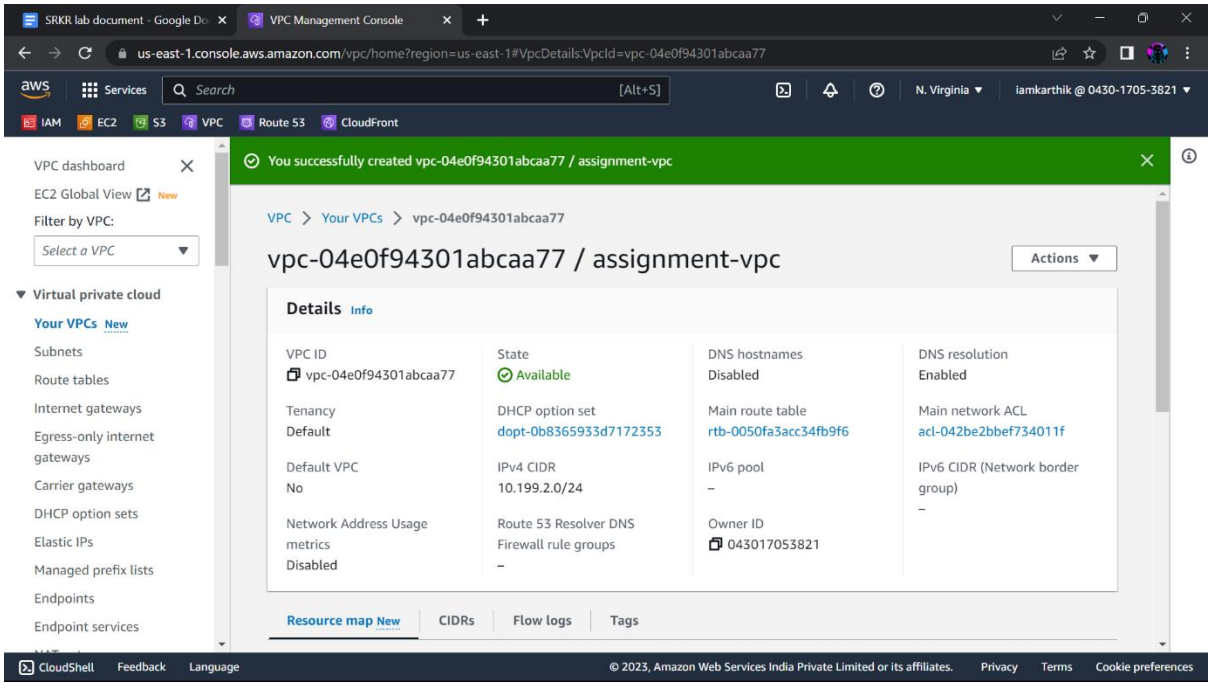
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us-east-1.console.aws.amazon.com/vpc/home?region=us-east-1#VpcDetails:VpcId=vpc-04e0f94301abcaa77
Services
Search
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IAM
EC2
S3
VPC
Route 53
CloudFront
VPC dashboard
EC2 Global View New
Filter by VPC:
Select a VPC
Virtual private cloud
Your VPCs New
Subnets
Route tables
Internet gateways
Egress-only internet gateways
Carrier gateways
DHCP option sets
Elastic IPs
Managed prefix lists
Endpoints
Endpoint services
You successfully created vpc-04e0f94301abcaa77 / assignment-vpc
VPC > Your VPCs > vpc-04e0f94301abcaa77
vpc-04e0f94301abcaa77 / assignment-vpc
Actions
Details Info
VPC ID
vpc-04e0f94301abcaa77
State
Available
DNS hostnames
Disabled
DNS resolution
Enabled
Tenancy
Default
DHCP option set
dopt-0b8365933d7172353
Main route table
rtb-0050fa3acc34fb9f6
Main network ACL
acl-042be2bbef734011f
Default VPC
No
IPv4 CIDR
10.199.2.0/24
IPv6 pool
–
IPv6 CIDR (Network border group)
–
Network Address Usage metrics
Disabled
Route 53 Resolver DNS Firewall rule groups
–
Owner ID
043017053821
Resource map New
CIDRs
Flow logs
Tags
CloudShell
Feedback
Language
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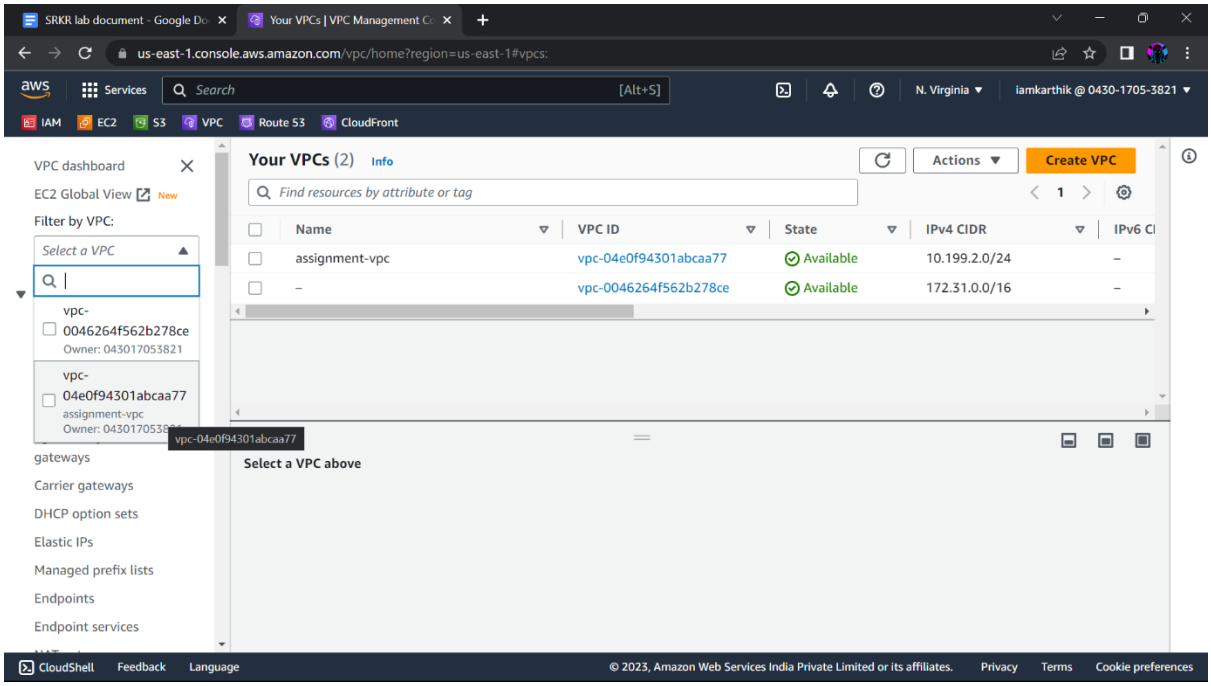
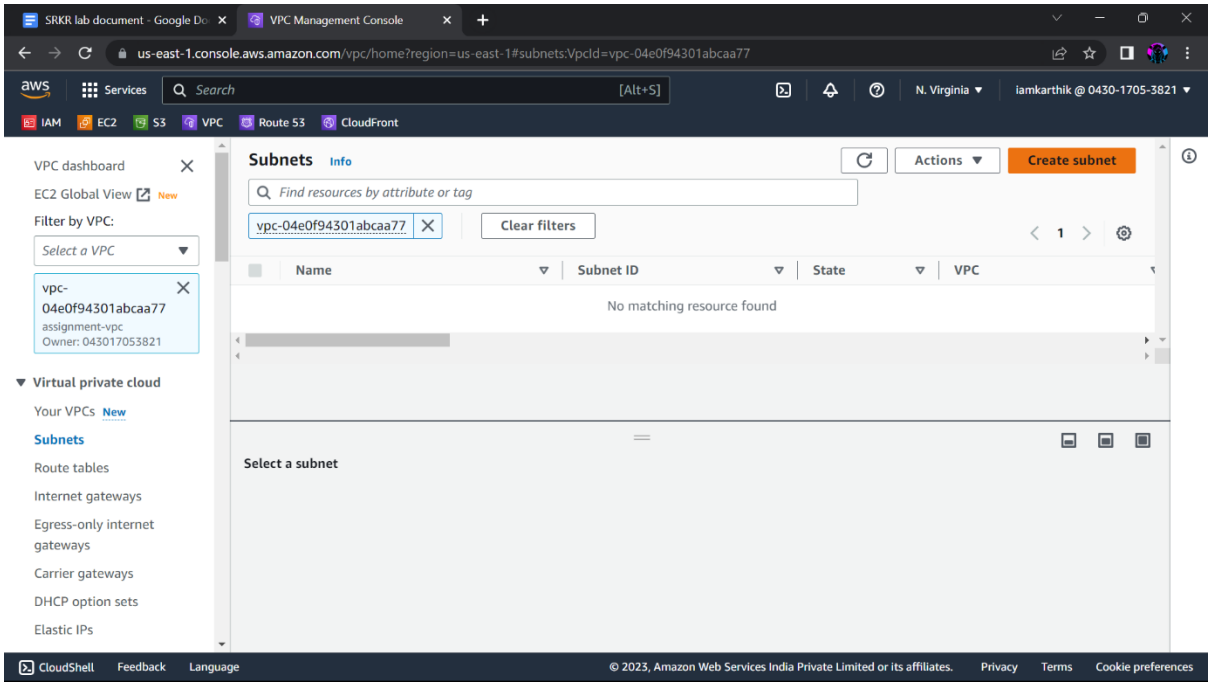
Privacy
Terms
Cookie preferences

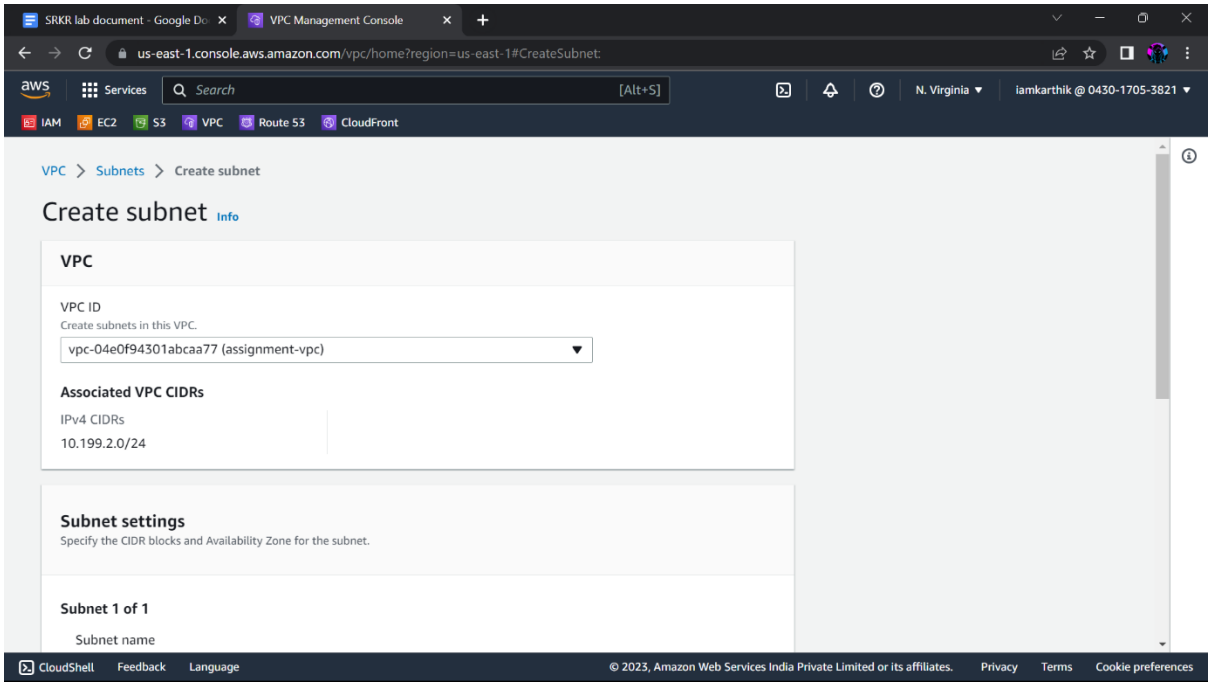
Step-3: Select your VPC in ***Filter by VPC.***

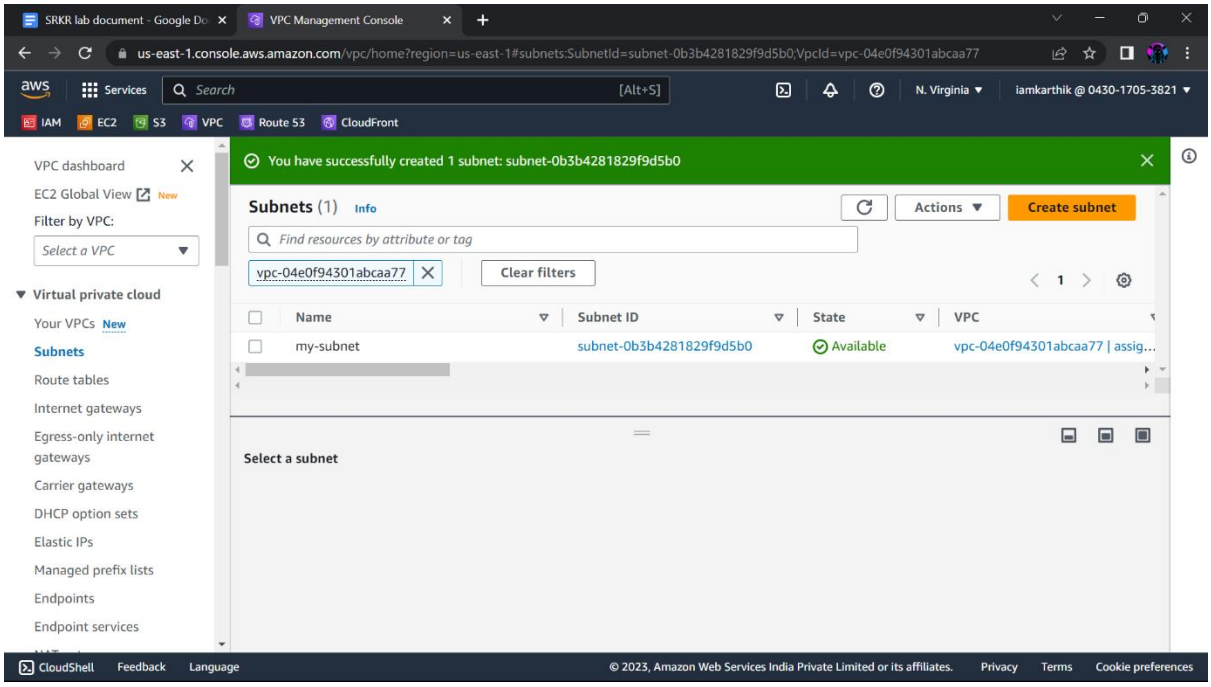



Step-4: Select Subnets and then click on ***Create Subnet.***

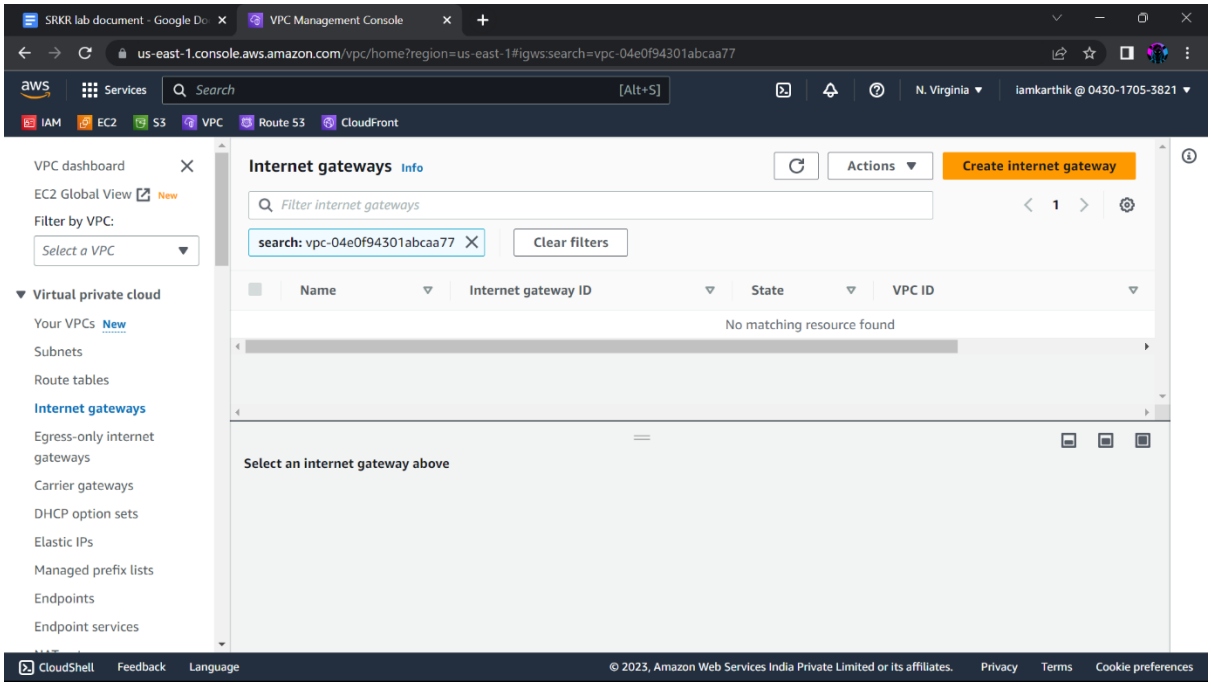


Step-5: Select your VPC in VPC ID and select ***Create subnet***.

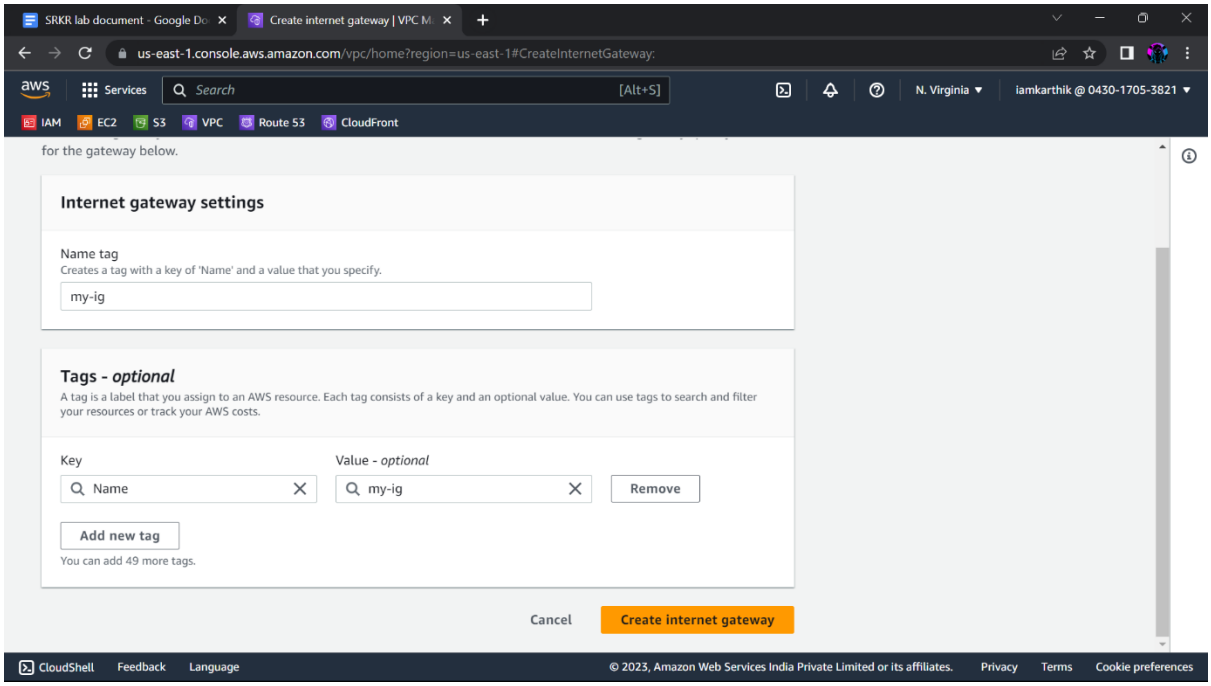


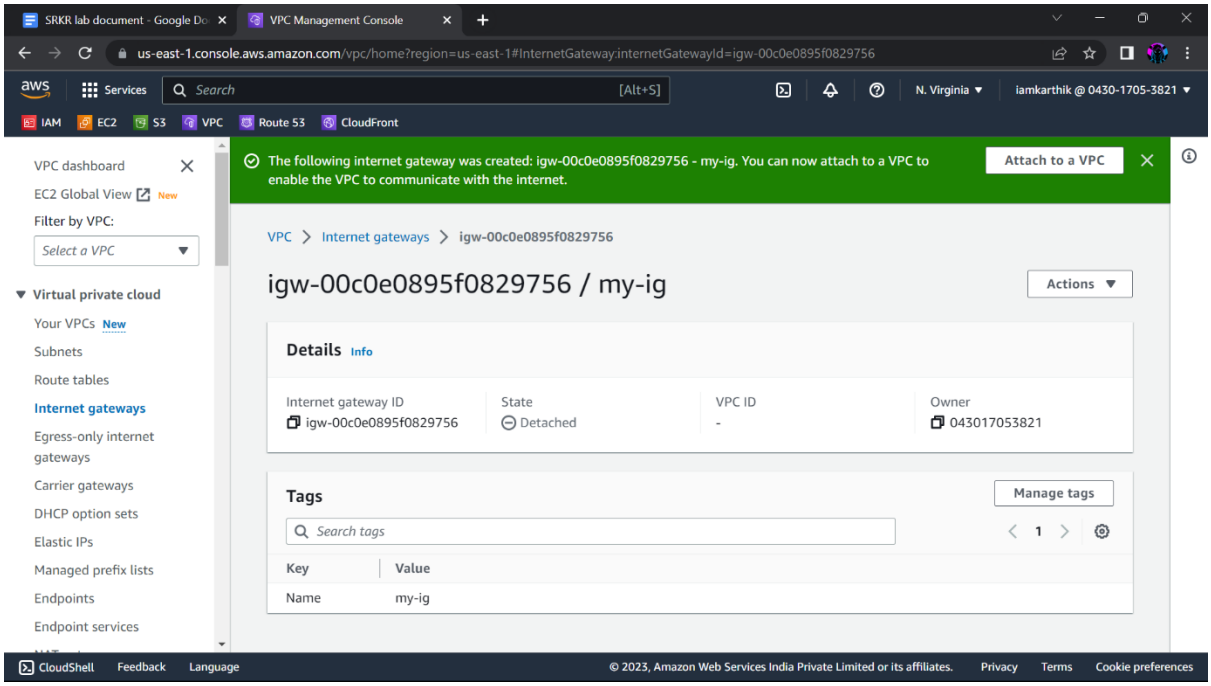



Step-6: In internet gateways, select ***Create internet gateway***.

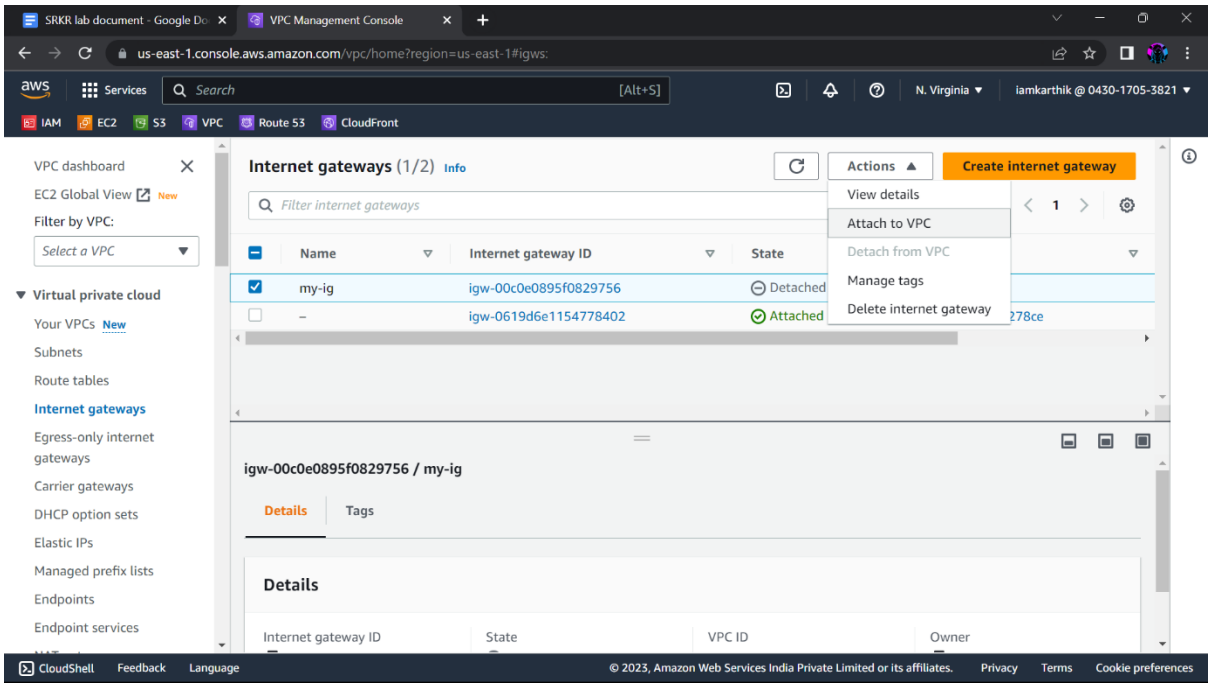



Give a name to your internet gateway and click ***Create internet gateway.***

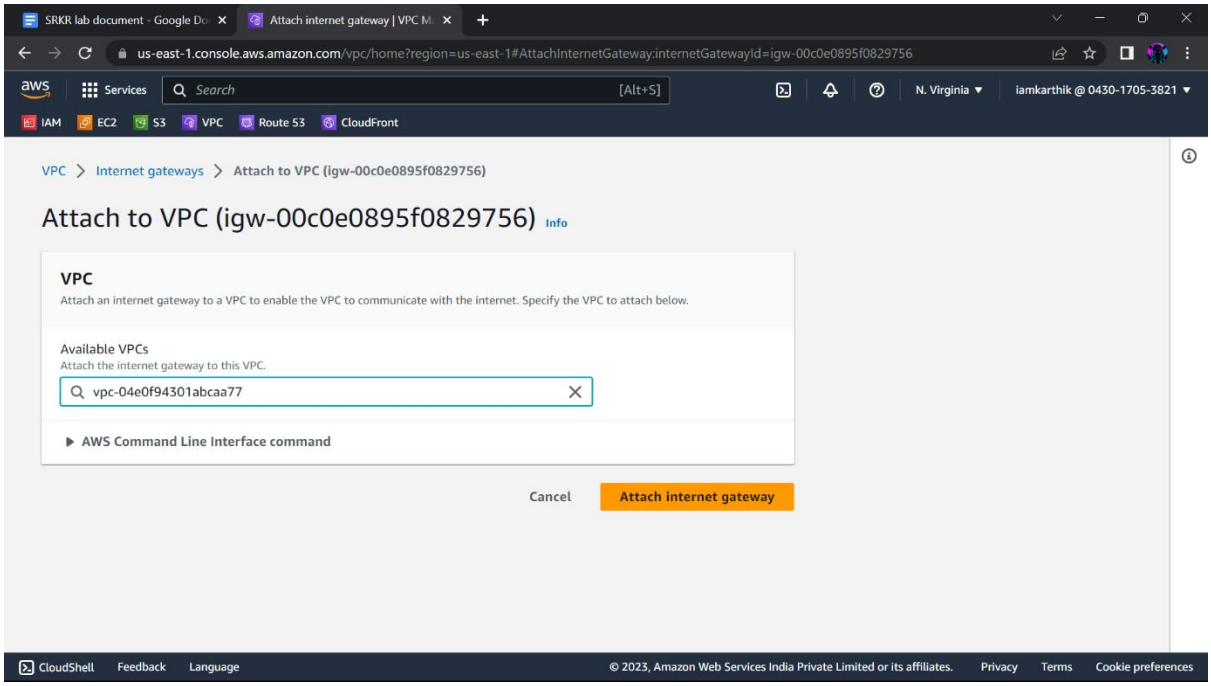


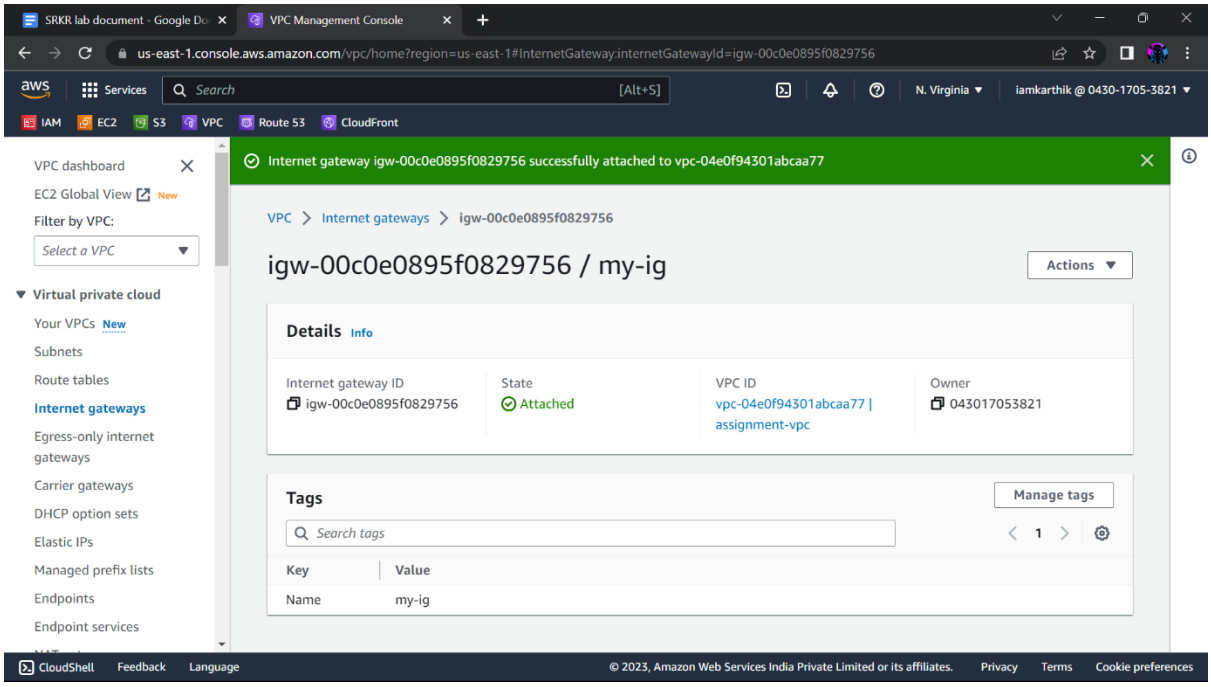



Step-7: Select your internet gateway and in Actions select ***Attach to VPC.***

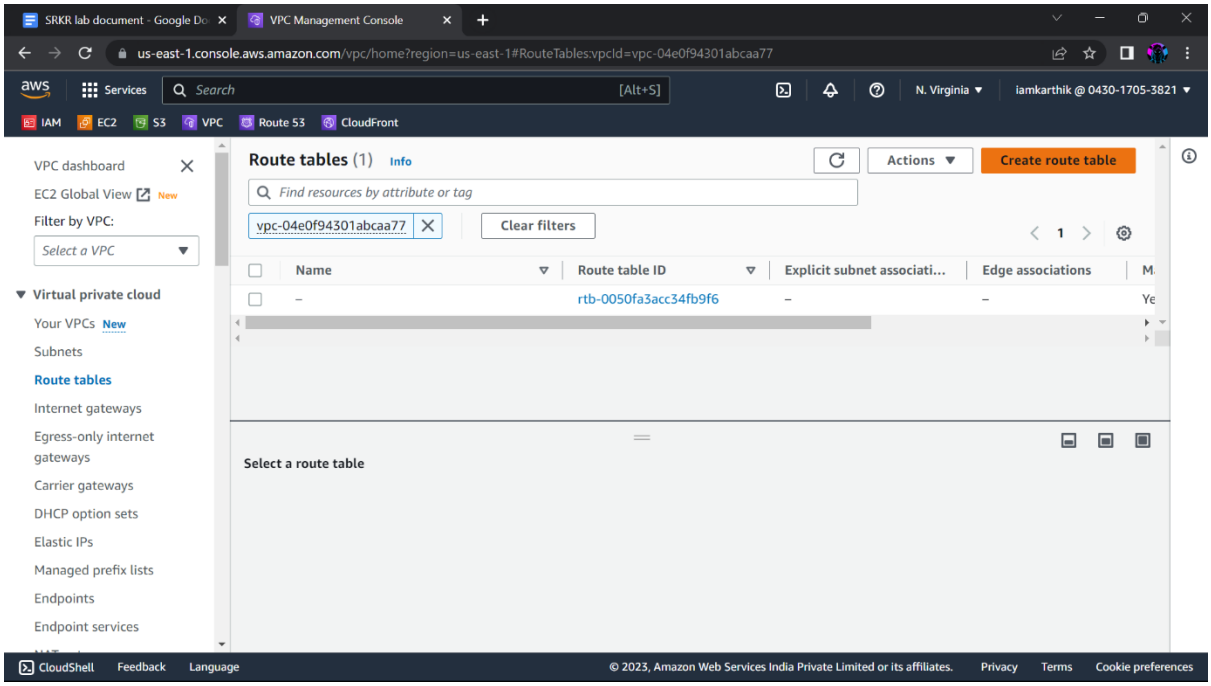


Select your VPC and click on ***Attach internet gateway.***

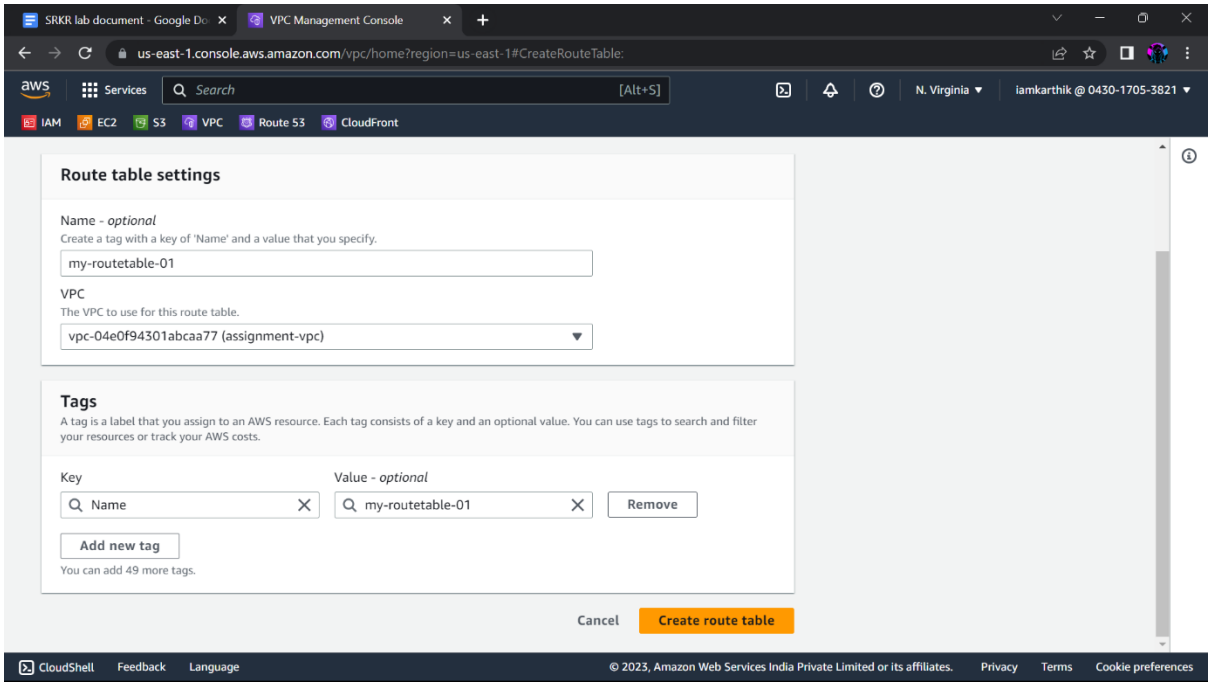


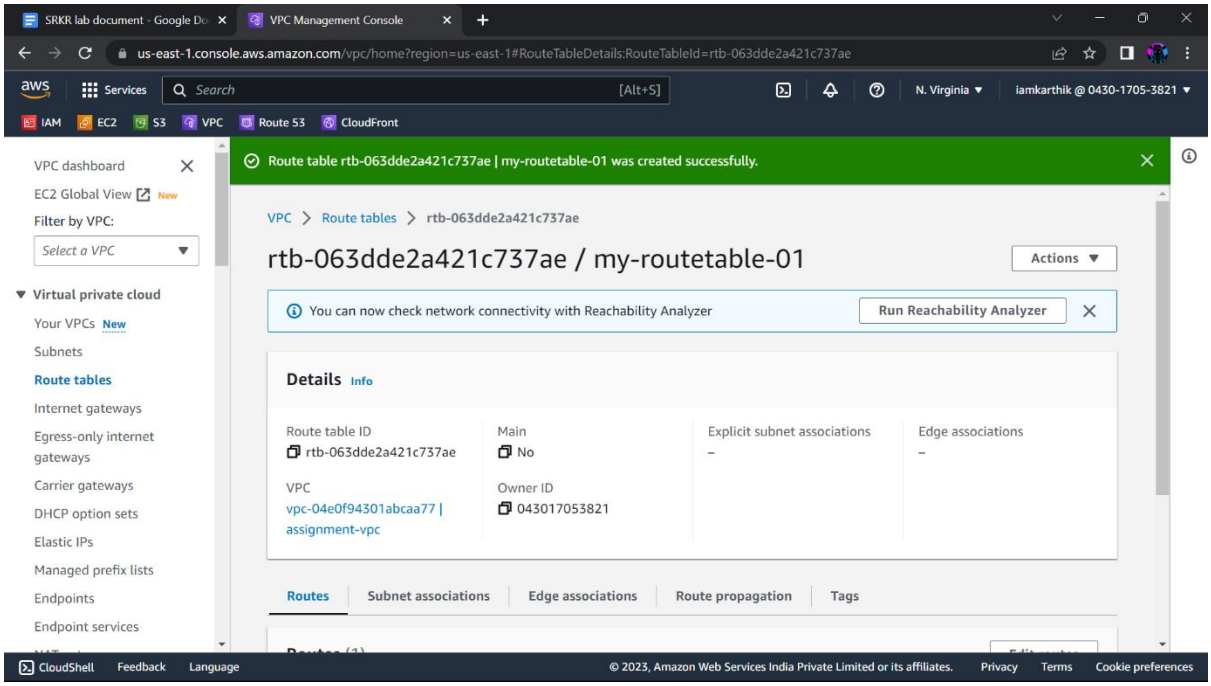



Step-8: In Route tables section, select ***Create route table***.

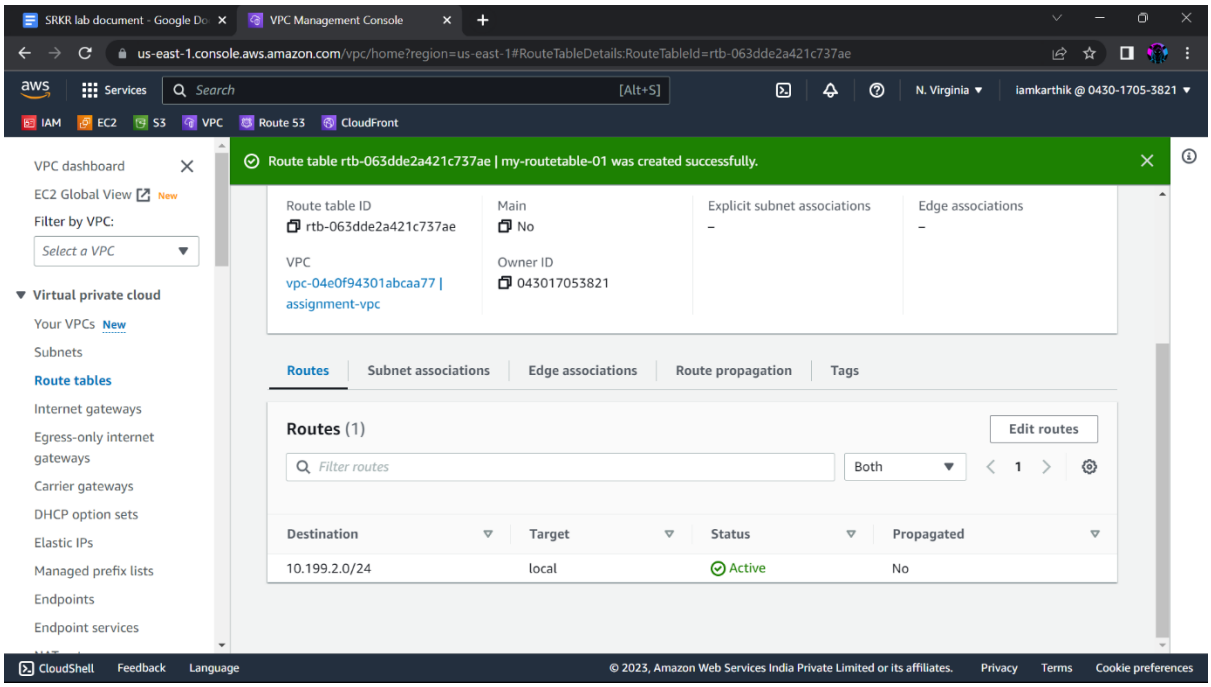



Give a name to your route table and select your VPC then click on ***Create route table.***

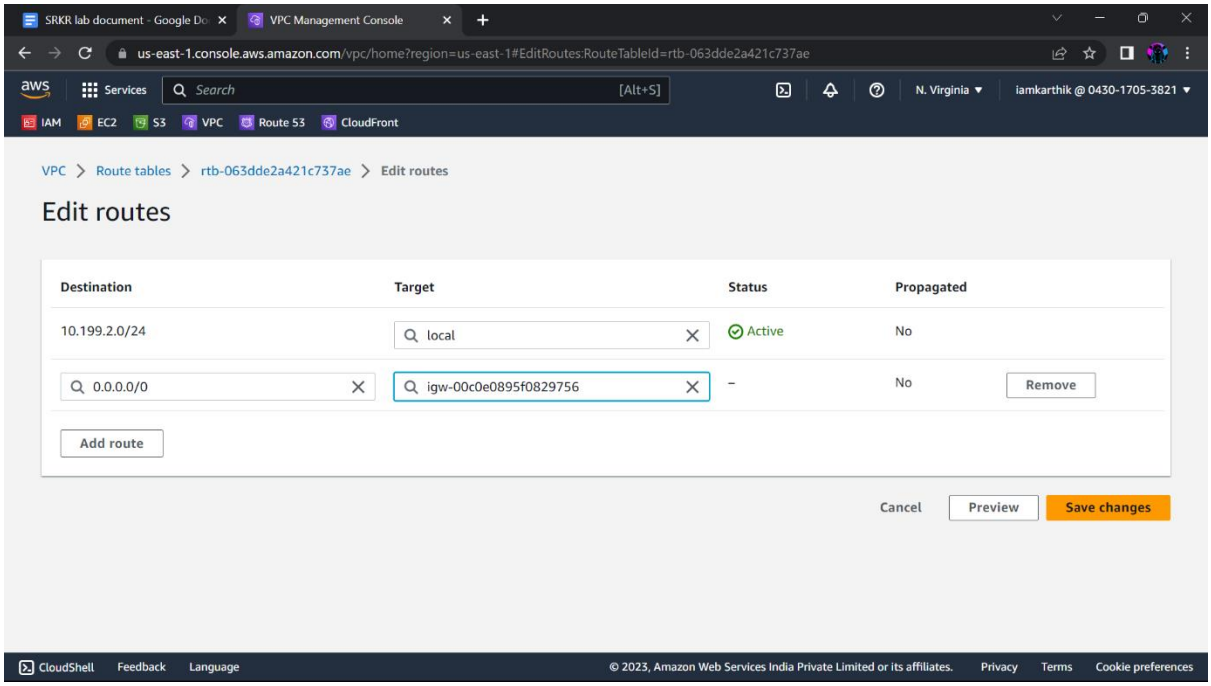


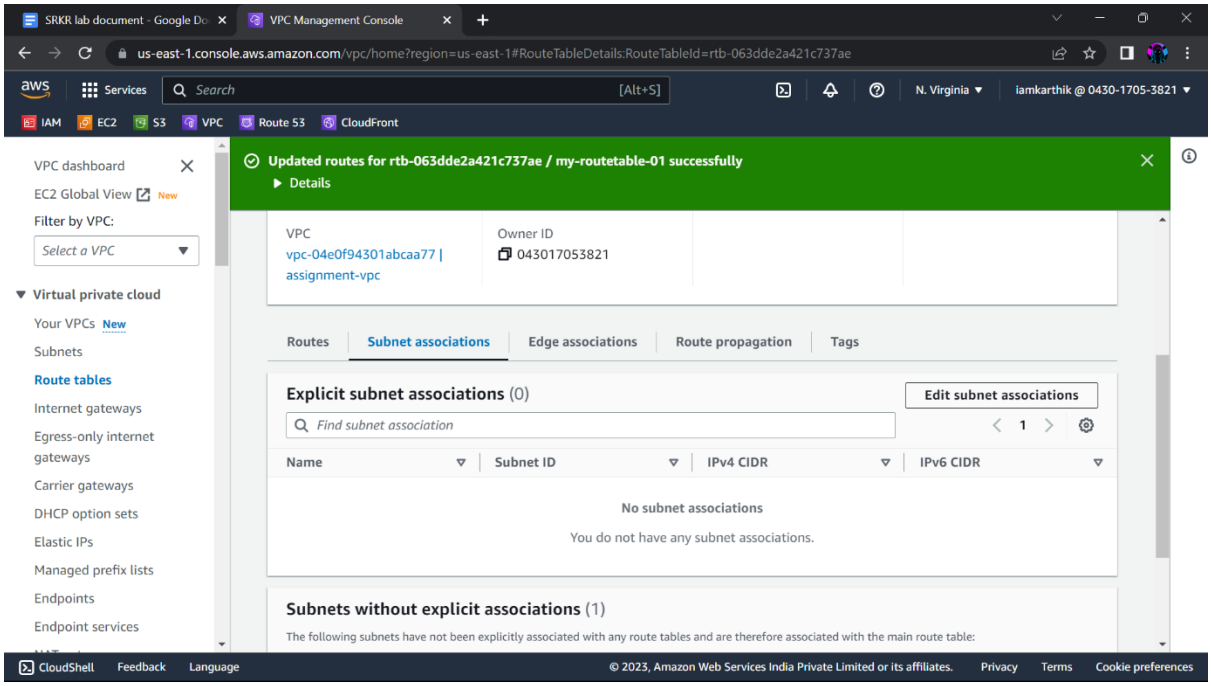



Step-9: In the routes, select ***Edit Routes.***

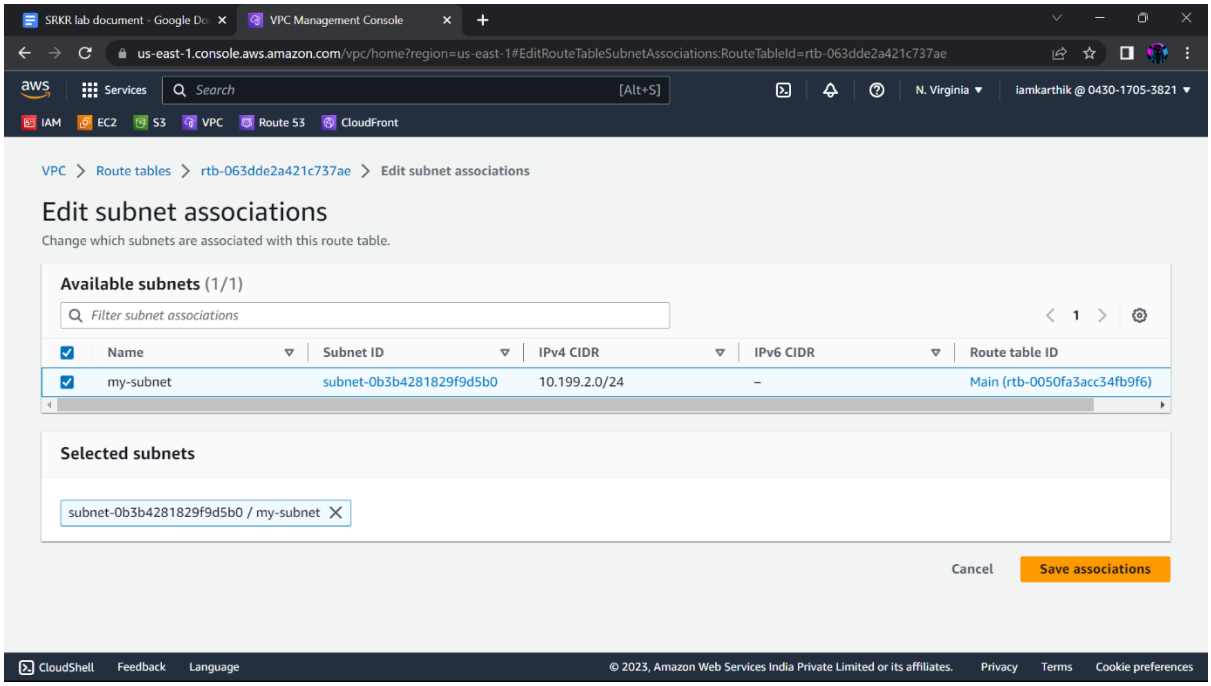


Add internet ***0.0.0.0/0*** in destination and your ***internet gateway*** in target then click on ***Save changes.***

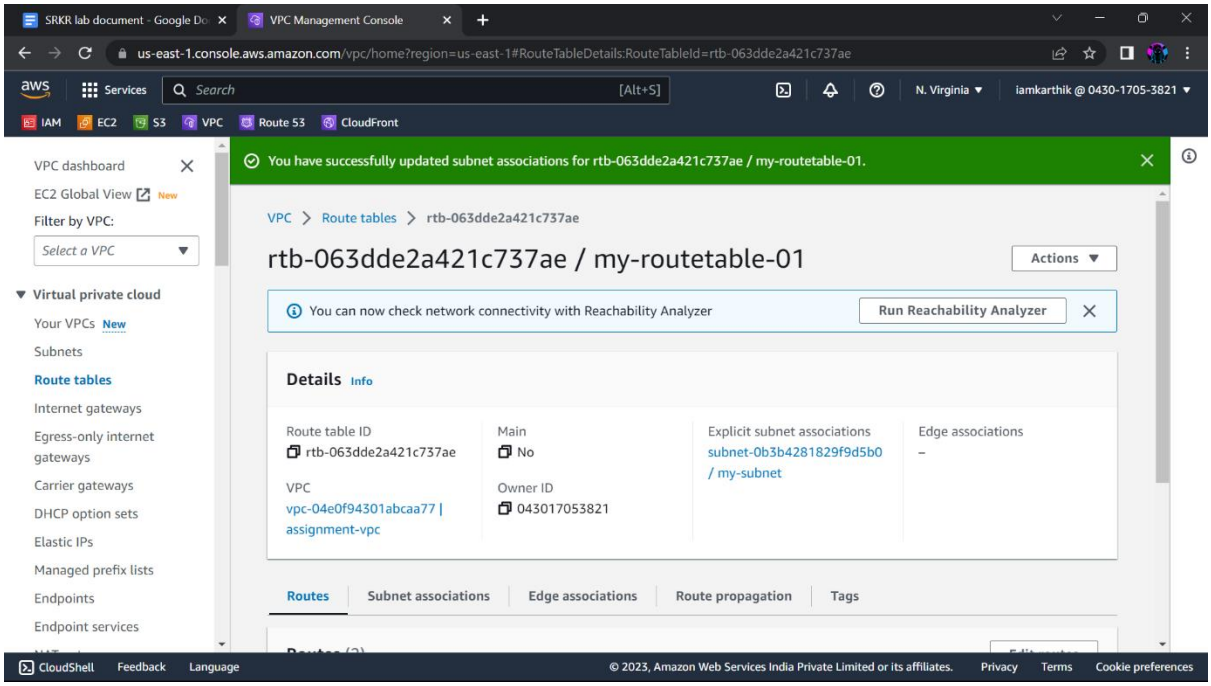


Step-10: In Subnet Associations, select ***Edit subnet associations.***

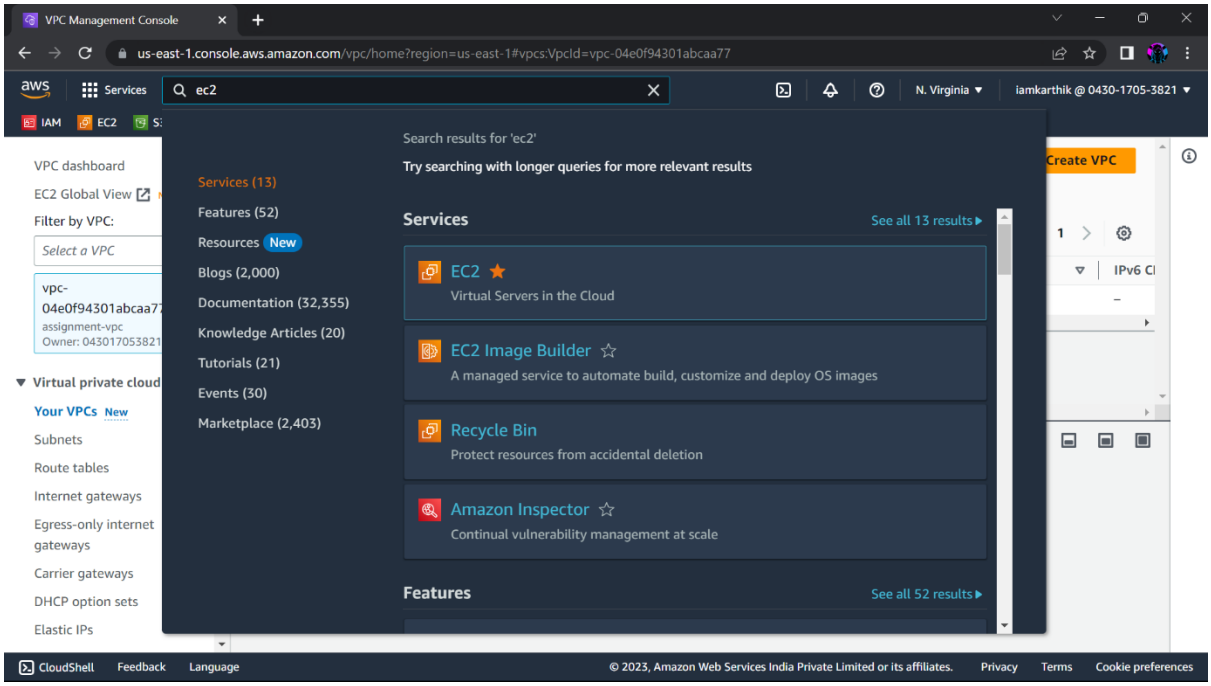



Select your subnet in available subnets and click on ***Save changes.***

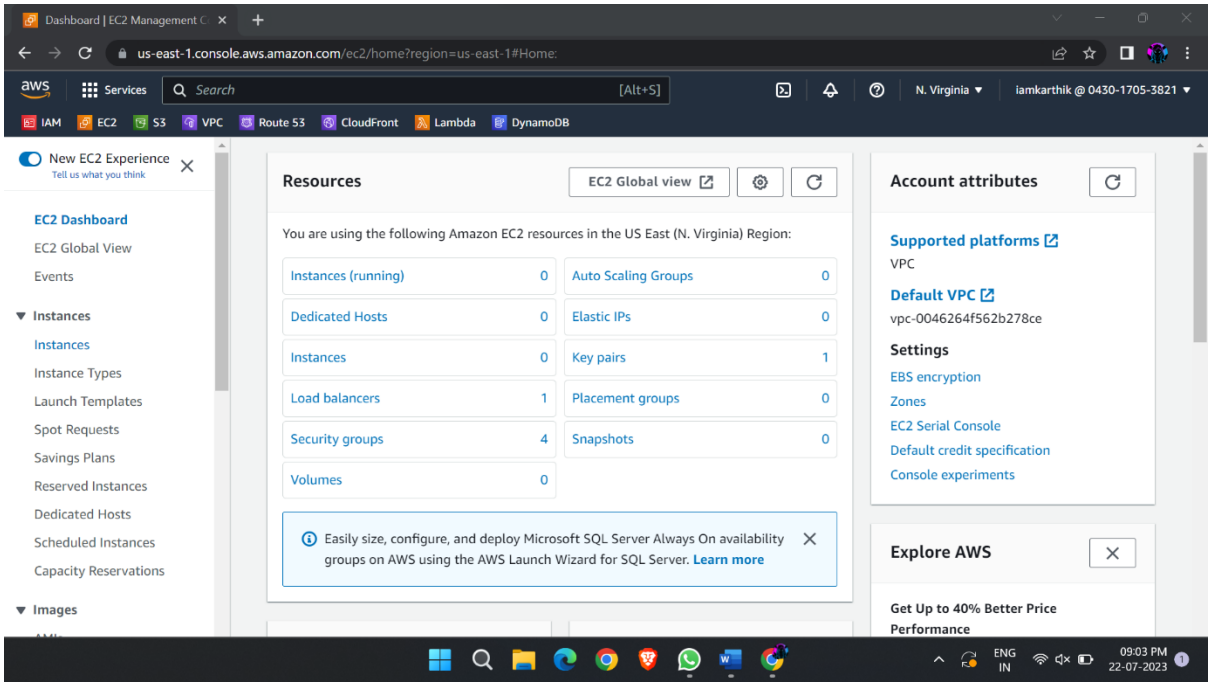


# ***Creating an instance inside the above created VPC***

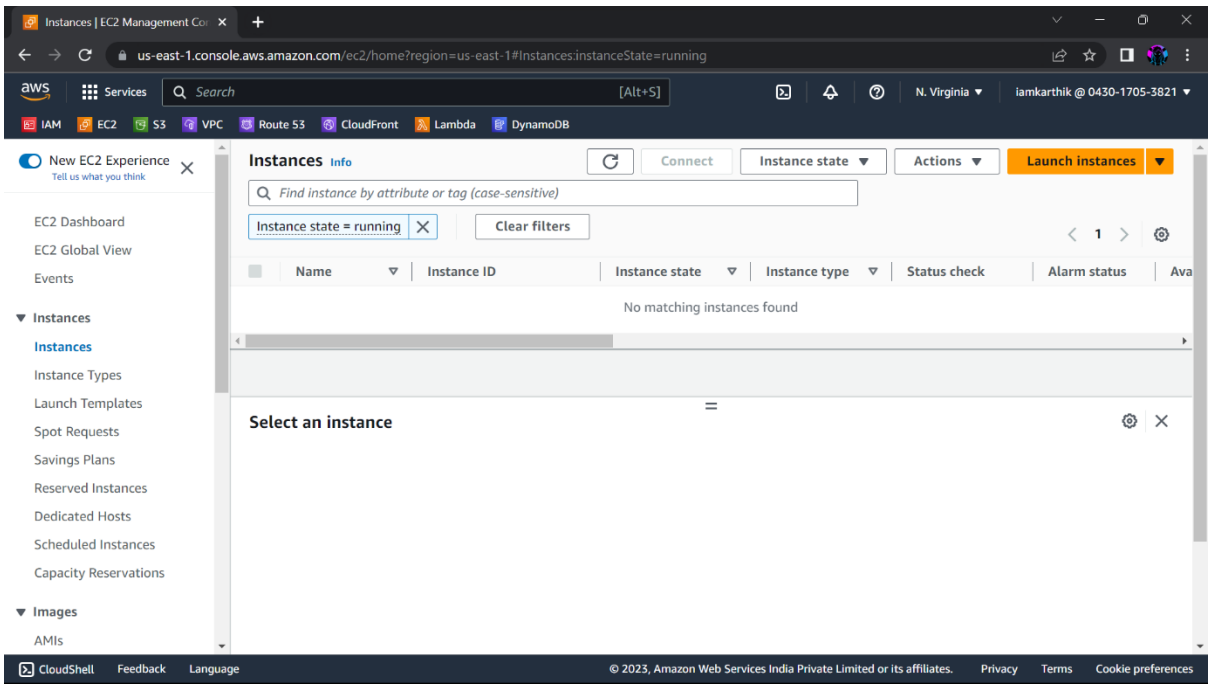
Step-1: Search for EC2 in the search bar.



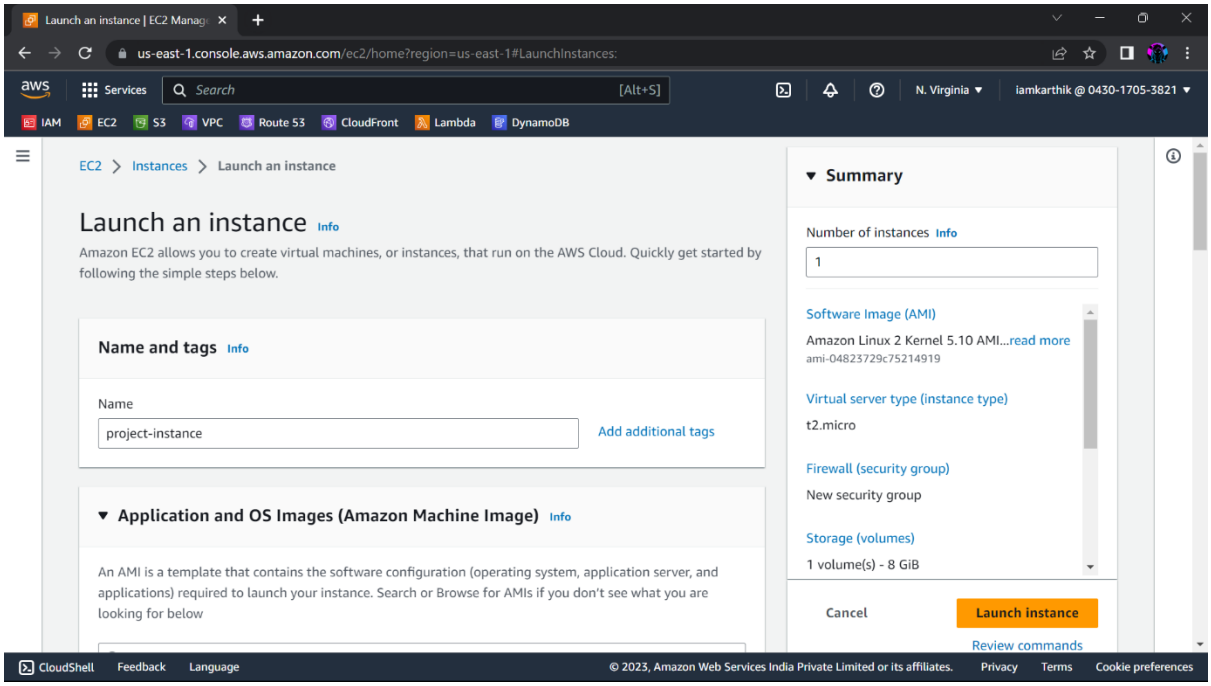

Step-2: Click on ***Instances***

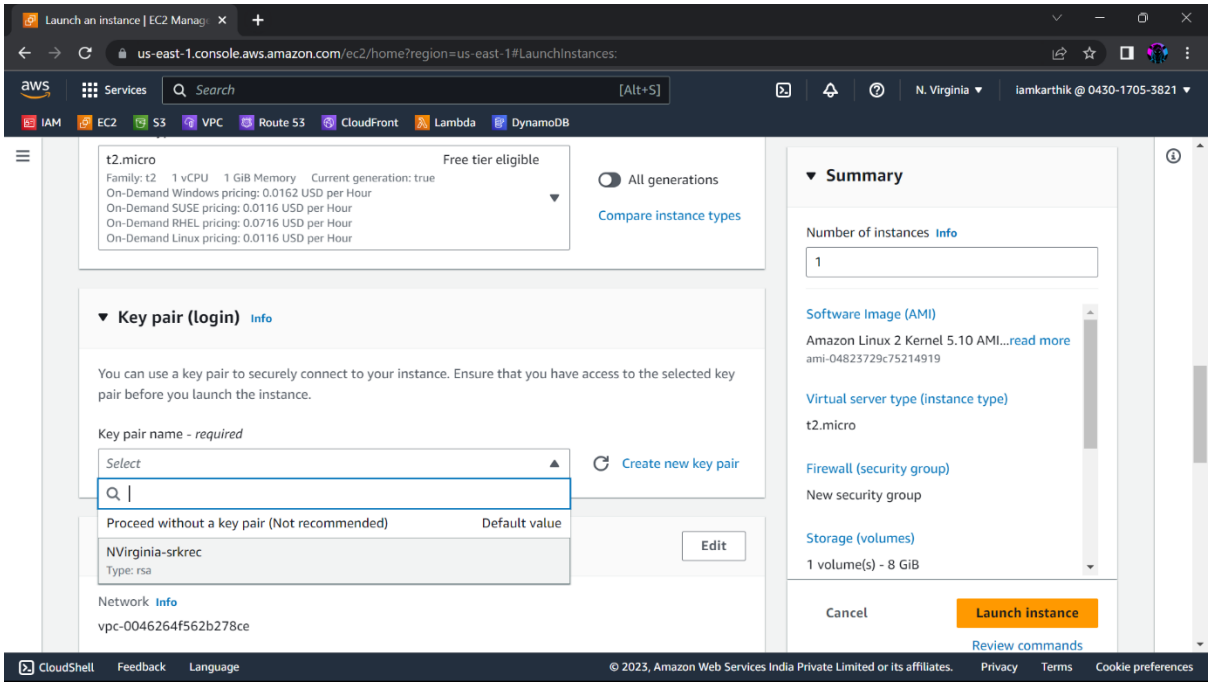


Step-3: Select ***Launch instance.***

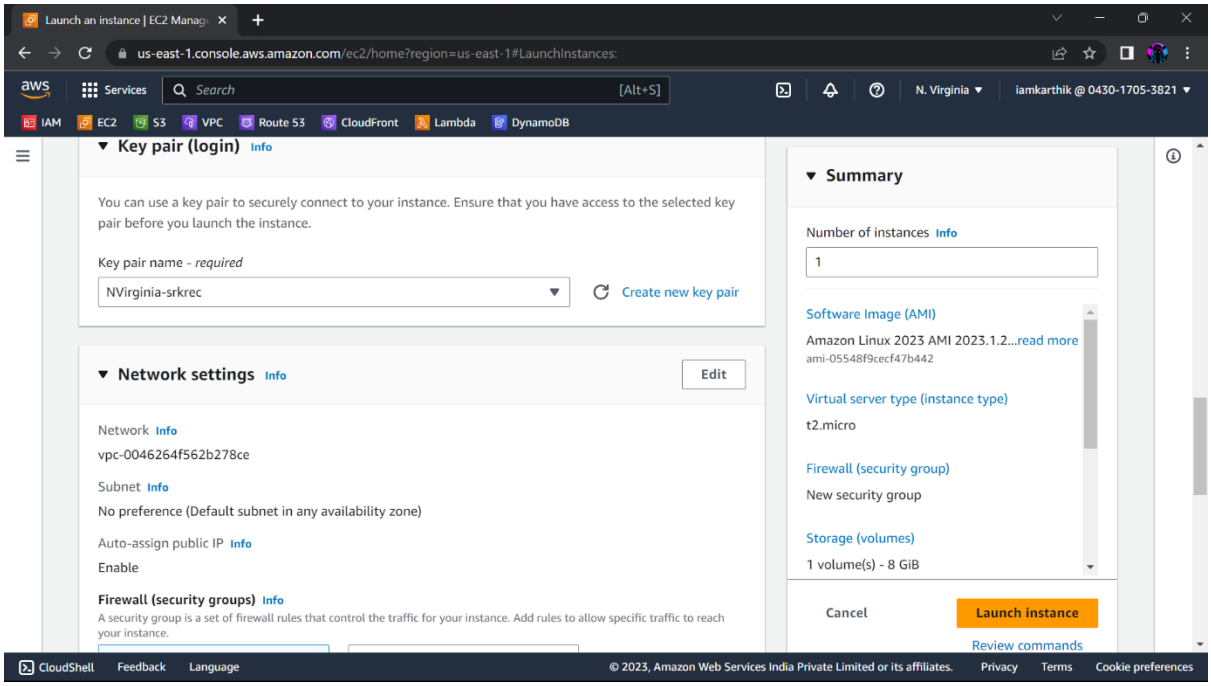



Step-4: Give a name to the instance, select the AMI and select your key pair.

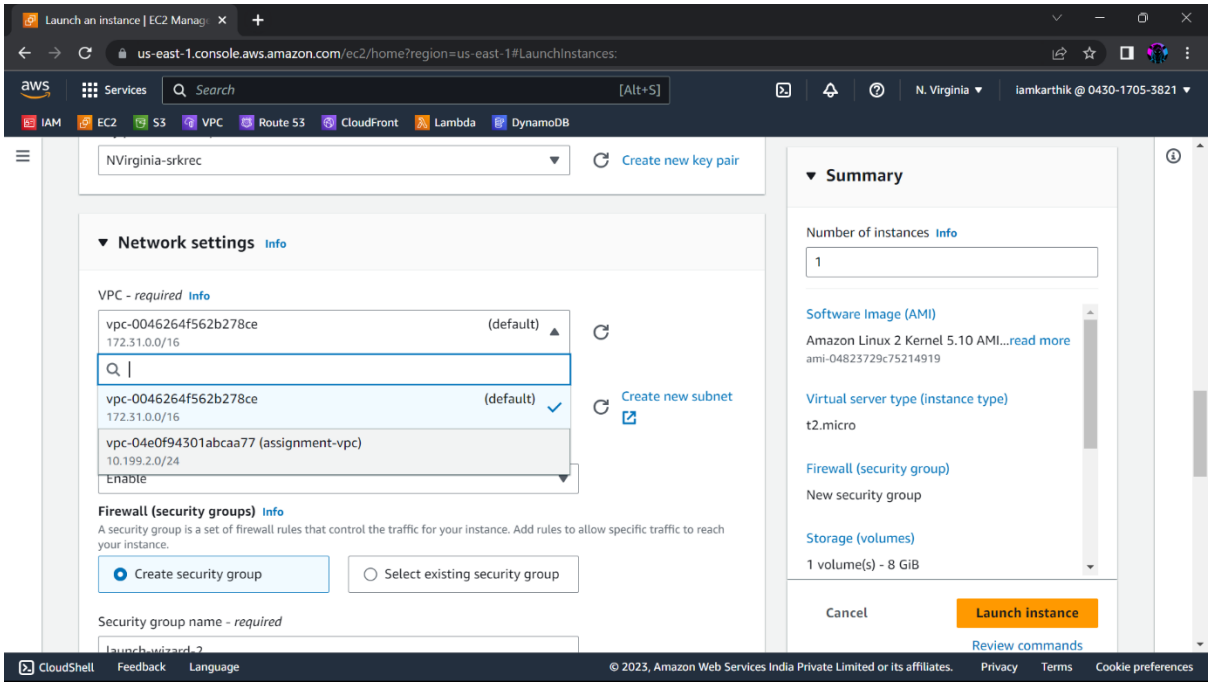


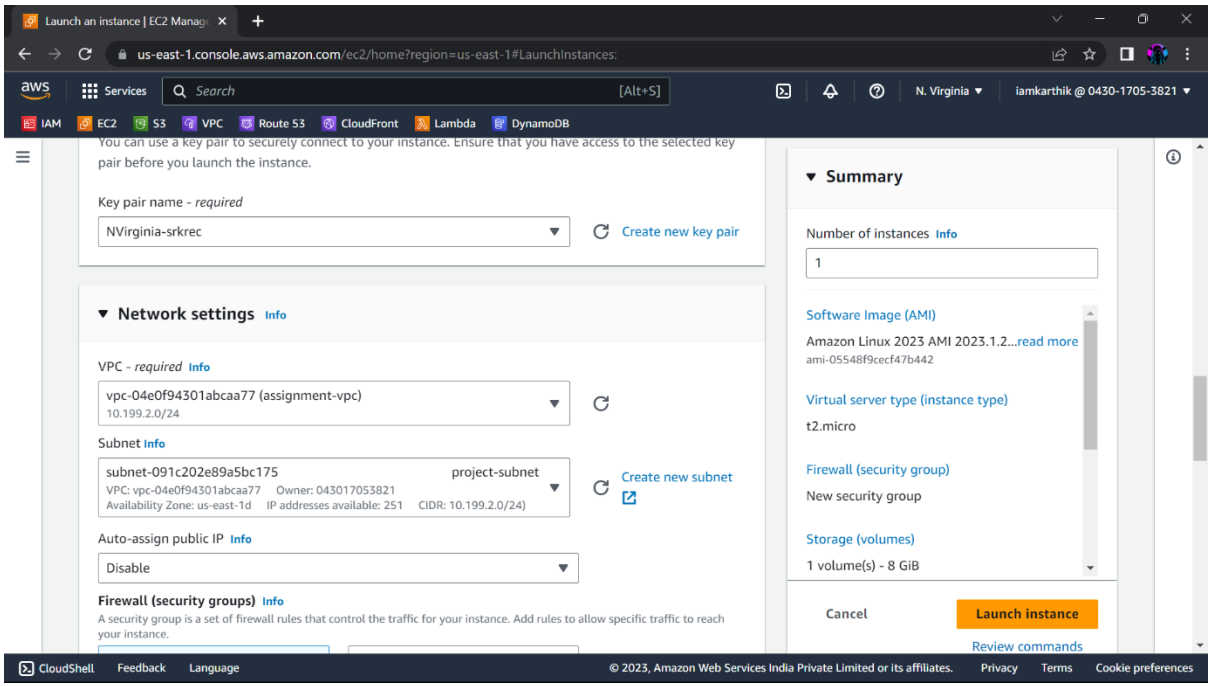



Step-5: ***Edit*** the network settings.

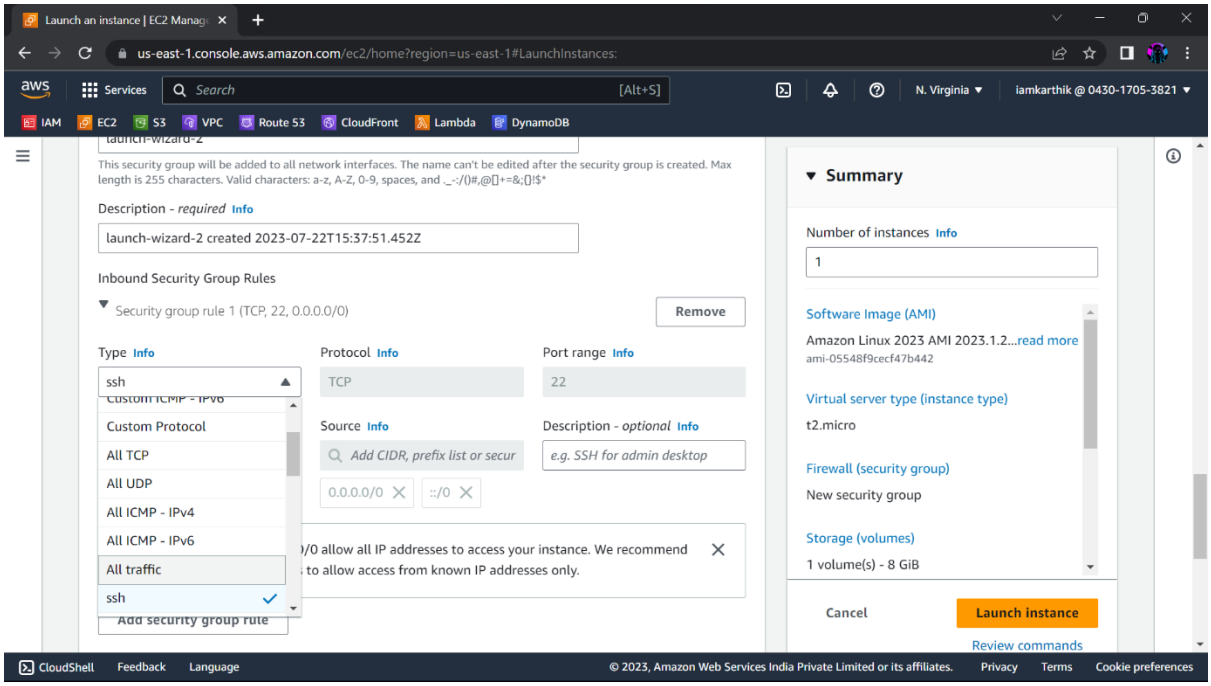


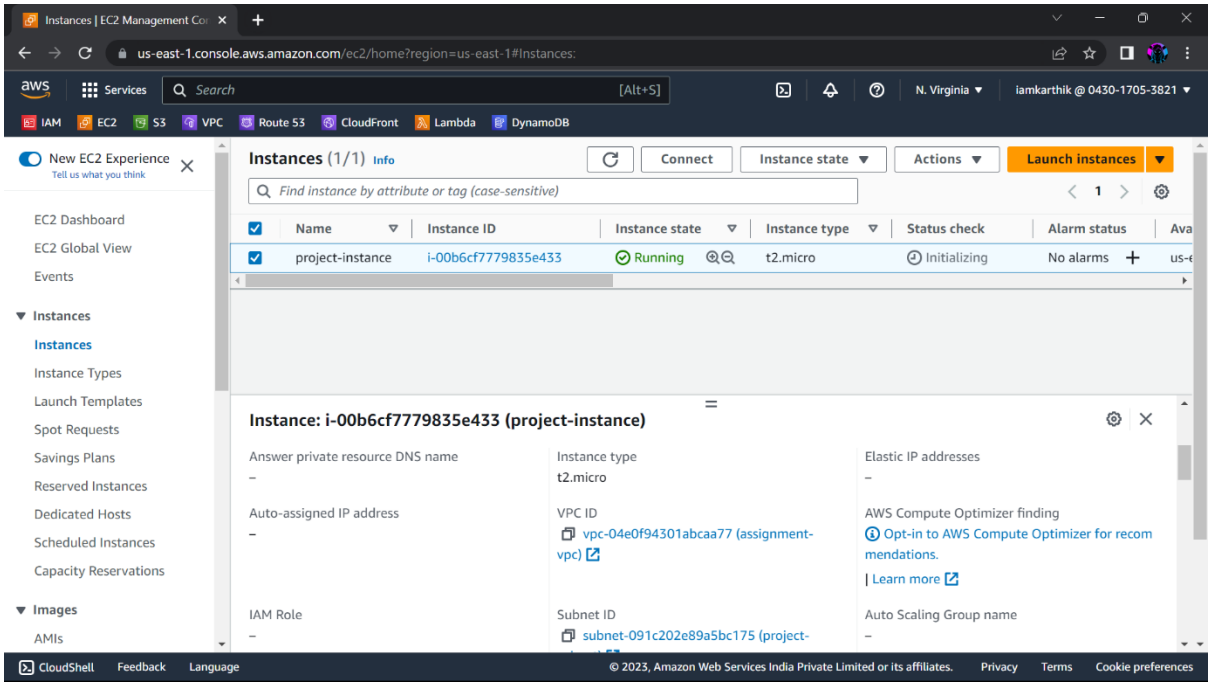
## Step-6: Select your VPC and subnet.



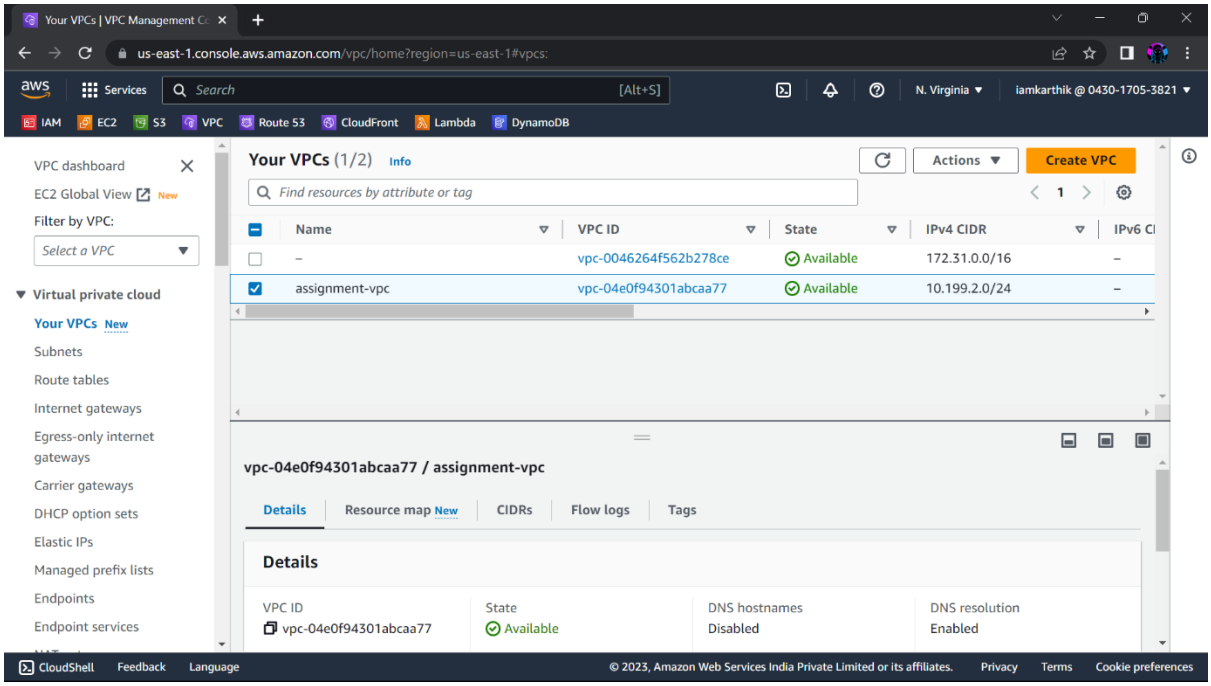
Step-7: In the Inbound Security Group rules, remove ssh and select ***All traffic*** then ***Launch instance.***



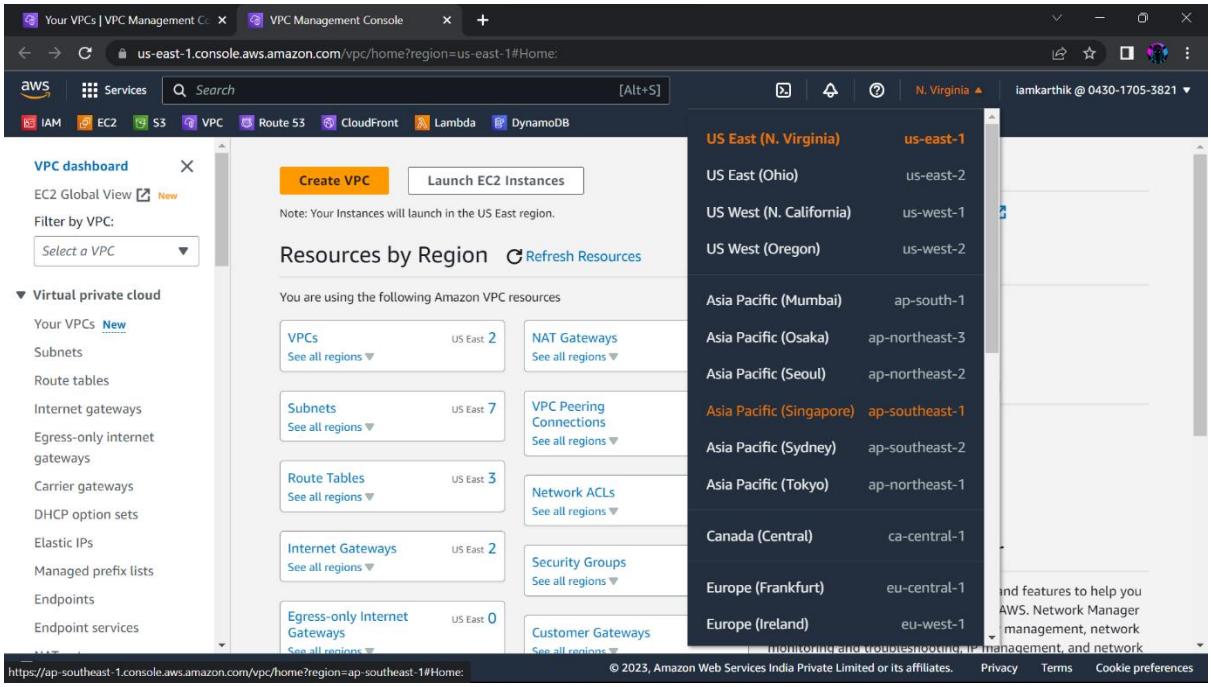



# ***Establish a peering connection between the two VPC's***

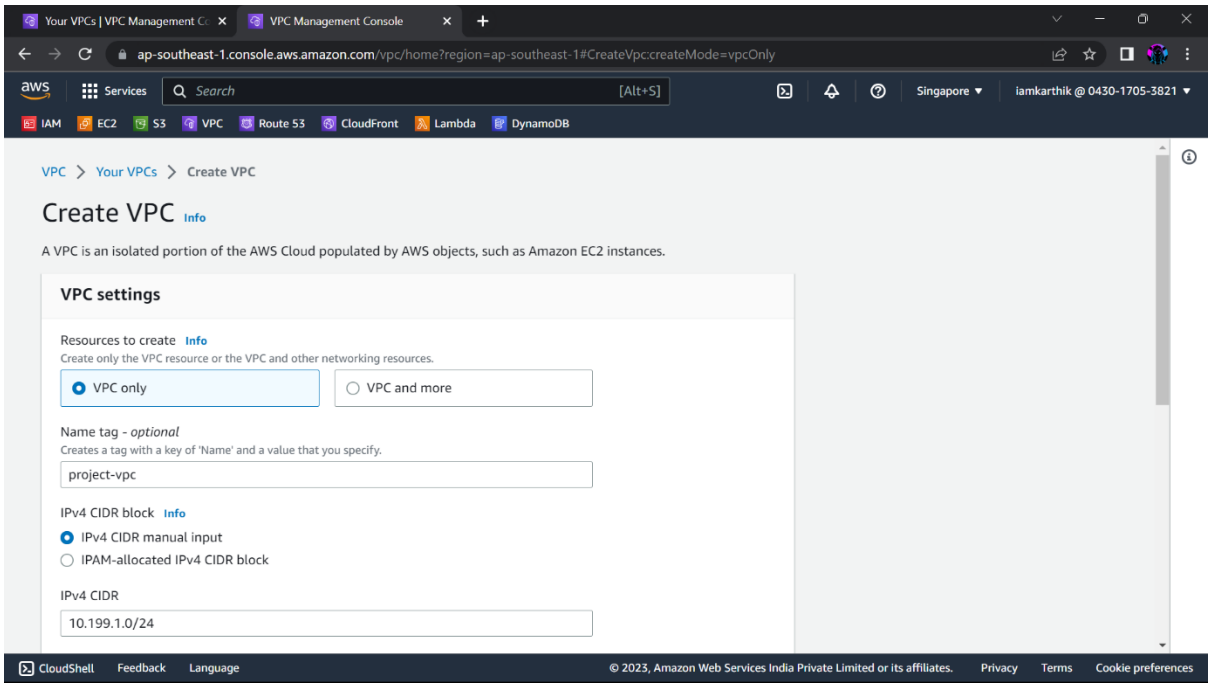
Step-1: Create a VPC in N. Virginia region.

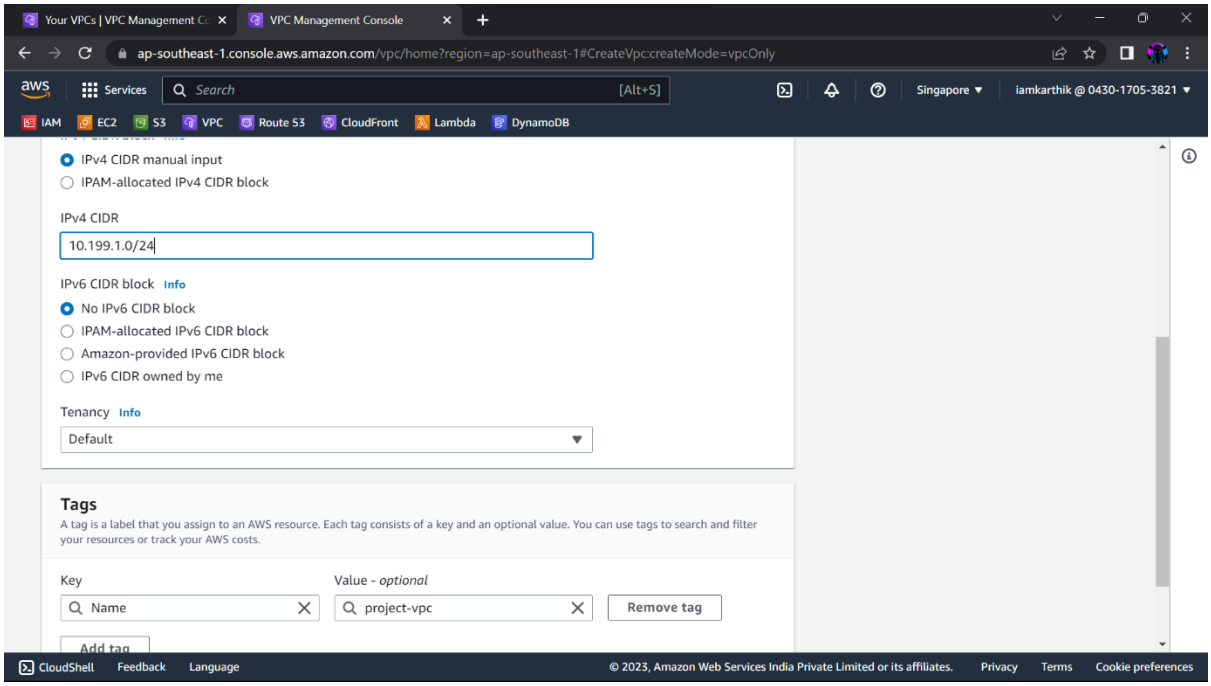


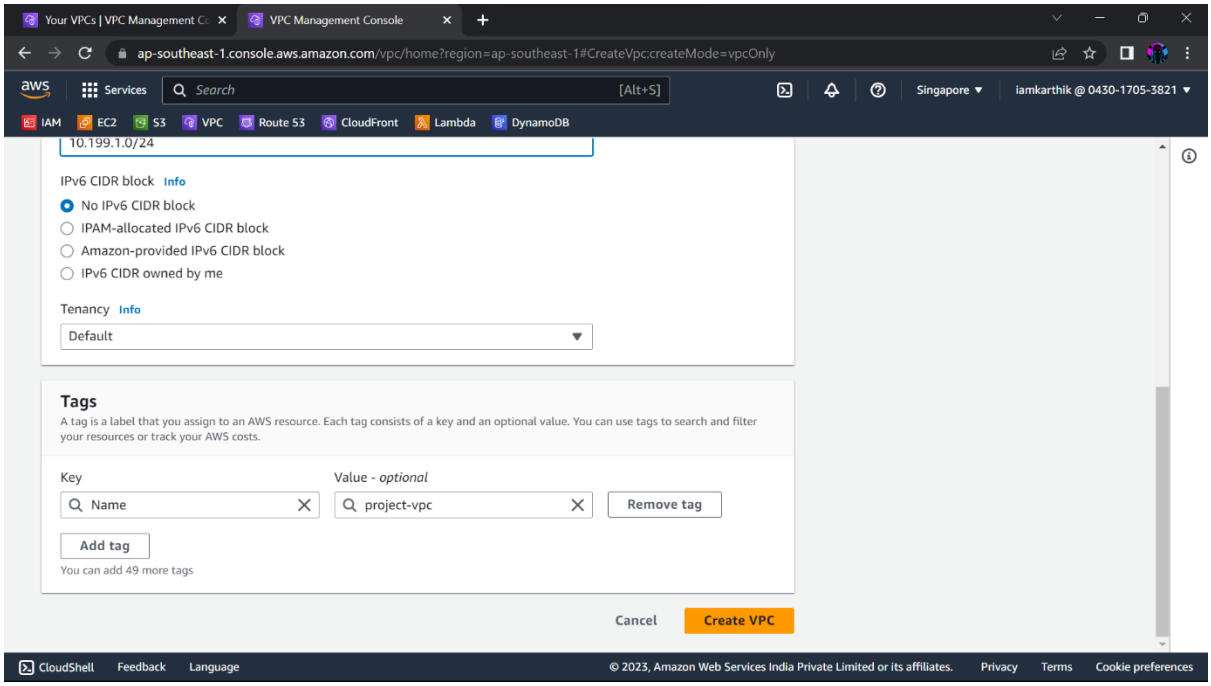

Step-2: Change to another region (***ap-southeast-1***) and go to VPC and select ***Create VPC.***



Step-3: Select ***VPC only wizard*** and give IPV4 CIDR then select ***Create VPC.***




Your VPCs | VPC Management Cc
VPC Management Console
ap-southeast-1.console.aws.amazon.com/vpc/home?region=ap-southeast-1#CreateVpc:createMode=vpcOnly
Services
Search
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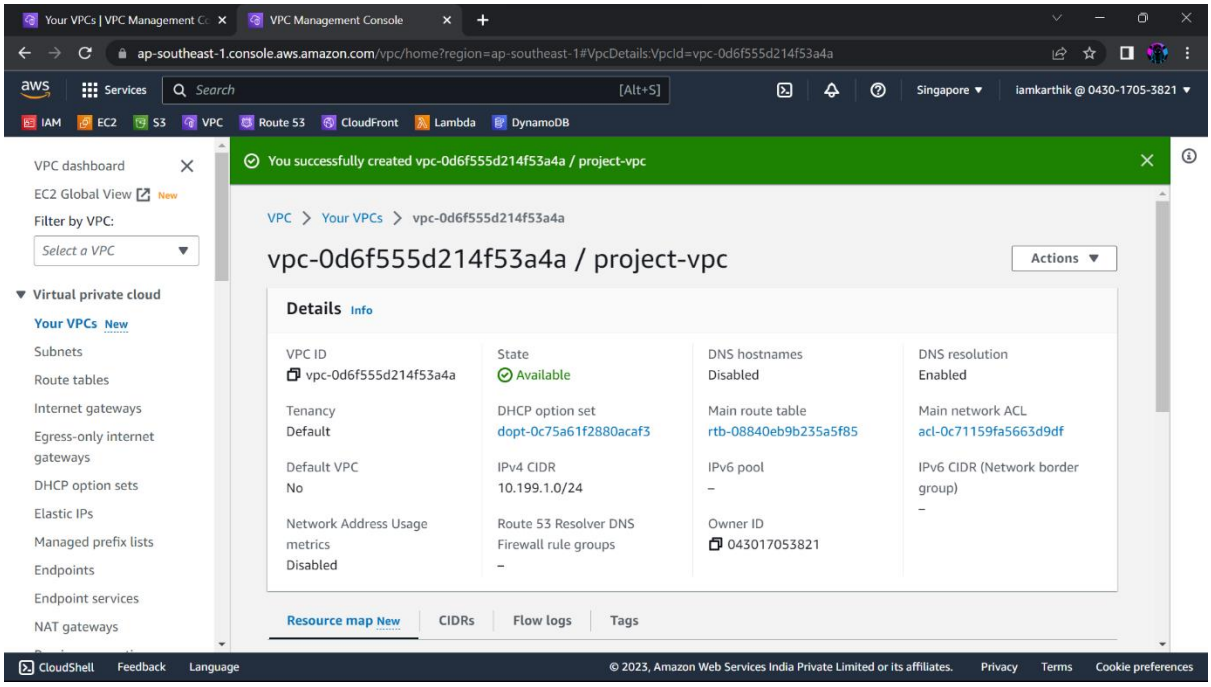
iamkarthik @ 0430-1705-3821
IAM
EC2
S3
VPC
Route 53
CloudFront
Lambda
DynamoDB
10.199.1.0/24
IPv6 CIDR block Info
No IPv6 CIDR block
IPAM-allocated IPv6 CIDR block
Amazon-provided IPv6 CIDR block
IPv6 CIDR owned by me
Tenancy Info
Default
Tags
A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.
Key
Value - optional
Name
project-vpc
Remove tag
Add tag
You can add 49 more tags
Cancel
Create VPC
CloudShell
Feedback
Language
© 2023, Amazon Web Services India Private Limited or its affiliates.
Privacy
Terms
Cookie preferences


Your VPCs | VPC Management Cc
VPC Management Console
ap-southeast-1.console.aws.amazon.com/vpc/home?region=ap-southeast-1#VpcDetails:VpcId=vpc-0d6f555d214f53a4a
Services
Search
[Alt+S]
Singapore
iamkarthik @ 0430-1705-3821
IAM
EC2
S3
VPC
Route 53
CloudFront
Lambda
DynamoDB
VPC dashboard
EC2 Global View New
Filter by VPC:
Select a VPC
Virtual private cloud
Your VPCs New
Subnets
Route tables
Internet gateways
Egress-only internet gateways
DHCP option sets
Elastic IPs
Managed prefix lists
Endpoints
Endpoint services
NAT gateways
You successfully created vpc-0d6f555d214f53a4a / project-vpc
VPC > Your VPCs > vpc-0d6f555d214f53a4a
vpc-0d6f555d214f53a4a / project-vpc
Actions
Details Info
VPC ID
vpc-0d6f555d214f53a4a
State
Available
DNS hostnames
Disabled
DNS resolution
Enabled
Tenancy
Default
DHCP option set
dopt-0c75a61f2880acaf3
Main route table
rtb-08840eb9b235a5f85
Main network ACL
acl-0c71159fa5663d9df
Default VPC
No
IPv4 CIDR
10.199.1.0/24
IPv6 pool
–
IPv6 CIDR (Network border group)
–
Network Address Usage metrics
Disabled
Route 53 Resolver DNS Firewall rule groups
–
Owner ID
043017053821
Resource map New
CIDRs
Flow logs
Tags
CloudShell
Feedback
Language
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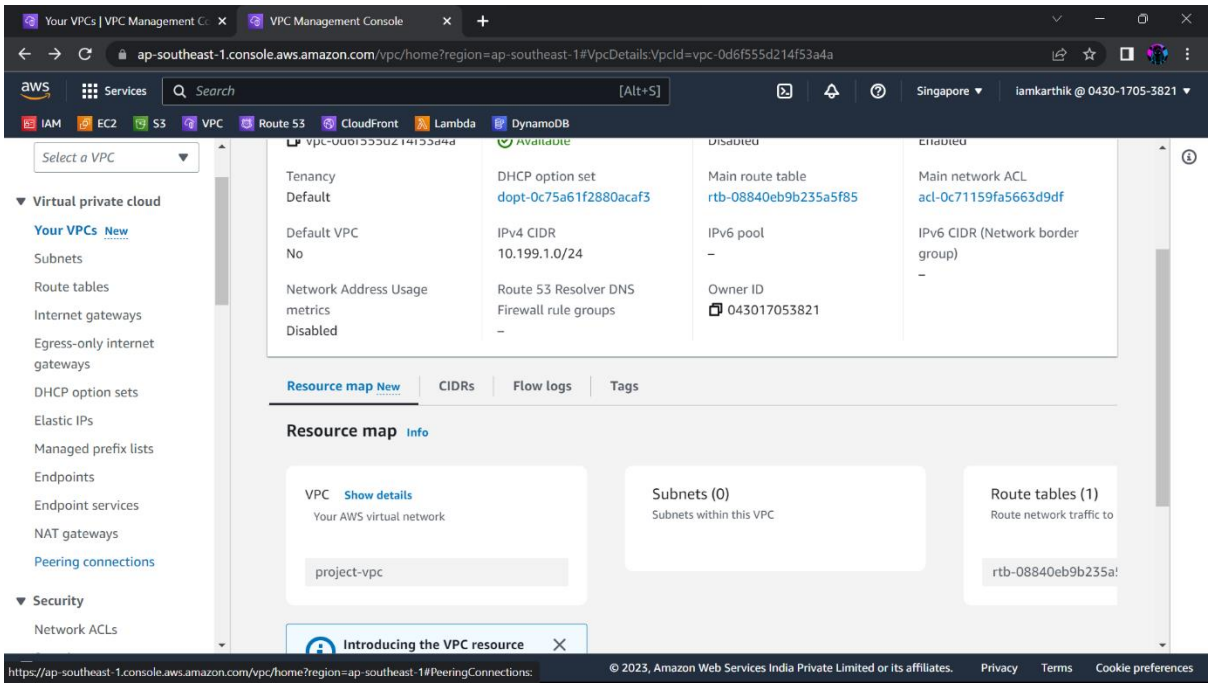
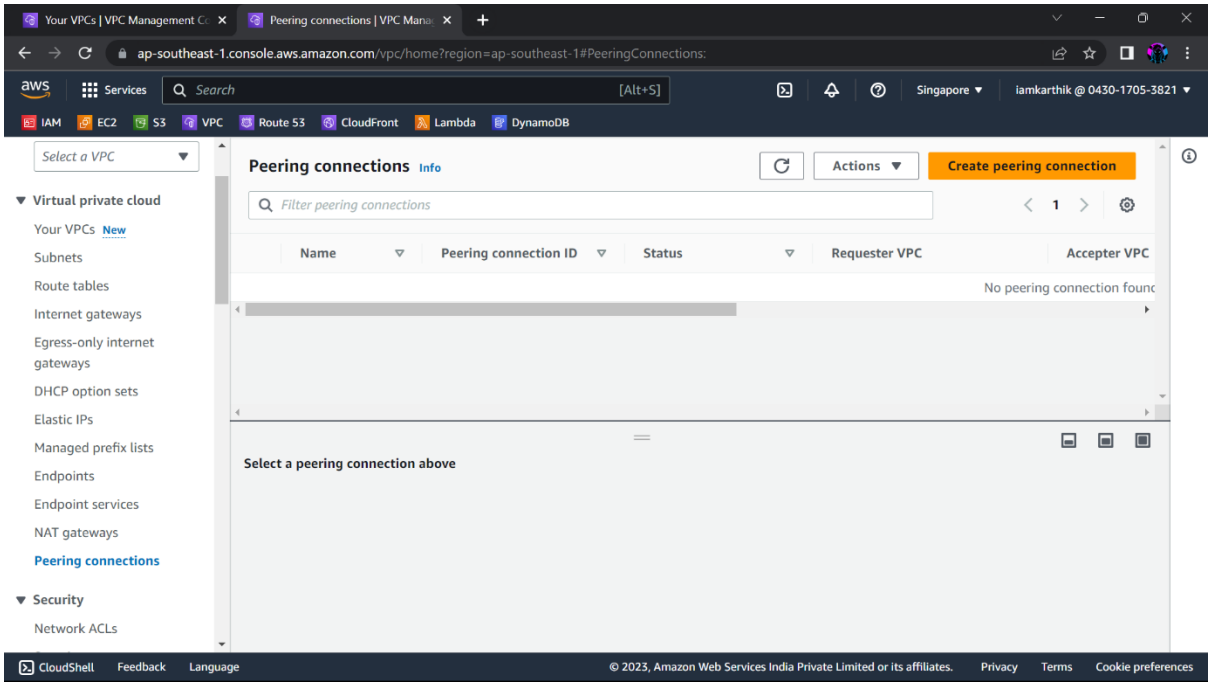
Cookie preferences

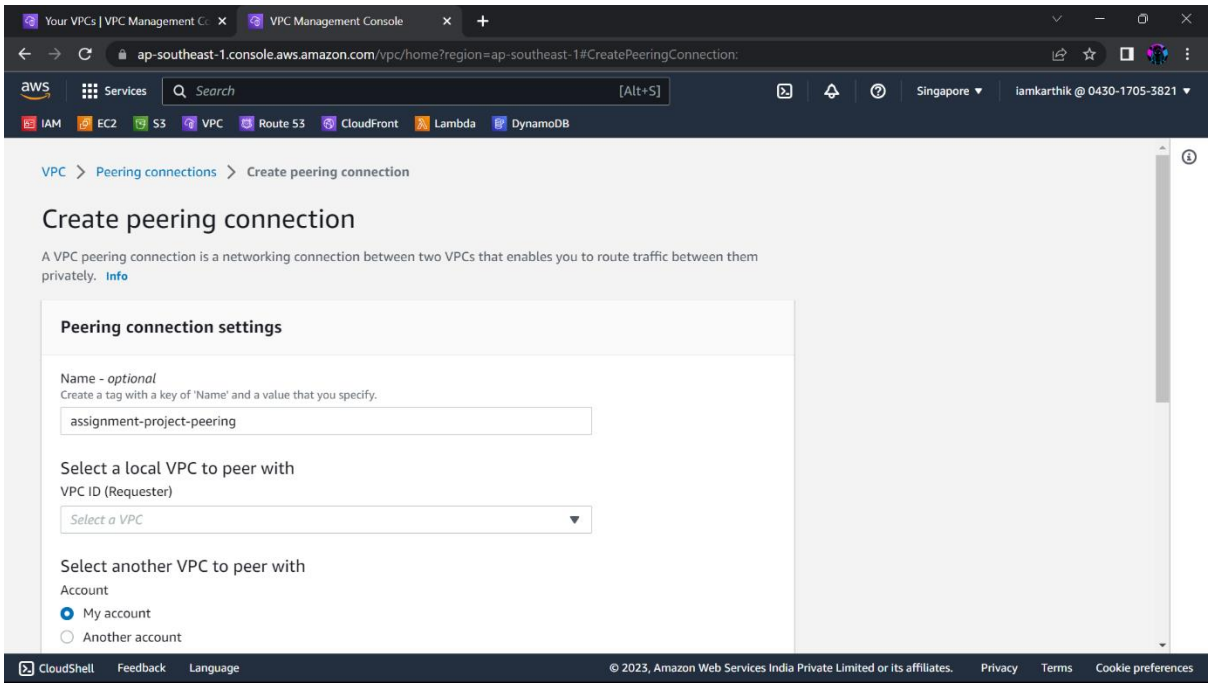
Step-4: Click on ***Peering connections.***

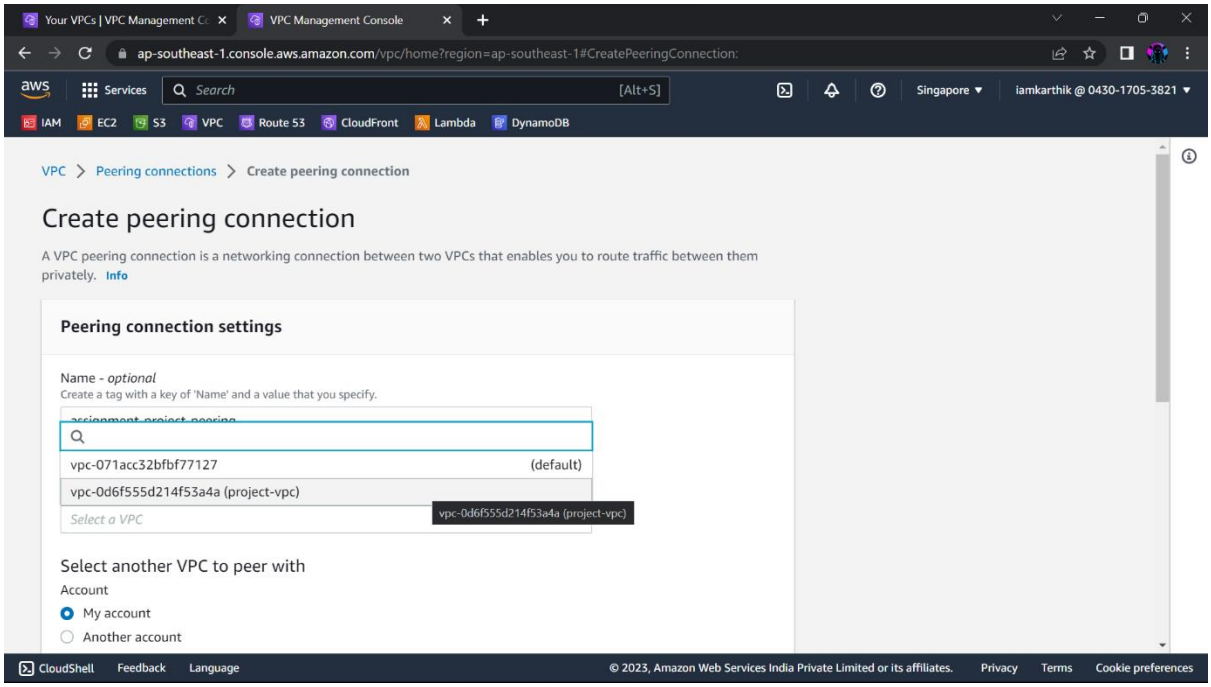



Step-5: Select ***Create peering connection.***

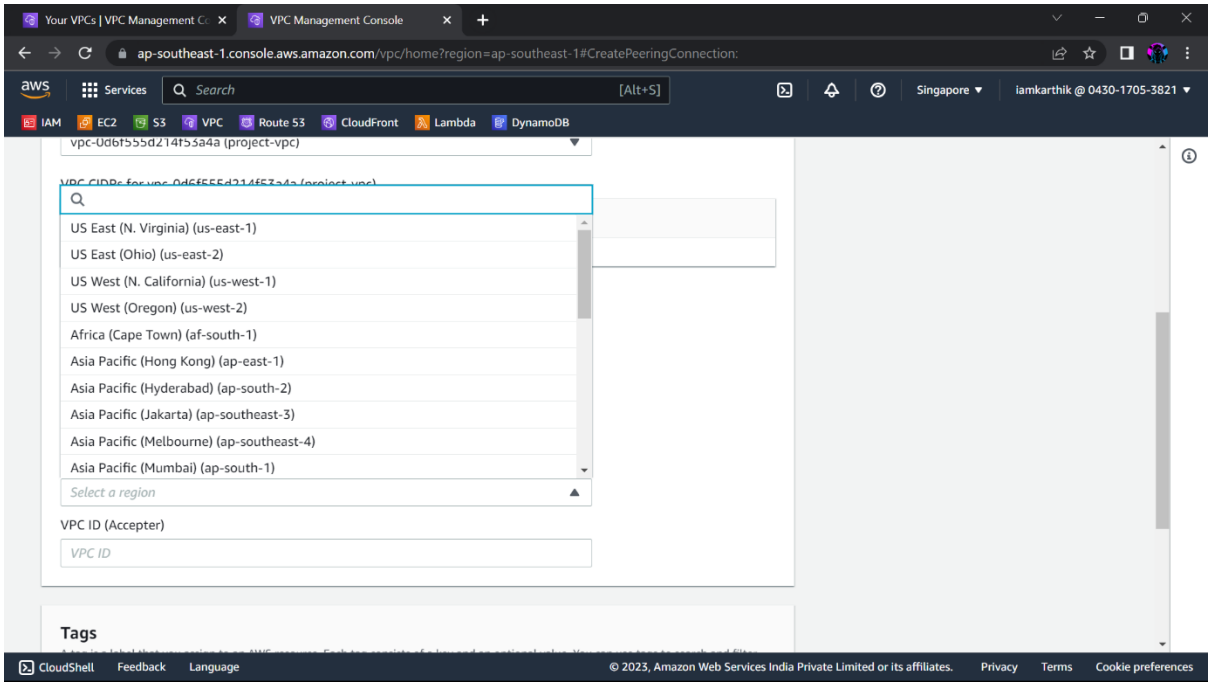


Step-6: Give a name to your peering connection and Select the requester VPC.

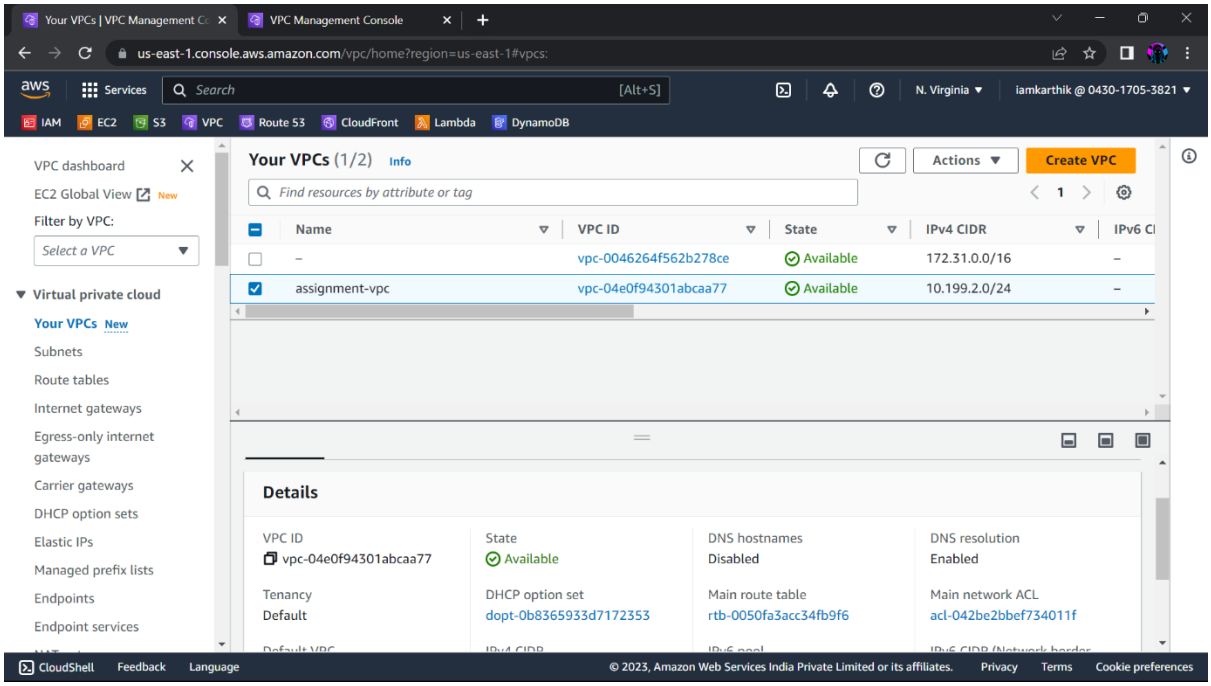


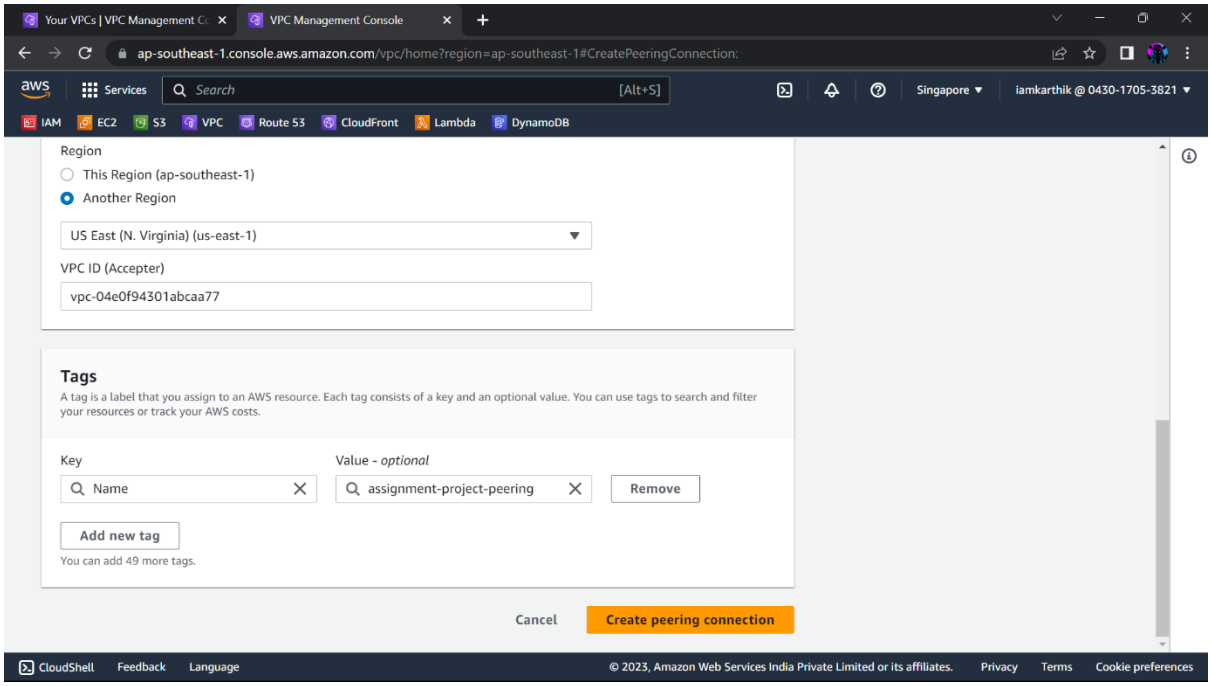
Step-7: Select ***My account*** as another accepter VPC. Select ***Another region*** and select the region of your accepter VPC.

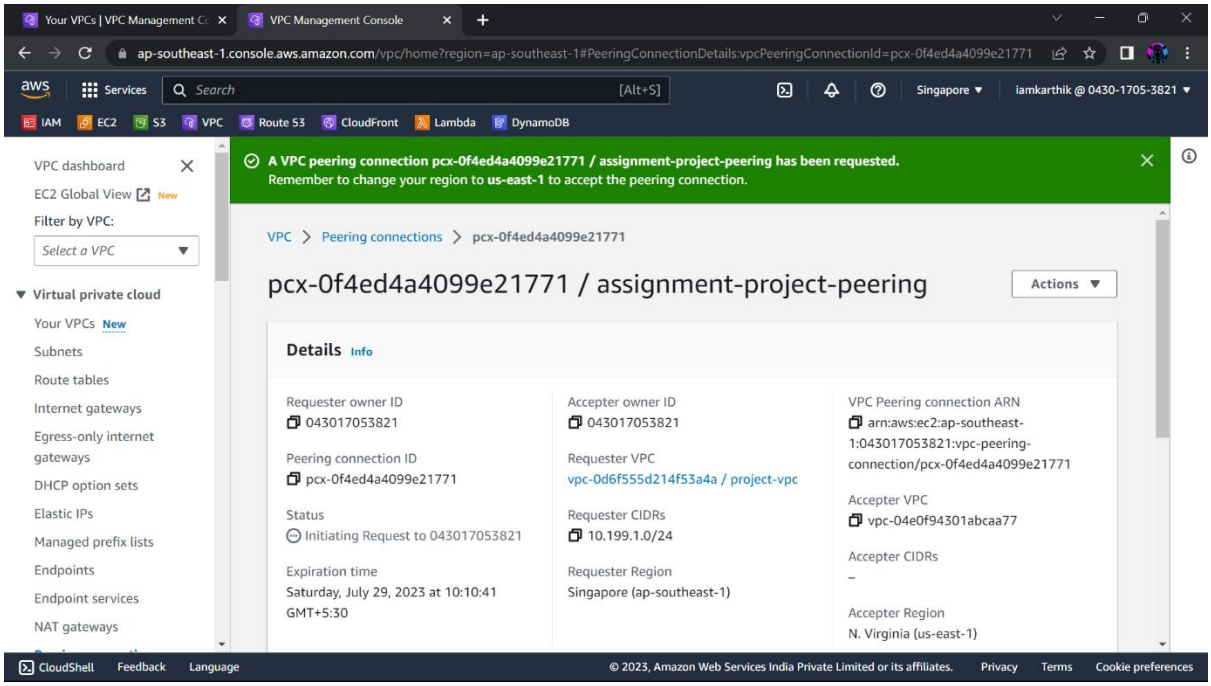



Step-8: Goto your Accepter VPC and select your VPC. In the Details copy the VPC ID.

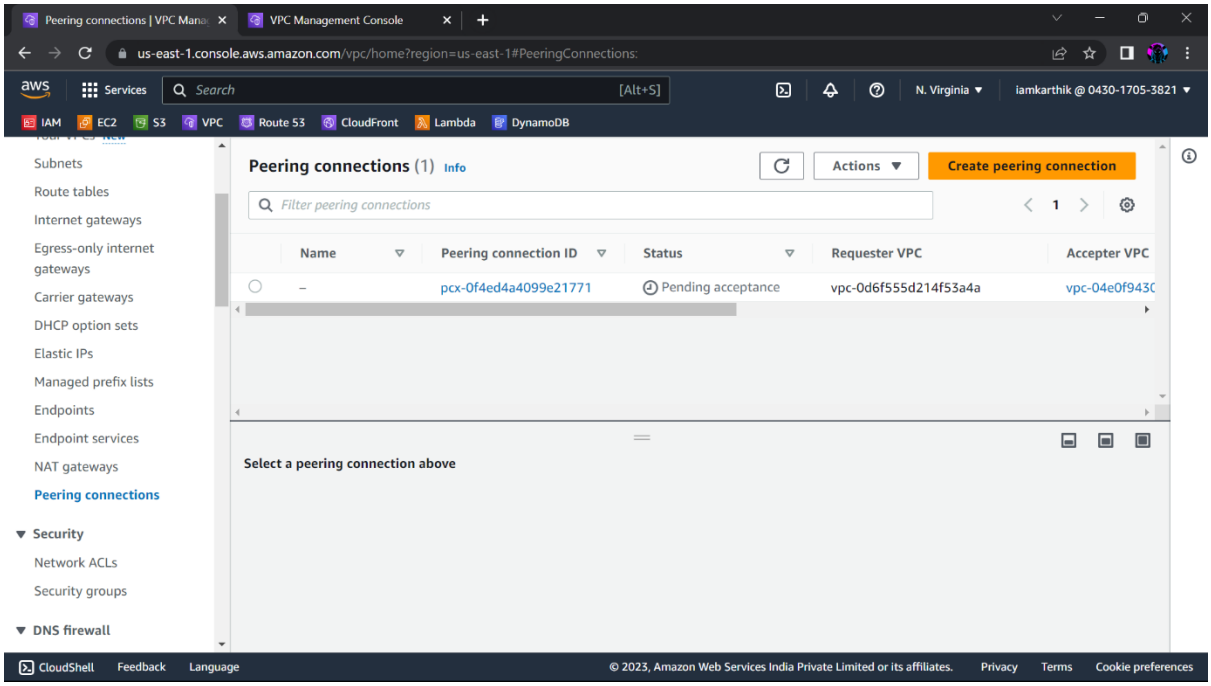


Step-9: Paste the Accepter VPC ID and click on ***Create peering connection.***

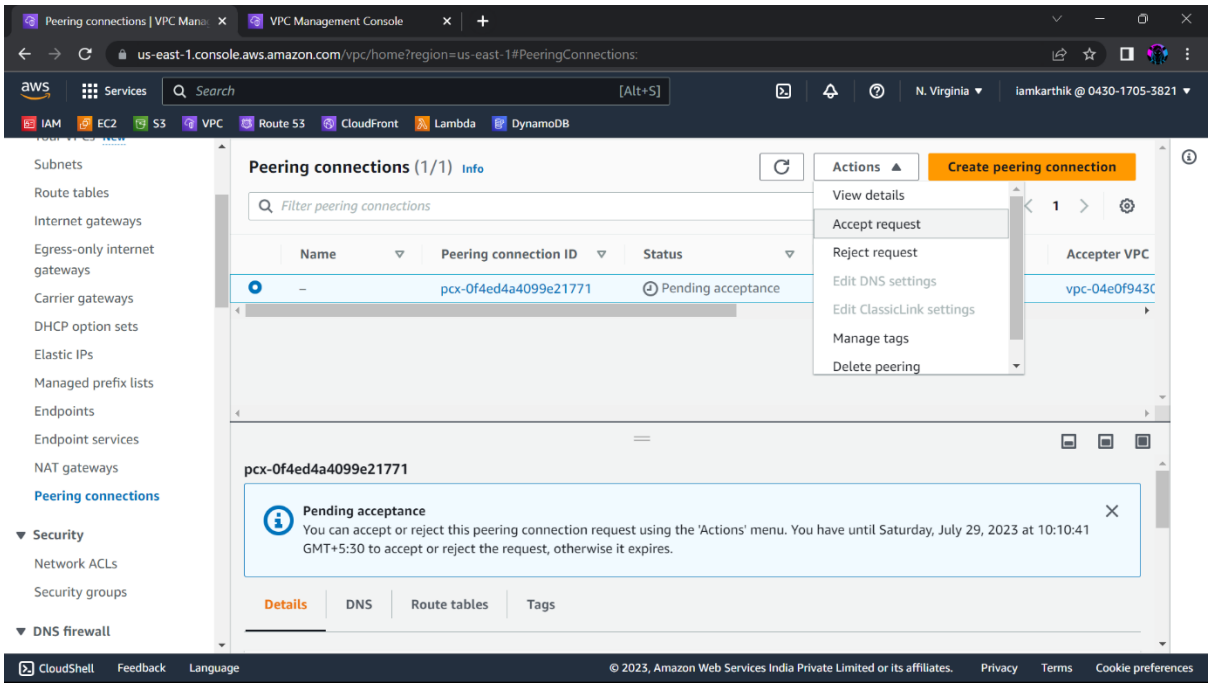


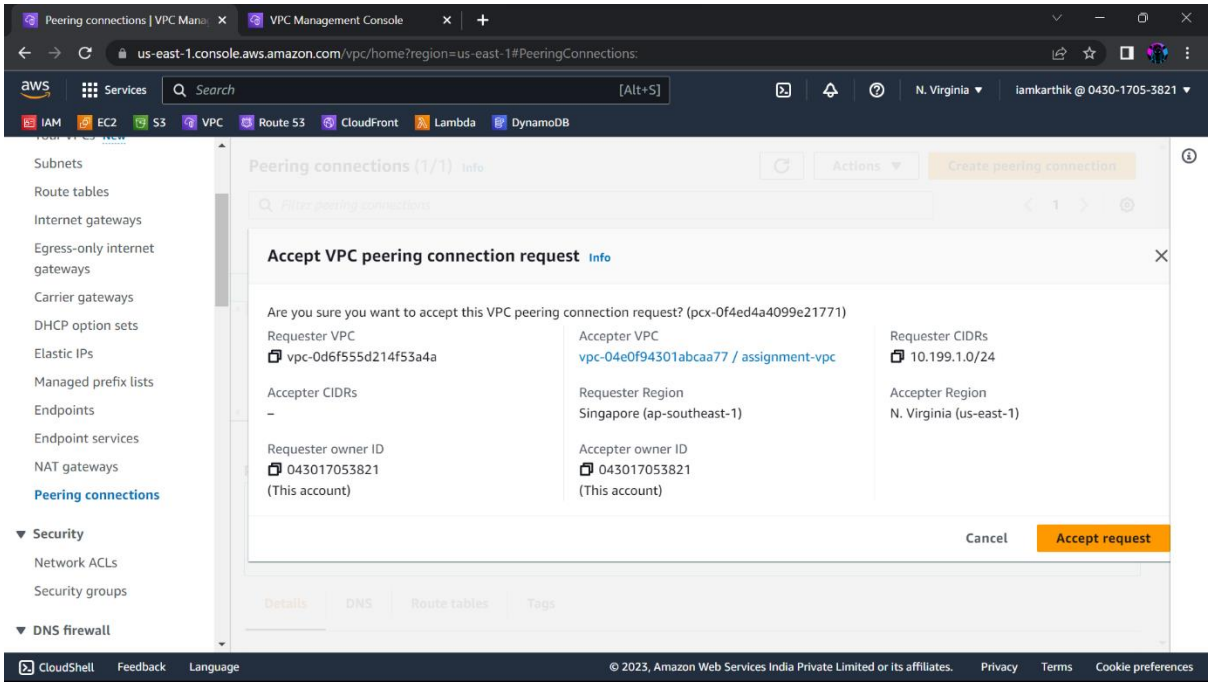
Step-10: Now go to peering connections in Accepter VPC. There will be a peering request under acceptance.

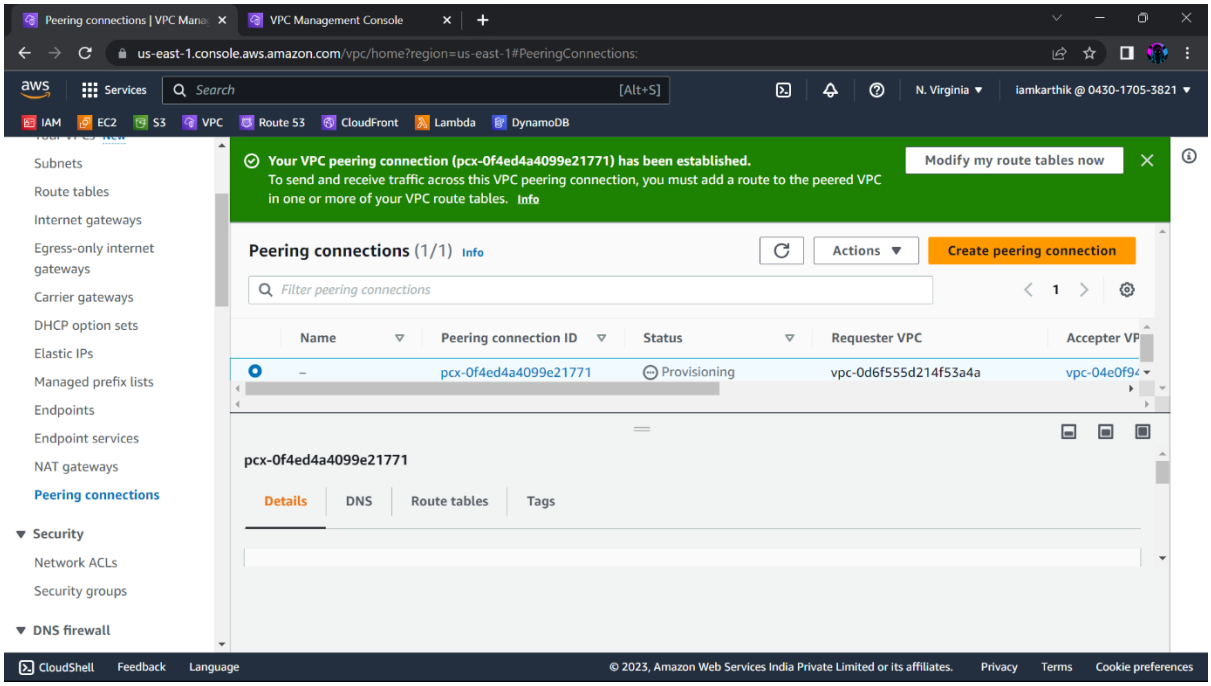



Step-11: Select the peering request and select ***Accept request*** in actions.

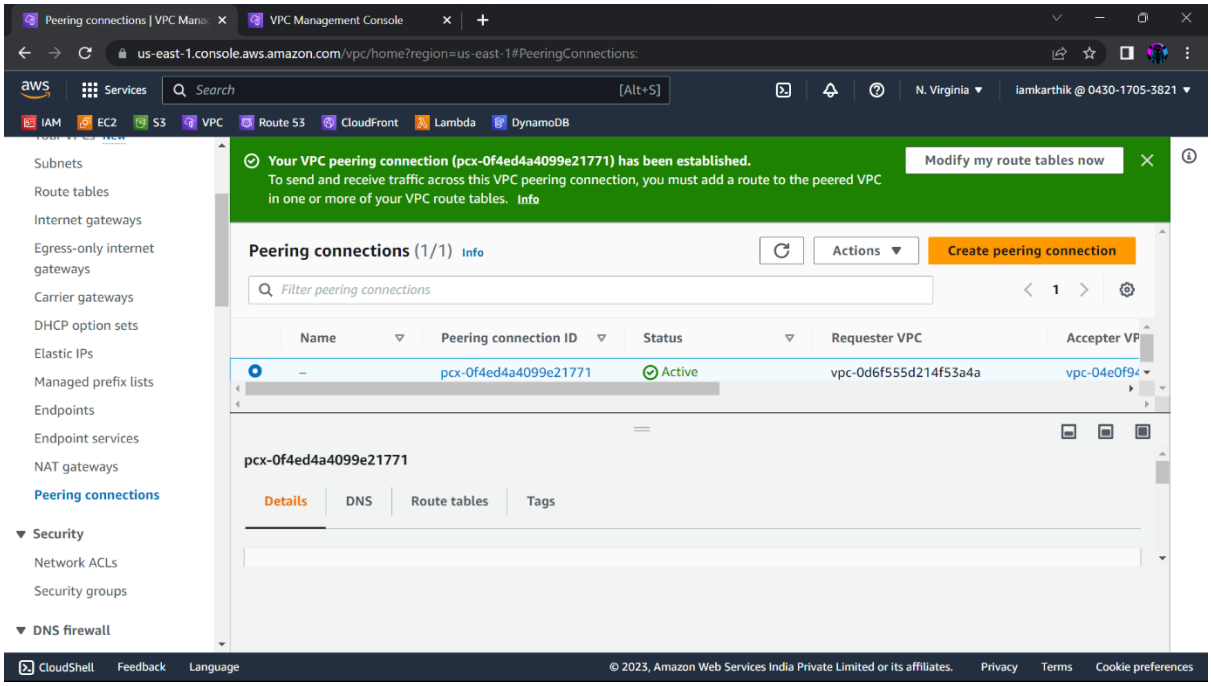


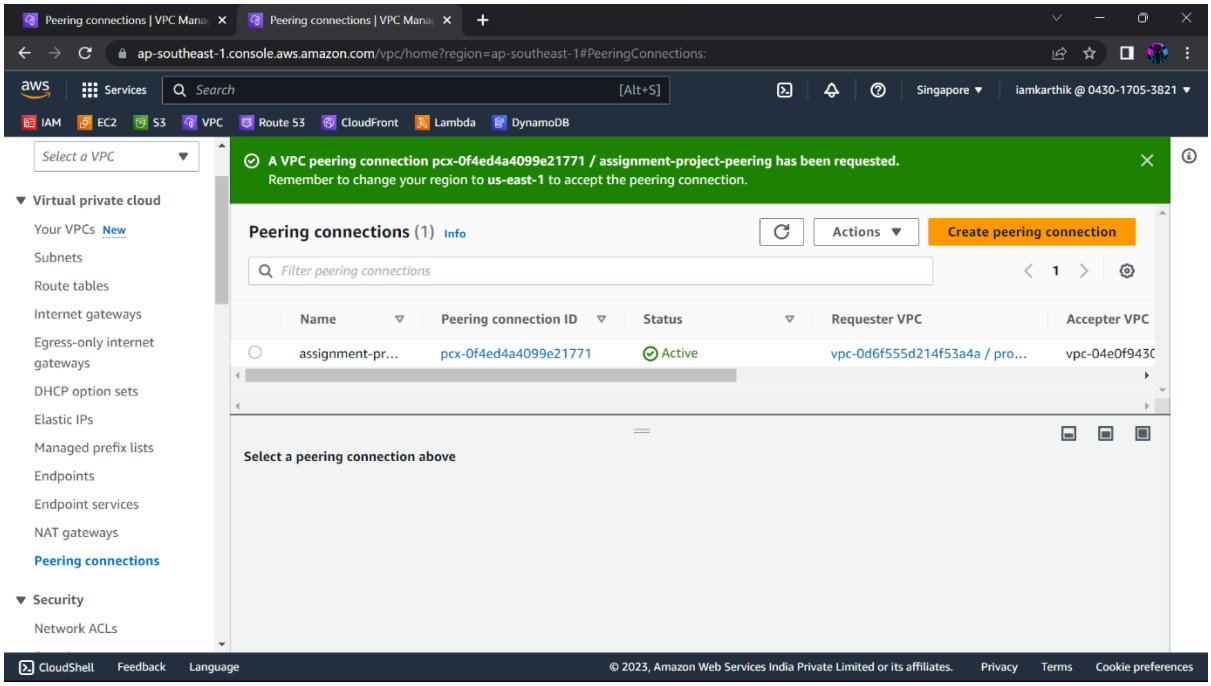
Step-12: Click on ***Accept request.***



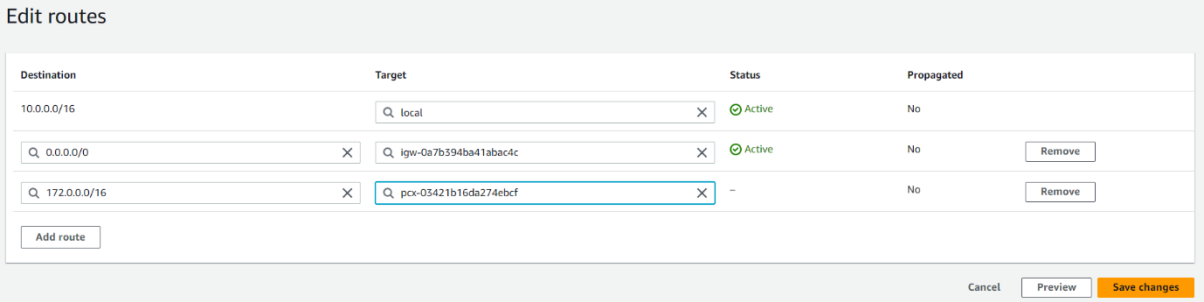
The peering connection is now established.



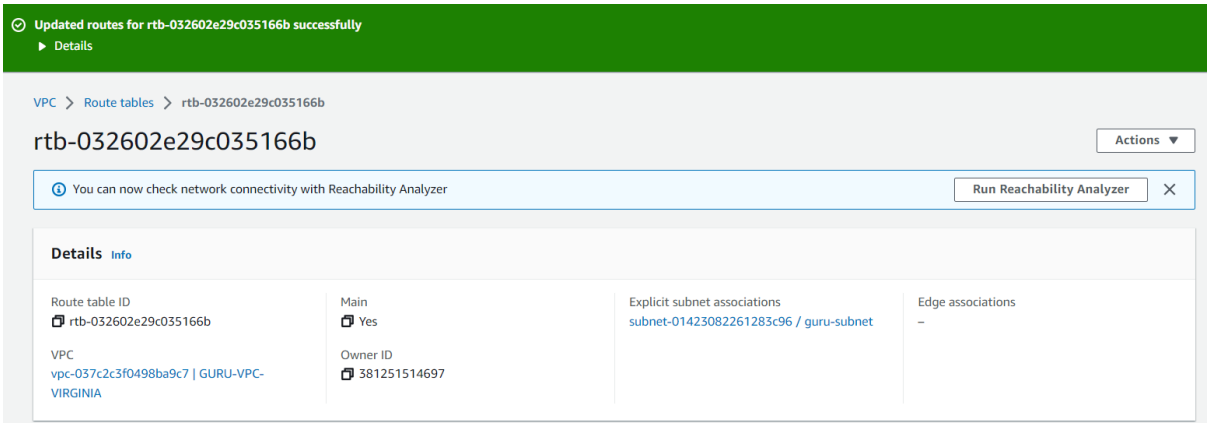



# ***Communicating through private IP's***

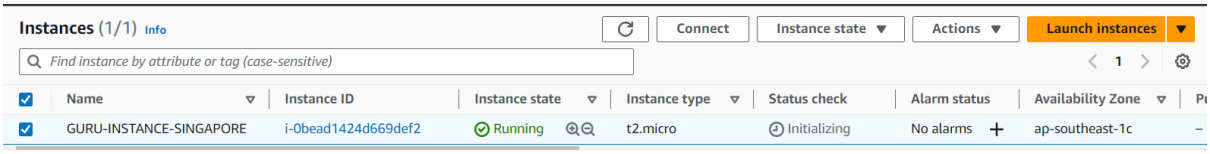
**STEP-1:** Add the **ROUTE** as shown below to **SINGAPORE REGION**



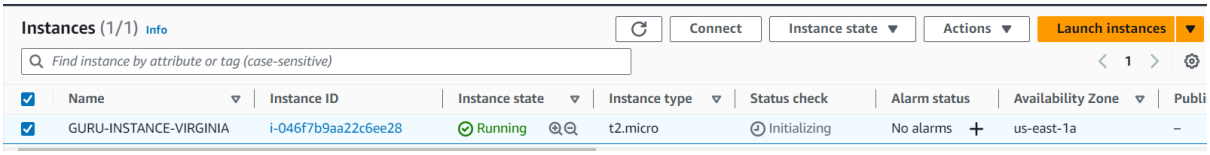

**STEP-2: PEERING CONNECTION HAS BEEN ESTABLISHED SUCCESSFULLY**



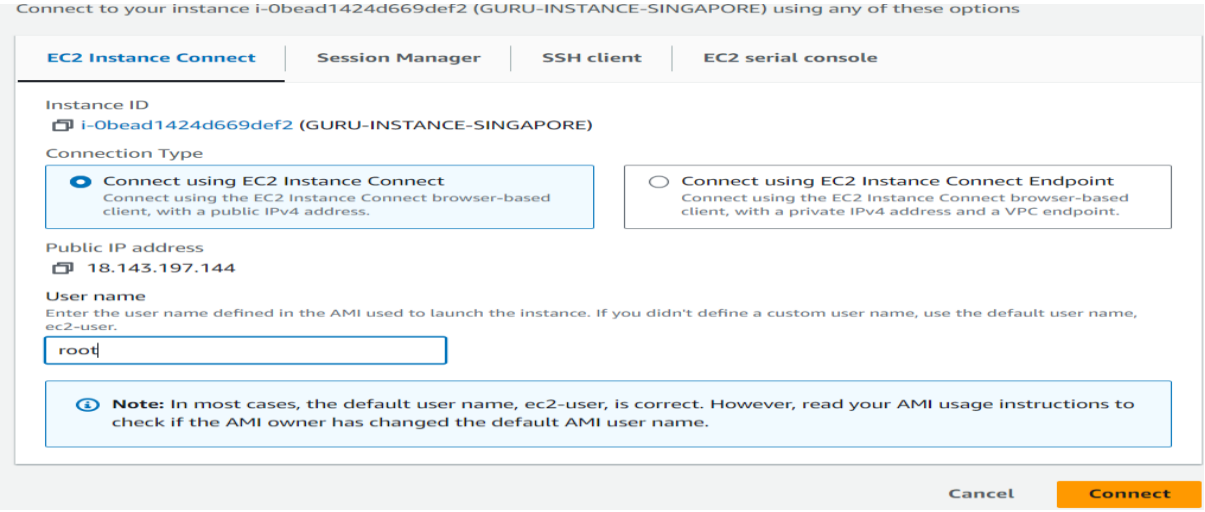

**STEP-3:** Here is the previously created instances with the VPC's in **SINGAPORE REGION** click on **connect**



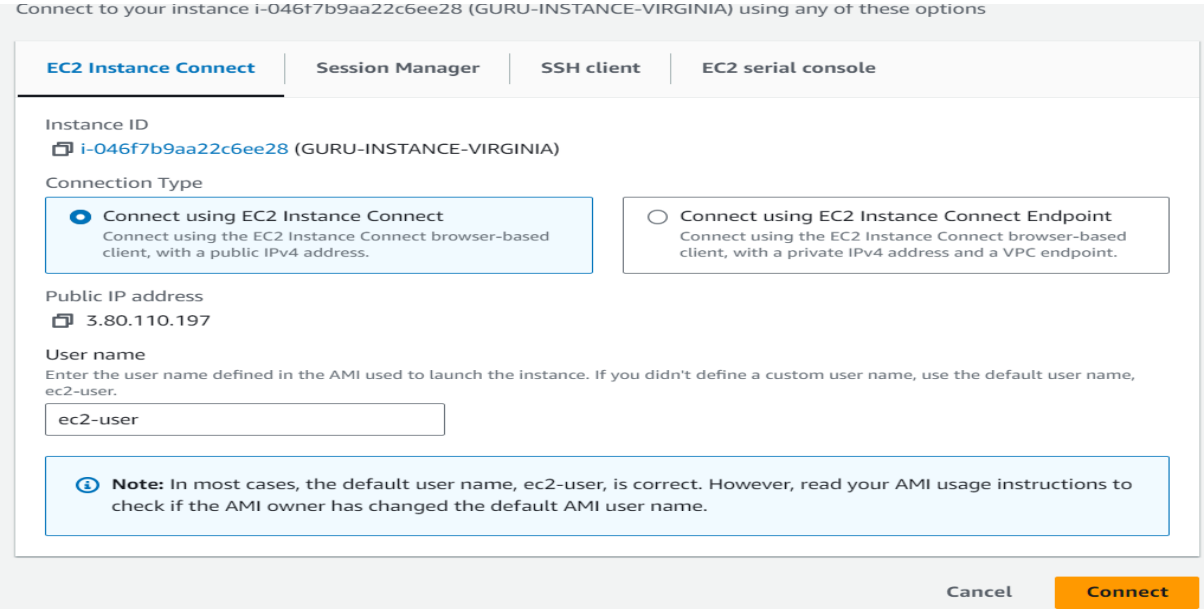

**STEP-4:** Here is the previously created instances with the VPC's in VIRGINIA REGION click on **connect**



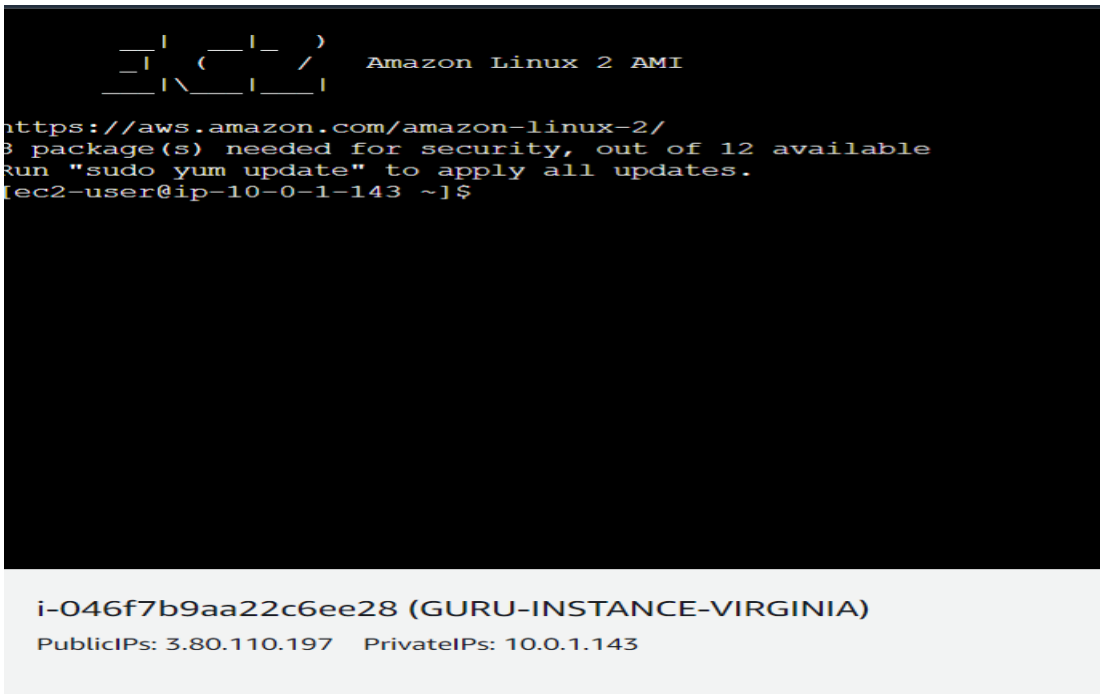
**STEP-5:** Edit the username as **ROOT** and click **CONNECT**




**STEP-6:** Click **CONNECT** in this region



**STEP-7:** Copy the **PRIVATE IP** of **N VIRGINIA** REGION




**STEP-8**: Enter the **LINUX COMMAND** and paste the **PRIVATE IP of VIRGINIA REGION**

**STEP-9:** Make sure that the **PACKAGE LOSS IS 0%**

**NOW THE VPC's COMMUNICATION IS ESTABLISHED**

```
[root@ip-172-0-1-202 ~]# ping 10.0.1.230
PING 10.0.1.230 (10.0.1.230) 56(84) bytes of data.
64 bytes from 10.0.1.230: icmp_seq=1 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=2 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=3 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=4 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=5 ttl=255 time=21.2 ms
64 bytes from 10.0.1.230: icmp_seq=6 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=7 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=8 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=9 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=10 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=11 ttl=255 time=20.9 ms
64 bytes from 10.0.1.230: icmp_seq=12 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=13 ttl=255 time=20.9 ms
64 bytes from 10.0.1.230: icmp_seq=14 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=15 ttl=255 time=20.9 ms
64 bytes from 10.0.1.230: icmp_seq=16 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=17 ttl=255 time=21.0 ms
64 bytes from 10.0.1.230: icmp_seq=18 ttl=255 time=21.0 ms
^C
--- 10.0.1.230 ping statistics ---
18 packets transmitted, 18 received, 0% packet loss, time 17019ms
```